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**EVALUATION OF A WEIGHT MANAGEMENT PROGRAM USING THE INTUITIVE EATING
APPROACH FOR CLINICALLY OVERWEIGHT AND OBESE ADULTS.**

A thesis presented for partial fulfilment of requirement for the

Degree of Master of Science

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Abstract

Background: Maintained weight loss has been shown to reduce the risks associated with excess weight. However, weight maintenance is short lived in ~80% of adults attempting weight-loss interventions that have poor long-term sustainability (e.g. calorie restriction). The non-diet approach uses intuitive eating and mindful eating practices while debunking the diet mentality.

Aim: This study aimed to conduct a long-term (one year) assessment of a 24-week weight management program (Eating for your Health) using an intuitive eating approach in hospital referred overweight and obese adults.

Design: Twenty-four program completers were followed up after one-year, using a mixed method approach (quantitative and qualitative). Weight, height, waist and hip circumferences were measured, and changes in eating behaviour, quality of life and program progress were assessed. Paired sample t-test and One-way Anova was used to compare changes between different time points. Three, one-hour focus groups (n=13) were conducted, using six themes. Thematic analysis was used to capture and transcribe data within these themes.

Results: A significant improvement in mean (\pm SD) total Intuitive eating level was seen from baseline to one-year follow-up (3.33 (\pm 0.39) to 3.52 (\pm 0.46) ($p < 0.04$ respectively). Restrained, emotional and external eating behaviour respectively, did not change significantly from baseline 2.65 (\pm 0.78), 1.92 (\pm 0.88), 2.51 (\pm 0.64) to one-year follow-up 2.61 (\pm 0.77), 1.86 (\pm 0.85), 2.45 (\pm 0.70). Positive change was observed in sugar intake decreasing from 4.2 to 2.2 ($p = 0.02$) servings at one-year follow-up whereas no changes were seen for fruit, vegetable, carbohydrate, dairy, alcohol or water intake. More than half (59%) of the participants maintained their weight with 27% losing weight and 14% gaining weight. Participants believed the group setting encouraged joint activities and peer learning, whilst individual sessions with a dietitian supported personalised goal setting. Intuitive and mindful eating education and strategies was valued most, whilst unsupportive home environments, readily available food at work and cultural beliefs and practices were barriers for using this approach.

Conclusion: Intuitive eating-based weight management programs can achieve weight loss and positive eating behaviour. The results from this study will aid in improving current non-diet approach programs within the hospital and implementing future programs.

Keywords: Intuitive eating, mindful eating, primary healthcare weight management, weight loss, group education

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List of Abbreviations

ACC	American College of Cardiology
AHA	American Heart Association
BMI	Body Mass Index
COPD	Chronic obstructive pulmonary disease
CVD	Cardiovascular disease
DEBQ	Dutch Eating Behaviour Questionnaire
DSE	Diabetes support education
FAB	Food, activity and behaviour
FFQ	Food Frequency Questionnaire
GI	Glycaemic Index
HAES	Health at Every Size
HDL	High density lipoprotein
IE	Intuitive Eating
ILI	Intensive Lifestyle Intervention
Kg	Kilogram
LDL	Low density lipoprotein
M	Metre
NWCR	National Weight Control Registry
NZ	New Zealand
Q-LES-Q-SF	Quality of life enjoyment and satisfaction questionnaire-short form
QOL	Quality of life
SD	Standard Deviation
TFEQ	Three Factor Eating Questionnaire
TOS	The Obesity Society
USA	United States of America
WC	Waist Circumference
WHO	World Health Organisation
WHR	Waist to hip ratio

Contributions to research

Table 0. 1: *Contributions to this study*

Researchers	Contributions to this thesis
Zakiya Bi	Main researcher, participant recruitment, screening and testing, data collection, data analysis, statistical analysis, interpretation and discussion of results.
Associate Professor Rozanne Kruger	Main academic supervisor and guidance with design of thesis, methods, statistical analysis, interpretation of results, and revision.
Franica Yovich, NZRD	Supervisor, principal investigator of Eating for Your Health study, guidance with study design, methods / focus groups and interpretation of results.

CHAPTER ONE

1.0 Introduction

Overweight and obesity has been transformed from a minor public health concern that largely affected the affluent society to a major risk to public health that can now be seen world-wide (Swinburn, 2008). There are no national success stories for decreasing obesity rates; similarly, all countries are searching for answers on how to reverse the rising levels of adult and childhood obesity (Swinburn et al., 2011). The increasing prevalence of obesity is one of the major driving factors for the rising levels of chronic diseases (e.g. type 2 diabetes, cancer, lung and heart disease) (Dixon, 2010). As a result, there is an increase in health care costs, loss of productivity, extended hospital visits and higher mortality rates (Lal et al., 2012, Lenoir et al., 2015). Obesity is complex with multiple factors attributing towards the problem, and more individuals are being exposed to the increasingly obesogenic environment (Grundy, 1998, Swinburn, 2008). In the first half of the 20th century, a decrease in physical activity was seen as a result of an increase in motorization and mechanization, along with changes in the global food system, with greater promotion and access to cheap, energy-dense and nutrient-poor foods (Swinburn et al., 2011, Yach et al., 2006). The combination of unhealthy dietary behaviour and increased physical inactivity promotes weight gain and is identified as a major cause of mortality and disability from non-communicable diseases worldwide (Dietz et al., 2015, Lenoir et al., 2015).

In New Zealand, the prevalence of obesity has increased over time, with current adult obesity rates being three times those in 1977 (Ministry of Health., 2015). Currently almost one-third of New Zealand adults (30%) are obese and a further third (35%) are overweight (Ministry of Health (2015a). A greater proportion of New Zealand Māori (47%) and Pacific adults (67%) are obese compared to their non- Māori and Non-Pacific counterparts. It has also been estimated that 147,000 (4%) adults are extremely obese (Body Mass Index $\geq 40\text{kg/m}^2$), with a greater proportion of females being placed in this category (Ministry of Health., 2015). The obesity epidemic is also socially patterned with adults living in most deprived areas more likely to be obese or extremely

obese compared to adults living in least deprived areas. Individuals living in low-socioeconomic groups are less likely to purchase foods according to the dietary guidelines, as energy dense foods that are nutritionally poor are seen as being affordable and an effective way to provide daily calories (Turrell, 1996, Barosh et al., 2014). In contrast, high quality nutrient-rich foods cost more and are consumed by the more affluent. Thus individuals attempting to reduce food cost may select foods that are based on refined grains, added sugar and fats that are more affordable and satiating, and may lead to increased energy intake and weight gain (Drewnowski, 2004). Physical inactivity is also more prevalent in adults living in socioeconomically deprived areas. Therefore, weight loss interventions need to be individualized and cost-effective for it to be sustainable.

To combat the obesity epidemic a wide range of strategies have been used to elicit weight loss. For instance, commercial weight loss programs that alter macronutrients; e.g. Atkins diets (low carbohydrate), Ornish diet (low fat), Mediterranean diet (increased unsaturated fats), Weight watchers (restriction of portion sizes and calories) and Zone diet (modulate macronutrient balance and glycemic load) are widely used (Tsai and Wadden, 2005). Research examining the effects of macronutrient composition on weight loss and obesity-related comorbidities have shown diets such as the Atkins diet, Ornish diet and Zone diet to be effective in achieving short term (three to six months) weight loss and positive health outcomes, however the benefits are not sustained at long term follow-ups (Sacks et al., 2009, Naude et al., 2014, Dansinger et al., 2005). This has largely been attributed to a minority of individuals being able to adhere to the diets, cost, support and side effects from the diets (Dansinger et al., 2005). Another popular method employed by individuals is restrictive eating. This could either be restricting oneself from eating specific foods or reducing the amount of food being eaten or skipping meals (Quick and Byrd-Bredbenner, 2012). Clinical trials based on restrictive eating have also found this method to lead to weight loss, however the results are only sustained for a short period of time. Individuals are unable to adhere to this method and give in to temptations, which can lead to further weight gain, disordered eating and cause other physiological and psychological harm (Quick and Byrd-Bredbenner, 2012, Dulloo and Montani, 2015, van Strien et al., 2014a).

Due to limited long term benefits and associated negative health effects of the weight centered approach (e.g. weight loss programs, energy restriction) researchers are now moving towards the promotion of permanent lifestyle changes (Camilleri et al., 2016). The use of intuitive eating to promote sustainable lifestyle modifications is an area of weight management treatment being used as an alternative to dieting. Intuitive eating, in contrast to controlled eating, is an eating style that focuses on eating motivated by an individual's physical hunger and satiety cues rather than eating due to emotional or environmental motivators (Bacon et al., 2005). Intuitive eating based interventions aims to encourage individuals to focus on their overall health rather than weight loss to promote a positive attitude towards food and their body image (Mathieu, 2009, Cadena-Schlam and Lopez-Guimera, 2014). Although there is limited research, intuitive eating has shown to promote healthy dietary practices, and to improve physical and emotional health outcomes (Bacon et al., 2005, Tylka, 2006). Individuals who eat intuitively are 40% less likely to have disordered eating behaviours (e.g. chronic dieting, binge eating) and take part in extreme weight control behaviours (Denny et al., 2013). Randomized control trials in overweight and obese individuals have also demonstrated that intuitive eating can result in weight maintenance and weight loss (Bacon et al., 2005, Provencher et al., 2009, Bacon and Aphramor, 2011).

1.1 Statement of research problem

The existing research based on intuitive eating has been promising, however many of these studies have primarily been conducted in college students and work places. There is limited data on weight management programs within primary care (Goodyear-Smith et al., 2014). Primary care settings are important locations for providing support and promoting healthy living, however, programs based in primary care have very minimal follow-up with participant's afterwards. Since weight management is an ongoing process with a high risk of re-lapse and weight gain, it is essential to monitor long term progress (Ramage et al., 2014). In New Zealand there is no evidence for the effectiveness of weight management programs based on the intuitive eating approach. Currently an intuitive eating-based weight management program called "Eating for your Health", facilitated by registered dietitians, is being conducted at Waitemata District

Health Board. It is a 4-month program with a combination of group education session along with individual dietetic consults targeted at overweight and obese outpatients within Auckland. The program aims to provide tools to improve an individual's health and well-being (Franica, 2017). Therefore, the long-term effectiveness of an intuitive eating-based program to improve health outcomes in overweight and obese individuals within the primary care setting must be explored. The results of this program evaluation will help guide the development of more effective weight management interventions and provide directions for future research.

1.2 Purpose of the research study

1.2.1 Aim

To conduct a long-term assessment (one year) of the efficacy of a weight management program (Eating for your Health) using an intuitive eating approach to improve eating behaviour and quality of life in hospital referred overweight/obese individuals.

1.2.2 Objectives

1.2.2.1 Primary objectives

To assess changes one year after completion of the Eating for your Health weight management programme in the following:

- a. Anthropometric parameters (weight, BMI, waist and hip circumference, waist to hip ratio)
- b. Eating behaviour (Intuitive eating, dietary intake)
- c. Quality of life
- d. Participant's program progress (confidence level; sustaining any changes made)

1.2.2.2 Secondary objective

To explore participant's perceptions of the overall programme using a qualitative approach (focus groups).

1.3 Thesis Structure

This thesis has been set out in six chapters. The first chapter introduces the topic of obesity, and strategies used for weight loss, with relation to weight maintenance using intuitive eating. The second chapter is the literature review and looks at the prevalence of obesity and treatments used to combat obesity. Chapter three details the methods of the study, with an overview of the “Eating for your Health” study, followed with specific details on the methods required for the current study. The fourth chapter highlights the key results. Chapter five consists of the discussion of the study findings, highlighting the limitations within each section. Chapter six concludes the thesis with a summary and recommendations for applicability and future research implications.

CHAPTER TWO

2.1 Introduction

Overweight and obesity continues to be seen as one of the major health concerns across the globe (Lenoir et al., 2015). The prevalence of obesity within New Zealand has tripled to over 30 percent between 1977 and 2016, making New Zealand the third most obese nation worldwide (Marion et al., 2017). In 2016/2017, a Ministry of health led survey estimated 1.2 million (32%) NZ adults to be clinically obese with a further 34% being overweight (Ministry of Health, 2017a). Obesity rates were highest amongst Māori adults (47%), the indigenous people of New Zealand and Pacific Island adults (67%) (Ministry of Health, 2017a). Findings were similar for children aged between 2-14 years, with 12% being obese and a greater proportion of Pacific children (30%) and Māori children (17%) obese. A number of interventions have been trialled to reduce the growing rate of obesity, with limited success in maintaining weight loss. This literature review will investigate at the programs / interventions that have been used to combat obesity along with the non-diet approach (intuitive eating, mindful eating).

2.2 Obesity: Definition and consequences

2.2.1 Classification of obesity

Obesity is defined as the accumulation of abnormal or excessive body fat within the adipose tissue in relation to lean body mass (Organization., 2000). Body mass index (BMI) is used to classify adults as being underweight, overweight or obese. It is based on an individual's weight status in relation to their height. BMI is calculated as weight divided by the square of height (Organization., 2000, Ng et al., 2014).

$$BMI = \text{Weight (kg)} / \text{height(m)}^2$$

BMI is seen as a useful measure of overweight/obesity and risks associated with obesity at a population level (Ng et al., 2014). The World Health Organisation's (Organization., 2000) weight

status classifications were used as the reference values in this thesis with obesity classified as a BMI of 30kg/m² or above. The WHO has standardized and clearly distinguished different categories for overweight and obesity (see table 2.2.).

Table 2.1: *Weight classification of adults according to BMI (Organization., 2000)*

Classification	Body Mass Index (kg/m ²)	Risk of comorbidities
Underweight	< 18.5	Low (but risk of other clinical problems increased)
Normal Range	18.5 - 24.9	Average
Overweight (Preobese)	25.0 -29.9	Increased
Obese class I	30.0 - 34.9	Moderate
Obese class II	35.0 - 39.9	Severe
Obese class III	≥ 40.0	Very severe

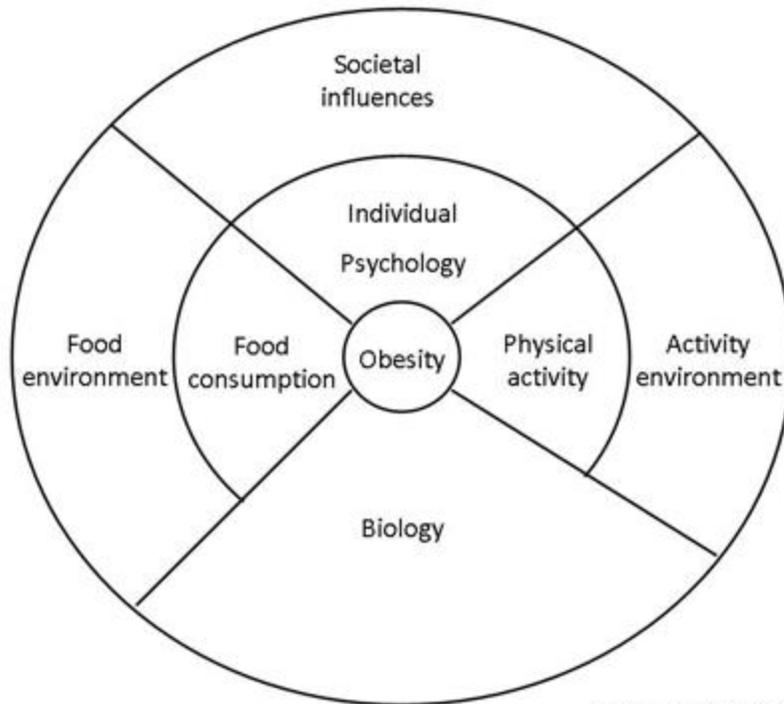
In addition to BMI, current guidelines recommend the inclusion of Waist Circumference (WC) or Waist to Hip Ratio (WHR) as alternative measures of abdominal adiposity (National Heart, 2000, Organization., 2000). A WHR greater than 1.0 in men and greater than 0.85 in women is an indication of excess abdominal fat accumulation (Organization., 2000). Waist circumference is a practical measure for assessing abdominal fat distribution with excess abdominal fat increasing the risk of cardiovascular disease, cancer and diabetes with a BMI of 21 kg/m² (Health and Unit, 2009, National Heart, 2000). Therefore, waist circumference is used as a supplementary indicator to BMI to assess disease risk factor when BMI is not markedly increased (National Heart, 2000, Health and Unit, 2009).

2.2.2 Causes of obesity

It has been well established that an imbalance between the amount of calories / energy consumed and level of physical activity is the cause of weight gain. However, studies have found that weight loss along with maintaining initial weight loss is not as simple as reducing the amount of calories consumed and increasing physical activity (Clark, 2015). The foresight project explored the challenges and factors that influence weight gain (see figure 2.2.2)(Kopelman et al.,

2007). One such factor is an individual's biology, referring to their genetics and health. Genetics contributing towards obesity is well established. Studies have found that specific genes contribute towards the risk of obesity through increased energy intake and decreases in satiety (Hetherington and Cecil, 2010). According to many twin and adoption studies, an individual's genes influences their weight status (O'Rahilly and Farooqi, 2006, Schousboe et al., 2003, Stunkard et al., 1990). For instance, in one adoption study, the adoptees demonstrated similar BMI to their biological parents rather than their adoptive parents. This association was shown across all the BMI categories (e.g. lean through to obese) (Saunders et al., 2007). Other research has shown that children are 10 to 12 times more likely to be obese if born in a household with both parents being obese (Fuemmeler et al., 2013, Whitaker et al., 2010).

The set-point theory suggests body weight is regulated through a complex physiological system that controls food intake and energy expenditure to correct any deviations in order to maintain a fixed body weight (Bilman et al., 2017, Harris, 1990). The human body ensures this by providing internal signals/cues for hunger and satiation to guide us in eating the appropriate quantity of food to meet the body's need. Individuals that respond to these internal cues stop eating when they are full or no longer hungry (Bilman et al., 2017). Research has shown young children are able to regulate and respond to their internal cues. However, older children and those with more genetic risk of obesity had less ability to respond to their internal hunger cues (Rolls et al., 2000). Adults can also override internal hunger cues and experience eating disinhibition, which refers to being disconnected from the body's needs, which can be due to emotional reasons, habitual or in order to control their weight. Outland and colleagues (2013) found that participants override their hunger and eat due to "being stressed", "having food within reach", "everyone else is eating", and because "it was time to eat".



Source: Foresight systems map, 2007

Figure 2.2: *Cause of obesity based on the foresight systems map (Foresight, 2007)*

Dietary patterns over the past decade have taken a dramatic transformation, with people resorting to convenience foods, sugary drinks, larger food portion sizes, reduced fruit and vegetable intake and fewer home cooked meals (Callahan, 2013, Otinwa, 2014). Fast food consumption in New Zealand has seen a 10% increase per capita between 1999 to 2008; which was one of the largest increases within the Organization for Economic Development (OECD) (De Vogli et al., 2014). It is well established that fast foods and ready to eat meals are high in calories, bad fats (i.e. saturated and trans fats), salt and low in micronutrients, low in fibre and are consumed in large portion sizes (Wellard et al., 2015, Mohammadbeigi et al., 2018). High intakes of fast foods (two or more times per week) is associated with weight gain and increases risk of obesity (Otago. and Health., 2011). Low fruit and vegetable intake is often displaced with foods with “empty calories” which are energy dense and nutrient poor, and can also lead to weight gain (Ministry of Health and University of Auckland, 2003).

An individual's psychological drive for specific foods and consumption patterns has an influence on their weight status (Cotter and Kelly, 2018). For instance, chronic stress and daily hassles have been shown to result in higher BMI and waist circumference in men and women (Mason et al., 2018, Cotter and Kelly, 2018, Chao et al., 2015, Geiker et al., 2018). This can be a result of "stress-related eating", disturbed eating habits, or increased consumption of foods higher in sugar and fats, more snacking, sugary drinks and less fruit and vegetables (Adam and Epel, 2007, Cotter and Kelly, 2018, Chu et al., 2019). Other research has shown short sleep (<7h/night) duration (St-Onge, 2017), depression (Mushwana and Ngonyama, 2015) and eating disorders (e.g. binge eating, maladaptive eating) can also lead to overweight and obesity (Khan et al., 2018).

An individual's identity and well-being are traditionally dependent on their culture and cultural beliefs which permeates every part of their life, including their eating habits, activity patterns and their ideal body image perception (Jeffery, 2001). For instance, within the Pacific island communities' traditional foods (e.g. pig, desserts, corned beef, pies, cakes, and coconut cream-based foods) are served during special occasions such as weddings, church gatherings, funerals, and birthdays. These foods are considered as having a high status and are usually offered to individuals with high stature (e.g. church ministers) first. Within this community sharing of these foods is a way of showing generosity with guests' and acceptance of foods being provided is seen as showing goodwill. Individuals also feel obligated to eat the food being served to them due to their cultural beliefs of expressing hospitality and generosity despite the food being served is considered to be unhealthy. Peer pressure and eating in a social context can result in over consumption (Whitfield et al., 2007).

Socio-economic status and geographic location has been shown to have an impact on the rate of obesity (Pearce et al., 2007). Having a low socio-economic status has a strong association with high BMI. An analysis of the 2008/2009 NZ adult Nutrition survey showed individuals with higher socio-economic status had a "Healthy" dietary pattern which is associated with better health outcomes in comparison to participants of lower socio-economic status having a "traditional" dietary pattern (Beck et al., 2018, Jiao et al., 2015). An individual's living area also has an influence on their weight status with the NZ health survey showing adults to be 1.6 times more

likely to be obese and children to be 2.1 times likely to be obese when living in the most deprived (poorest) areas in comparison to individuals living in affluent areas. Extreme level of obesity (BMI $\geq 40\text{kg/m}^2$) was approximately four times higher amongst individuals living in the most deprived area (Ministry of Health., 2015). In addition to this, studies have shown low-income neighbourhoods have less access to healthy foods with greater access to foods that endorse unhealthy eating due to higher density of convenience stores and fast food outlets (Hilmers et al., 2012, Lepkowska, 2018). Studies conducted within Australia and New Zealand have found shorter travel times and approximately 2.5 times more fast food restaurants for those living in the most disadvantaged areas (Thornton et al., 2016, Hilmers et al., 2012).

In the last decade, electronics (e.g. phones, television) and social media use has drastically increased and is used as a platform for delivering messages, information/news and entertainment. It is well established that increased television time is associated with increased risk of obesity due to lack of physical activity, increased snacking along with influence of unhealthy food choices through product advertisements (Rosiek et al., 2015, Mamun et al., 2013). Therefore the NZ Ministry of Health recommends less than 2 hours of recreational screen time (Ministry of Health, 2015b), however within NZ more than half of 5-14 year old children watch more than two hours of television per day, with the number being higher for Māori (63%) and Pacific (67%) children (Ministry of Health, 2017a). In addition to television, using social media (e.g. blogs, microblogs, social networks, social sharing platforms) has increased with greater accessibility through smartphone and tablets. A study by Alley and colleges (2017) found high social media use was associated with increased sitting time and participants had significantly greater sitting time on their days off due to social media use. Sedentary behaviour such as prolonged sitting increases the risk of obesity and is associated with poor health outcomes (e.g. mental health, cardiovascular disease, type 2 diabetes) (Homer et al., 2019). Studies have also shown that people are more likely to be multi-tasking such as being on the internet, chatting on Facebook or working on emails and sitting at their computer instead of at the dining table. Daley and colleagues have (2013) found eating while being distracted leads to increased food intake, while paying attention to the meal being consumed was linked with eating less later in the day. People are also influenced by blogs, pictures and tweets relating to food and health with

teenagers following in the foot-steps of celebrities and individuals with the most followers or likes who share information about health and well-being which are not necessarily evidenced based (Vandewater and Denis, 2011, Derenne and Beresin, 2018).

With the advent of civilization and technology the prevalence of physical activity has decreased (Kohl et al., 2012). Increase in leisure time activities (e.g. television, computer usage), multiple screen use, long commutes, lack of sleep, elevators and electrical household appliances all result in more physical inactivity (Otinwa, 2014). According to the WHO (2018), one in four adults and three in four adolescents are not meeting the recommended levels of physical activity. Within NZ, only half of the adult population are meeting the recommended 30 minutes of physical activity/day for 5 days of the week with men (55%) being more physically active than women(48%) (Ministry of Health, 2017a). Taking part in regular physical activity has been proven to help in the prevention and treatment of non-communicable diseases (e.g. stroke, diabetes, heart disease, hypertension), along with improvements in quality of life, mental health and well-being and prevention of weight gain.

2.3 Health consequences of obesity

Knowing the health consequences of obesity helps create a better understanding of the negative impact it can have on an individual's life and how weight loss can help ameliorate associated health risks. Being overweight or obese can have a detrimental impact on an individual's health and well-being. The health risks of obesity can be physical (e.g. coronary heart disease, cancers, diabetes, stroke, hypertension, sleep apnoea, hyperlipidemia, osteoarthritis), psychological (e.g. anxiety, depression, body dissatisfaction, eating disorder) or social (e.g. low employment, few friends, poor life satisfaction) (Organization., 2000, Organization., 2004).

Prospective studies indicate overweight and obesity to be associated with increased mortality. A recent meta-analysis looked at approximately 4 million healthy participants that never smoked, from 189 prospective studies conducted between 1970-2015, within four continents (East Asia, Australia, New Zealand, Europe and North America), and with a mean follow-up period of 13.7 years. They reported the all-cause mortality rate was approximately 10% within a period of five

years, with individuals with a BMI greater than 25kg/m² having significantly higher risk versus individuals within the healthy BMI range (18.5-25kg/m²). This pattern was consistent across the four continents with the risk of mortality increasing in conjunction with rising BMI (The Global BMI Mortality Collaboration, 2016). They also found mortality related to stroke, respiratory disease and heart disease to have a strong positive correlation for individuals with a BMI over 25kg/m² (The Global BMI Mortality Collaboration, 2016). However, epidemiological studies show improvements in disease risk factors and quality of life with modest weight loss (Johns et al., 2014b). For instance, a modest (5-10%) weight loss has been shown to significantly reduce the risks of type 2 diabetes, obstructive sleep apnoea and non-fatty liver disease (Jensen et al., 2014b). Intentional weight loss has also shown to reduce triglyceride levels, increase HDL cholesterol levels, improve symptoms associated with asthma, chronic obstructive pulmonary disease (COPD) and obesity hypoventilation syndrome (Rueda-Clausen et al., 2015).

2.4 Weight management strategies

The term weight management is referred to a set of behaviours and practices essential for sustaining weight at a healthful level. There are several methods being used to manage/lose weight and for most people that have lost weight, maintaining that weight loss can be a real challenge. The health benefits associated with weight loss are lost once the weight is regained (Barnes et al., 2007). Obesity is a complex disease and presents a challenge for treatment, with individuals resorting to diets and various weight control programs and/methods to lose weight. A recent nation-wide survey of 2500 mid-aged women in New Zealand showed approximately 40% of women were trying to lose weight while 42% were trying to maintain and prevent further weight gain (Leong et al., 2016, Leong et al., 2013). Similar results were found within the Australian Longitudinal study on Women's Health with 72% of the cohort actively attempting to control their weight (Williams et al., 2007). Within both population groups, weight control practices included consuming smaller portions of snacks/meals, reduced fat and sugar intake and increasing physical activity (Leong et al., 2013, Williams et al., 2007). These are in line with the Eating and Activity Guidelines for New Zealand Adults (Ministry of Health, 2015b). However,

some people resorted to smoking, fasting, laxatives, diuretics, diet pills, vomiting and compulsive exercising, all of which can be detrimental to health (Leong et al., 2013, Williams et al., 2007).

2.4.1 Commercial diets

A number of weight loss programmes result in individuals losing weight that is maintained only for a short period (3-6 months). One of these methods are commercial fad diets which either eliminate essential food groups and/or recommend consuming one type of food in excess and at the expense of other foods, with the focus on low calorie intake and/or consuming energy through exercise. For instance, Weight Watchers encourages increased physical activity and adoption of a diet high in fruits and vegetables, low in carbohydrates, dairy products and fat (Newlands et al., 2019). Jenny Craig rely on a pre-packaged prepared low- calorie meal replacement (1200-2000 calorie per day) with the inclusion of vegetables, fruits and wholegrains (Finley et al., 2006). Nutrisystem provides portion controlled both high in protein and low in glycaemic index (GI) (Gudzune et al., 2015). Atkins diet is based on very low carbohydrate intake and unlimited fat and protein, while the South Beach diet is a three-phase modified low carbohydrate, high protein diet (Atallah et al., 2014). Other diets focus on very low-calorie intake (800-1000 calorie intake) such as Health Management Resources, Medifast and Optifast (Gudzune et al., 2015).

Tsai and Wadden (2005) conducted a systematic review of major commercial weight loss programs. Individuals using Weight Watchers lost approximately 5% body weight within 3 to 6 months. This was also shown in a randomized controlled trial assessing the effectiveness of the Atkins, Ornish, Weight Watchers and the Zone diets for weight loss and cardiac risk (Dansinger et al., 2005). The results showed 25% of participants sustained a 5% weight loss at one year, with 10% losing more than 10% body weight. The results also showed no significant difference in weight loss between the four diet groups.

Commercial diets have shown to result in weight loss, however, if individuals are unable to adhere to the weight loss strategies that lead to the weight loss, they will not be able to continue to lose weight or maintain the weight they have lost (Clifton et al., 2014). Dansinger and

colleagues (2005) found that only a small proportion of individuals were able to adhere to their prescribed diet (Weight Watchers, Atkins, Ornish, Zone diet). A gradual decline in participant's compliance was shown as the study progressed, ranging from 21% at 2 months to 42% at 12 months. The highest discontinuation was shown in the Atkins (48%) and Ornish (50%) diets. The authors concluded that the main reasons were suggestive of participants finding the diet to be too extreme to be followed (Dansinger et al., 2005). A systematic review of commercial diets also showed comparable drop-out rates with attrition rates of 27% at 12 weeks (Weight Watchers), 27% at two years (Weight Watchers and Jenny Craig) and 19% at one year (Weight Watchers). Very low calorie diets result in rapid weight loss, however very few participants were able to complete the interventions with studies showing participants dropping out at 13 weeks (n=19%), 20 weeks (n=31%) and 26 weeks (n=45%) (Tsai and Wadden, 2005). The authors concluded that the commercial programs are high in cost, high in attrition rates with the participants having a high probability of regaining 50% or more body weight within one to two years.

2.4.2 Energy Restriction

Another common method employed for weight loss is restricting energy/calorie intake (i.e. not eating for long periods to influence body shape or weight) (Quick and Byrd-Bredbenner, 2012). The concept of restrictive eating was first introduced by Herman and Mack (Herman and Mack, 1975) to show individuals' tendency to restrict food consumption for the primary goal of weight loss or prevention of weight gain. Energy restriction theory for weight loss is derived from the theory of energy balance. In simple terms, if we consume less calories than expended, we will be in negative energy balance, resulting in weight loss (Lee et al., 2010, Fock and Khoo, 2013). Thus, health professionals and clinical guidelines encourage an energy restriction of 500-1000kcal/day to lose approximately 10% of body weight (Ministry of Health, 2015b). However, energy restriction can have counterproductive effects; feelings of deprivation and hunger resulting in overeating and eventually leading to weight gain (Galgani and Ravussin, 2008, Keski-Rahkonen et al., 2007). Dieting combined with rapid weight loss, were found to be predictive of future weight gain in 80% of individuals (Rogerson et al., 2016, Keski-Rahkonen et al., 2007), and can contribute towards difficulties in long-term weight maintenance (Reid et al., 2005, Siahpush

et al., 2015, Pietilainen et al., 2012, Korkeila et al., 1999). This is believed to be due to the body's physiological mechanisms that are put in place to decrease energy expenditure following periods of reduced energy intake to restore energy balance, eventually slowing down the rate of weight loss (Galgani and Ravussin, 2008, Hill, 2006). Dieting reduces satiety hormones (leptin) and increases hunger hormones (ghrelin), therefore, even though restricting food intake results in weight loss, it also leads to an increase in hunger and reduction in energy expenditure (Hill, 2006, Galgani and Ravussin, 2008). Restrictive eating may also be one of the adaptive behaviours used to minimize weight gain in today's society, which has abundance of easily accessible food (de Lauzon-Guillain et al., 2006). Whether this type of eating behaviour is an effective approach to weight loss within the general population or whether it leads to increased weight in the long term is controversial. Several studies have supported a positive correlation between restrictive eating and increased BMI (Chaput et al., 2009, Quick and Byrd-Bredbenner, 2012, Lluch et al., 2000), whereas other studies have found no significant association between weight gain and restrictive eating (Drapeau et al., 2003, de Lauzon-Guillain et al., 2006). A recent 3-year prospective study in a population-based Dutch sample (n=675), examined the association between BMI and dietary restraint along with moderating effects of education, age and sex (van Strien et al., 2014a). Dietary restraint was measured using nine questionnaire items on "weight fluctuations and "concern for dieting". Their results showed that high dietary restraint amongst women was significantly associated with an increase in BMI after a period of three years, but no significant associations were found within men. Similar results were found in the six year prospective "Quebec Family Study" (Drapeau et al., 2003), where higher food restraint promoted weight gain in women compared with the low food restraint group. However, a negative correlation was found within men, where low energy intake prevented an increase in waist circumference in the high restraint group. The authors suggested the weight gain in women was partially due to the highly restrictive behaviours being difficult to maintain over the 6-year period, leading to disinhibition, hence the weight gain. Men, however, were initially not as restrictive in their behaviours in comparison to women and were better able to maintain the behaviour over time. In contrast, a study in 19 478 healthy American male health professionals aged between 40-75 years old, showed that frequent dieting was strongly related to weight regain (Coakley et

al., 1998). Hence highlighting the fact, that regardless of gender, food restricting/dieting can be a predictor of future weight gain and other methods of weight loss should be explored for weight sustainability.

Restrained eating may also lead to weight cycling (Santarpia et al., 2013, Montani et al., 2015). Weight cycling is defined as repetitive periods of significant decrease in intentional weight loss followed by unintentional increase in body weight (de Zwaan et al., 2015, Dulloo and Montani, 2015). Little is known about the long term effects of repeated weight loss and regain, however prospective studies show frequent weight fluctuations to be a strong determinant of future weight regain and an increase in BMI in both males and females (van Strien et al., 2014b). Weight cycling can also result in loss of fat-free mass, psychological distress and increased cardiovascular disease risk (e.g. elevated triglycerides, high blood pressure, low HDL-c) (Verghnaud et al., 2008).

2.5 Maintaining weight loss

2.5.1 Behaviour change and weight loss

As mentioned above, using diet strategies alone often results in short-term weight loss, with very little long-term weight sustainability. Health professionals and government based recommendations promote the use of behavioural strategies to elicit change (Organization., 2004, Ministry of Health and Clinical Trials Research Unit, 2009b). Behavioural strategies aim to help reinforce and support lifestyle change in both diet and physical activity. The 2017 weight management guidelines for New Zealand adults recommends the use of the Food, Activity and Behavioural (FAB) approach instead of a single factor approach towards weight loss (Ministry of Health, 2017b). The FAB approach recommends making changes to an individual's food and drink, activity level (reduce sedentary time and support sufficient sleep) and incorporating behavioural strategies in a weight management plan. A systematic review by Johns and colleagues (2014a) assessed the effectiveness of diet or exercise intervention vs a combined approach (behaviour and diet and/or exercise). There was no difference in weight loss between the diet only and combined approaches in the short term (three to six months), whereas greater weight loss was seen in the long term (12 to 18months) within the combined approach. When compared with physical activity alone, greater weight loss was seen at three to six months and

12 to 18 months using the combined approach. These results further highlight the importance of using behavioural strategies to elicit long term weight maintenance.

It is important to highlight the key factors that can aid in maintaining weight loss which can be incorporated within weight loss programs. A National Weight Control Registry (NWCR) developed in 1994 consists of a successful group of individuals who have maintained weight loss for at least one year worldwide (Wing and Hill, 2001). The registry has collected responses through surveys from the participants for nearly two decades. A diverse range of techniques had been identified to attain weight loss, with a range of possible key factors associated with long term weight maintenance. Participants reported participating in physical activity, limiting screen time, self-monitoring of body weight and food intake, and eating breakfast as the most successful strategies for maintaining weight loss. Other factors reported for aiding in weight maintenance were reducing emotional eating, improving self-efficacy, stimulus control and having regular meals (Kelley et al., 2016, Elfhag and Rossner, 2005a).

A key factor highlighted in weight management programs is the importance of having a strong social support system (Ministry of Health, 2017b). Social support has been found to not only benefit health but enhance weight management, with several studies showing a positive effect on long-term weight maintenance (Marquez et al., 2016, Jamal et al., 2016, Elfhag and Rossner, 2005a) and a few studies demonstrating no effect or an inverse relationship (Jakicic et al., 2006, Kulik et al., 2015). Social support has been shown to facilitate weight loss through various mechanisms including group support, spouse/family or friend, phone calls or direct contact with health professionals. Participants involved in a weight management program whose support person actively took part in the program were seen to be more successful in maintaining weight (Wing and Jeffery, 1999, Karfopoulou et al., 2016). This was shown in a study by Wing and Jeffery (1999), who recruited participants with a friend/family support person versus participants with no support, to examine the difference that social support makes in weight loss and maintenance (Wing and Jeffery, 1999). Participants with a support partner lost more than one-third of weight and were more likely to maintain their weight in comparison to individuals taking part in the program alone (64% versus 24%).

A 'ripple effect' has also been hypothesized in individuals accompanying participants within an intervention (Schierberl Scherr et al., 2013). A large body of evidence has shown that individuals exhibit health related behaviours very similar to the people around them. Correlations have been made between patterns of physical activity, diet and BMI of spouses, friends and family members (Macken et al., 2000, Golan et al., 2010, Christakis and Fowler, 2007). Evidence also shows individuals are more inclined to change/improve their behaviour if their partner, friends or family members also take part in healthy behaviours, and they are also more inclined to take part in unhealthy behaviours if their social support people undertake unhealthy behaviours (Pachucki et al., 2011, Brown et al., 2014). This effect was shown in a study by Gorin et al (2008) who examined whether a weight loss program delivered to one spouse had an effect on the home environment (Look AHEAD study). Participants were assigned to an intensive lifestyle intervention (ILI) or enhanced usual care which included education and diabetes support (DSE). Participants that were in the ILI had greater weight loss with more spouses losing >5% body weight in comparison to the group receiving education and diabetes support only (26% versus 9%). Lower energy and fat intakes were also observed with the ILI (Gorin et al., 2008).

Having social support has also been associated with having a lower attrition rate within weight loss interventions. In a 10 month follow-up study, participants that were recruited with support partners had a study completion rate of 95% in comparison to 76% for participants without a support person (Wing and Jeffery, 1999). Data from these studies highlights the importance of having a support system whilst taking part in behaviour interventions. It can provide benefit for the individual taking part in the intervention and the support person as a bidirectional relation can be seen, where an individual trying to lose weight can receive motivation and help from their support person, whilst at the same time having a positive effect on the person providing the support.

2.5.2 Eating Behaviour

Eating behaviour is an important factor affecting nutritional intake and weight loss and / or maintenance (Sung et al., 2009). Eating is a highly habitual activity. Thus, changing one's behaviour within this domain can be challenging. Eating behaviours have been classified based

on specific eating styles; emotional, external and restraint eating (Brogan and Hevey, 2013, van Strien et al., 2014a). These classifications are derived from psychosomatic, restraint and externality theories, with the concepts being placed within the aetiology models of obesity (van Strien et al., 1986).

The concept of emotional eating is derived from the psychosomatic theory and implies the tendency to eat in response to negative emotions/distress (Wallis and Hetherington, 2009, Poínhos et al., 2013). The physiological reaction to negative emotions prepares individuals for a fight or flight response, which inhibits gastric motility and bloodstream glucose release that, in turn, suppresses the feeling of hunger (van Strien et al., 2009). According to the theory, emotional eaters are unable to distinguish hunger from the physiological states that accompany negative emotions such as anger, anxiety, or fear, possibly due to early learning experiences. Thus, in the event of stress or emotional arousal, emotional eaters respond by eating, whereas normally this experience would suppress appetite due to the body's physiological response (Adriaanse et al., 2011, Heatherton et al., 1991).

The Externality theory of obesity, focuses on external eating behaviour (Schachter, 1968), and states that some individuals are more sensitive to external food related cues, such as seeing or smelling food (Herman et al., 2008, Herman and Polivy, 2008). Therefore, external eating results in overeating due to their heightened response to food-related cues within their environment. The restrained eating theory, states that this behaviour is an attempt to voluntarily decrease food intake or engage in dieting practice for the purpose of weight loss or weight maintenance (Poínhos et al., 2013). Intense dieting practices can ultimately lead to patterns of overeating (external or emotional eating), due to external stimuli and physiological arousal disrupting the cognitive restraint which is usually exercised by dieters (Poínhos et al., 2013, Herman and Polivy, 2008, van Strien et al., 2014a). These can have detrimental health effects, as mentioned earlier and further promote obesity. Studies have measured these eating behaviours using various self-reported questionnaires concerned with weight outcomes (Koenders and van Strien, 2011, Dohle et al., 2014, Niemeier et al., 2007).

2.5.3 Self-Report Measures of Eating Behaviour

Several self-reported measures exist to assess emotional, external and restrained eating, with the following two questionnaires most frequently used (Sung et al., 2009); the Dutch Eating Behaviour Questionnaire (DEBQ) (van Strien et al., 1986) and the Three Factor Eating Questionnaire (TFEQ) (Stunkard and Messick, 1985).

Dutch Eating Behaviour Questionnaire (DEBQ)

The DEBQ is a widely used self-reported eating behaviour questionnaire developed by van Strien et al (1986). The questionnaire is based on three psychological theories on overeating; External eating, emotional eating, and restrained eating. The emotional eating subscales assess an individual's desire to eat under negative emotional conditions such as anxiety, depression and stress, thus only focusing on eating in response to negative emotions as opposed to positive emotions. The external eating subscale measures the tendency to eat in response to external food-related cues such as smell, sight, taste of appealing foods. The restrained eating behaviour assess the restrictive eating tendencies such as deliberately eating less food or resisting certain types of foods (Barrada et al., 2016).

Three-Factor Eating Questionnaire (TFEQ)

The TFEQ is a self-assessment tool developed to measure cognitive and behavioural components of eating. Similar to the DEBQ, the TFEQ consist of three subscales; Restraint, Disinhibition, and Hunger (Stunkard and Messick, 1985). Restraint measures the tendency of individuals to restrict their food intake to control their body weight. The Sub-categories are flexible and rigid control. Flexible control is referred to as a "gradual approach to eating, dieting and weight" which relates to an individual's ability to control their diet and engage restraint when weight maintenance is required (Westenhoefer and Stunkard, 1999, Bond et al., 2001). Rigid control is described as an "all or nothing approach to eating, dieting and weight" where individuals adhere to strict rules in order to achieve their weight loss goals (Westenhoefer and Stunkard, 1999).

The disinhibition scale measures loss of control over eating behaviours in response to various stimuli such as emotions (Stunkard and Messick, 1985). This measure contains sub-categories

which are habitual, emotional and situational Disinhibition. Habitual disinhibition is the susceptibility to eat due to daily life circumstances; emotional disinhibition occurs in response to negative emotional states such as loneliness and anxiety; and situational disinhibition refers to the tendency to eat due to environmental cues. The hunger scale measures subjective feelings of hunger and food cravings (Bond et al., 2001).

2.5.4 Eating behaviour and body weight

Eating behaviour is habitual and is triggered based on an individual's hunger and satiety level, emotions or when confronted with a food-related stimulus. Hence making changes to one's eating behaviour can be challenging. Several studies have assessed the association between eating behaviour (emotional, restrictive, external eating), body mass index and weight gain (see Table 2.2) (Koenders and van Strien, 2011, Dohle et al., 2014, Sung et al., 2009, Braden et al., 2016). Emotions can drive individuals that are overweight and obese to overeat with the inability to maintain weight management goals (Elfhag and Rossner, 2005a). Emotional eating has been associated with weight gain and increased BMI as a result of overeating (Dohle et al., 2014, Sung et al., 2009, van Strien et al., 2009). High emotional eaters taking part in physical activity can minimise the amount of weight gained, however emotional distress can result in eating (Koenders and van Strien, 2011, Dohle et al., 2014). van Strien and colleagues (2012) conducted a series of experimental studies to examine if distressed induced eating can be predicted when categorising participants as either a low or high emotional eater. The results showed high emotional eaters ate more in comparison to low emotional eaters after watching a sad movie than during a neutral movie (van Strien et al., 2012). In a follow-up study examining the effects of watching a sad vs happy movie, high emotional eaters consumed significantly more food after the sad movie compared to the happy movie, whereas no difference in the amount of food consumed was shown in low emotional eaters (van Strien et al., 2013). These results further illustrate the effect negative emotions has on eating behaviour.

Table 2.2: Summary of studies using the DEBQ and TFEQ to assess eating behaviour and weight outcomes and dietary intake

Author	Purpose	Questionnaires	Methods	Main findings
Dohle et al (2014) Switzerland	Assess whether physical activity attenuates the relationship between eating behaviour and body weight	DEBQ FFQ Diet-related health consciousness	Men (n=1623) + women (n=1802) Age: mean age of 56yrs old. Measured eating styles, weight, height and physical activity level at baseline and one-year follow-up.	<ul style="list-style-type: none"> • Women had higher restrained, emotional and external eating scores, ate more fruit/vegetables and diet related consciousness vs men. • Increased restrained eating and emotional eating was positively associated with BMI. • External eating was not related to BMI. • Higher emotional eating was related to increased consumption of high fat, high sugar foods. • Higher emotional eating and physical activity was associated with lower BMI and more fruit & vegetable consumption vs higher emotional eating and low physical activity.
Koenders et al (2011) Netherlands	To examine the relationship between eating behaviour and change in BMI	DEBQ	Men (n=963), women (n=599), Mean age of 44yrs old Web-based lifestyle questionnaire measured: Eating behaviour, physical activity level, sport participation, weight and diet history.	<ul style="list-style-type: none"> • High emotional eating was related to weight gain. • High level of physical activity led to weight loss • Physical activity had a positive effect on emotional, external and restrained eating and body weight. • Restrained eating and external eating behaviours had no significant on body weight.

Author	Purpose	Questionnaires	Methods	Main findings
Sung et al (2009) Korea	Relationship of eating behaviour to long-term weight change and body mass index.	DEBQ	Men (n=578), women (n=998) twins and their families that participated in the Healthy Twin Study. Eating behaviour, medical history and weight measured at 20yrs plus intentionally lost weight over 4 years was collected.	<ul style="list-style-type: none"> Emotional and Restrictive eating was positively associated with body weight gain and current BMI. External eating was not associated with weight gain or current BMI.
van Strien et al (2009) Holland	Examine which individuals are susceptible to weight gain.	DEBQ	N= 1342 participants, Age 20-40yrs, Eating behaviours were measured between normal weight (BMI \geq 17.5-<25 (n=717)) and overweight (BMI \geq 25 (625)).	<ul style="list-style-type: none"> Emotional eating increased the likelihood that overeating led to being overweight. Restraint and emotional eating moderated the relationship between food overconsumption and being overweight. No positive effect or moderator effect for external eating was found.
Braden et al (2016)	To examine whether a decrease in emotional eating was associated with weight loss.	TFEQ	Men and women (n=227), Overweight; BMI:25-45 kg/m ² with diabetes, Age \geq 18 years Compare behavioural weight loss program to usual care. Assessed weight and emotional eating at start of program, 6 months and 12 months.	<ul style="list-style-type: none"> Reduced emotional eating levels was associated with increased weight loss (\geq7% initial body weight) at 6 months and 12 months' post-interventions.

Author	Purpose	Questionnaires	Methods	Main findings
Niemier et al (2007)	Examine whether factors identified on the disinhibition scale related to long-term weight loss.	TFEQ	Participants from a behavioural weight loss trial (n=286) and National Weight Control Registry (n=3345). Psychological measures (stress, disinhibition, depression and eating disorder) and weight was measured	<ul style="list-style-type: none"> • Internal disinhibition significantly predicted weight loss at 6 months. • Higher levels of internal disinhibition at baseline predicted less weight loss at 18 months. • External disinhibition did not predict weight loss at any time-point.
Butryn et al (2009)	Examine whether early changes in disinhibition during weight loss leads to weight loss maintenance	TFEQ	<p>N= 81 adults enrolled in a weight loss treatment study with an average BMI of 38.4 kg/m².</p> <p>Two phase programs; low calorie diet + 2x liquid meal replacement (first 1-3 months) ,4-12 months; 1 of 4 weight maintenance diets to be followed</p>	<ul style="list-style-type: none"> • Highest decrease in internal disinhibition during the first 3 months of the intervention led to greater weight loss from 4-12 months. • No associations with external disinhibition and weight outcome was found.

DEBQ: Dutch eating behaviour questions, TFEQ: three factor eating questionnaire, FFQ: food frequency questionnaire. N= number, BMI: body mass index

Studies have not only found eating behaviour to be associated with weight gain (Sung et al., 2009, Koenders and van Strien, 2011), it has also shown to have a negative impact on weight loss. Low emotional eating has shown to result in clinically significant weight loss with a study showing participants were 1.7 times more likely to achieve weight loss in comparison to individuals with increased level of emotional eating (Braden et al., 2016, Teixeira et al., 2010).

Irrespective of body weight, the majority of individuals consume more food if it looks, smells and tastes appealing to them. However, the extent to which these factors affect the amount of food consumed in relation to physiological factors (e.g. sensations of hunger/satiety) does differ between non-obese and obese individuals (Zoon et al., 2014, Nisbett, 1968). Overweight and obese individuals have a higher tendency to base their food intake on taste and other appealing qualities, with less regard to their physiological hunger and satiety signals in comparison to non-obese individuals (Nisbett, 1968). However, for an individual to consume food when they are hungry and cease intake once full, they must be able to accurately recognise these physiological sensations. Suggestions have been made by Polivy and Herman (1987) that sensations such as hunger and satiety can be influenced by stimuli such as time (e.g. lunch, dinner, breakfast time). Therefore, if a meal/food is paired with a stimulus, hunger will be perceived when such cues are presented, regardless of the individuals actual state of nutritional deficit (Polivy and Herman, 1987). A study by Robin (1975), assessed the role of time (external cue) and boredom (internal cue) on food intake in obese and non-obese individuals (Rodin, 1975). The results showed that individuals that were obese ate sooner when they were bored in comparison to non-obese individuals. The author concluded that time is a factor for obese individuals for food consumption, whereas non-obese individuals relied on their physiological hunger and satiety cues.

Moreover, external cues and individuals experiencing negative emotions have been shown to favour the consumption of rewarding foods high in fat and/or sugar. This was highlighted in a study by Cleobury et al (2014) who examined the reasons for consuming unhealthy foods in overweight and obese males. The results showed that external (temptation) and emotional

(boredom, stress) eating were reported as a reason for eating unhealthy snacks in 55% and 26% episodes, respectively (Cleobury and Tapper, 2014).

In summary, eating behaviour plays a crucial role in weight loss outcomes. Not only does eating behaviours have an impact on weight loss and weight gain, they have an influence on the types of foods being consumed and how and when they are consumed. These findings highlight the need to develop interventions for targeting eating behaviours (emotional, restrictive, external). In order to maximise long term weight loss, it may be useful to target eating behaviours whilst encouraging physical activity to achieve weight maintenance.

2.6 The non-diet approach

2.6.1 Intuitive Eating

The intuitive eating approach has emerged as a holistic alternative to dieting and restrictive eating. This aims to help guide people to eat in response to their body's internal hunger and fullness cues, rather than responding to their external cues (Herbert et al., 2013, Van Dyke and Drinkwater, 2014). Intuitive eating philosophy suggests that individuals can create an unhealthy relationship with food and their body due to relying on external cues vs internal cues (Bush et al., 2014). These factors could include food saliency, increased portion sizes and energy dense foods, parental feeding practices, presence of various diets and the pursuit for thinness within the Western culture (Camilleri et al., 2016, Schaefer and Magnuson, 2014a).

Intuitive eating relies on the following 10 principles (Tribole and Resch, 2017):

- 1) Rejecting the diet mentality
- 2) Honour your hunger
- 3) Make peace with food
- 4) Challenge the food police
- 5) Respect your fullness
- 6) Discover the joy of food
- 7) Acknowledge your emotions without using food

- 8) Respect your body
- 9) Exercise: feel the difference
- 10) Honour your health

The principles of intuitive eating are intentions that can be used to guide eating behaviour and form healthier relationships with food. It also aids in establishing a sense of acceptance and appreciation of the current body shape / size to foster healthier eating patterns that rely less on calorie counting and more on listening to the body's physiological needs (Bacon and Aphramor, 2011). This approach is believed to achieve long-term behaviour change which can ultimately result in weight loss and weight maintenance (Anglin, 2012a). Studies have shown that eating intuitively can be learned, and can result in improved eating behaviour (Mensing et al., 2016, Cole and Horacek, 2010).

2.6.2 Mindful eating

Mindful eating complements intuitive eating as it teaches individuals to become more aware of their internal cues (Bush et al., 2014). The basic principle of mindful eating involves paying close attention to body's internal hunger and satiety cues to reduce excessive eating and utilizing external cues (e.g. reducing distractions and portion sizes) (Mathieu, 2009, Bush et al., 2014). Mindful eating also places emphasis on eating food slowly to appreciate the taste of the food eaten and to enable individuals to register the feeling of fullness, thereby achieving a greater control of eating. The use of the body's senses whilst eating attentively enables individuals to acknowledge their food preferences without any judgement (likes, dislikes) and encourages intake of nourishing and pleasing foods (Gravel et al., 2014, Mathieu, 2009). Additionally, eating slowly has been shown to aid in reducing the amount of food consumed, as individuals tend to feel full on smaller quantity of food (Monroe, 2015). A recent literature review by Warren and colleagues (2017) examining the role of mindful eating and intuitive eating in modulating eating habits, showed mindful based interventions were successful in reducing problematic eating behaviours (e.g. binge eating), emotional eating and eating in response to external cues. The authors concluded that inclusion of the mindful eating approach would be beneficial in weight-management advice to the general public.

Mindful eating-based interventions have shown to be effective in eliciting behaviour change within individuals attempting to lose weight. For instance, a randomised control trial by Tapper and colleagues (2009), found that participants utilising taught mindfulness-based strategies, lost more weight (2.32kg vs 1.35kg) and participated in more physical activity (3.11 sessions vs 2.81 sessions) per week in comparison with individuals in the intervention group not using the techniques at 6 months. Timmerman and Brown (2012) also used mindfulness-based techniques for weight management in women. The results were also positive with the intervention group losing weight and moving towards healthier eating practices in comparison to the control group (as shown in table 2.3). However, the authors highlighted the importance of longer follow-ups as difficulties arise with weight gain prevention in the long term.

Intuitive eating has been proposed as an eating style that encourages a positive attitude and relationship towards food, physical activity and one's body without focusing on weight loss (Denny et al., 2013). However, comparison studies do consider weight and BMI to quantify differences within different methods. Positive changes in eating behaviour as a result of eating in response to the body's physiological cues has been shown to result in more weight loss (see table 2.3) (Timmerman and Brown, 2012, Schnepper et al., 2019, Dalen et al., 2010, Leahy et al., 2017). In the absence of weight loss, improvements in disordered eating behaviour (Bacon et al., 2005, Hawley et al., 2008, Tapper et al., 2009), total cholesterol, HDL cholesterol, LDL cholesterol and systolic pressure were shown in multiple studies (Mensing et al., 2016, Tapper et al., 2009, Bacon et al., 2005).

The clearest positive association between intuitive eating and health outcomes has been shown with psychological (e.g. self-esteem, depression, body image, life satisfaction) health indicators (Van Dyke and Drinkwater, 2014, Tylka et al., 2014). For instance a study by Polivy et al (1992) conducted an "un-dieting" program, consisting of women who were overweight. The program consisted of ten, two-hour sessions aimed at teaching the principles of intuitive eating and provide education on effects of dieting on an individual's health and well-being. The results showed clinical and statistical improvements in depression, enhancement and self-esteem. A significant decrease in restrictive eating, interoceptive awareness and the drive for thinness was

observed in the absence of weight loss, with the effect sustained at 6-month follow-up. However, there was no significant improvement in body satisfaction, with the authors concluding this effect to be due to the absence of weight loss.

Table 2. 3: *Summary of intuitive eating and mindful eating studies*

Author	Study design	Purpose	Population	Methods	Results
Anglin (2012b) (California, USA)	Randomised control trial	To assess weight loss, BMI, waist circumference using calorie restriction or intuitive eating in obese adults.	Student (n=16) Obese (BMI \geq 30kg/m ²) Age: 20-48 years old	Calorie restriction (500kcal/day). All participants to exercise for 30minutes 3x/week. Food diary to record daily food intake. Weight, waist circumference and BMI calculated at baseline, 3 weeks and 6 weeks.	1) Calorie Restriction group had significantly lower (p=0.03) total weight loss than IE group. 2) IE group had significantly less (p=0.05) weight loss at 6 weeks.
Bacon et al. (2005) (Davia, California)	Randomised control trial	To examine the effectiveness of the Health at every size approach (HAES) which supports eating intuitively and homeostatic regulation.	Female (n=78) Age: 30-45 years old Obese (BMI > 30kg/m ²) History of chronic dieting, no history of CVD or renal disease and type 1 or type 2 diabetes	Diet group vs HAES group. Twenty-four 90- minute group session, followed by 6 monthly aftercare sessions (optional). Five assessment; baseline, 12, 26, 52 and 104 weeks.	1) 92% of participants completed HAES program vs 58% in diet group. 2) Cognitive restraint decreased in the HAES group vs increase in diet group 3) Weight and BMI was maintained in HAES group and sustained at follow-ups. 4) Diet group had significant weight loss (5.2%) post-treatment, regained weight at 2-year follow-up (p=0.068). 5) HAES group; significant improvements in total cholesterol (p=0.026), HDL cholesterol (p=0.000), LDL cholesterol (p=0.038 and systolic blood pressure (p=0.043) from baseline to follow-up. 6) Diet group; significant decrease in HDL cholesterol (p=0.009), with no significant decrease in total cholesterol, LDL cholesterol, SBP and DBP from baseline to follow-up. 7) HAES group had significant increase in exercise at follow-up vs diet group showing initial improvements post treatment with results not sustained at follow-up.

Author	Study design	Purpose	Population	Methods	Results
Hawley et al. (2008) (Dunedin, New Zealand)	Randomised, intention to treat trial	To compare three non-dieting intervention that focused on lifestyle change rather than weight loss.	Women (n=223), NZ European (89.8%) Overweight/obese (BMI ≥ 28 kg/m ²). Age: 25-68 years old	Within two group-based programs participants attended 2hour/week session for 10wks, 12 two-hour group sessions. Mail delivered intervention received mail delivered material for 10wks, monthly newsletter for 8months. Assessments at baseline, after 10week program and 4 months, 1 year and 2 year after program completion.	<ol style="list-style-type: none"> 1) Relaxation group had significantly greater increase in stress management behaviour than non-diet group ($p=0.018$). 2) All three groups had significant improvement in diet quality and stress management at 1 year and 2years. 3) Mean body weight was unchanged at 1 year and 2 years in all three programs.
Leahy et al. (2017) (USA)	Cross-sectional study	To examine the relationship between IE and postpartum weight loss.	Women (n=50) Age: 18-36 years old 12-18 months postpartum	Questionnaire regarding weight changes, exercise, breastfeeding and IE using the intuitive eating scale was completed by women 12-18 months postpartum.	<ol style="list-style-type: none"> 1) Intuitive eating practices predicted greater postpartum BMI decreases (Est.= -10, $p < 0.05$). 2) More intuitive eating practices predicted greater postpartum weight decreases (Est. = -0.277 $p < 0.001$).
Madden et al. (2012) (New Zealand)	Cross-sectional survey	To examine the association between IE and BMI.	Women (n=2500) Age: 40-50 years old	Survey sent out to randomly selected individuals from the electoral roll. IES was used to measure IE, along with binge eating, physical activity levels and food intake	<ol style="list-style-type: none"> 1) IE was significantly associated with BMI in an inverse direction. 2) A decrease in BMI for every 10-unit increase in IE was seen ($p < 0.001$).

Author	Study design	Purpose	Population	Methods	Results
Mensingher et al. (2016) (South-eastern Pennsylvania, USA)	Randomised control trial	To compare the effectiveness of a weight-neutral vs weight loss program for health promotion.	Women (n=80) Age: 30-45 years old Obese (BMI > 30kg/m ²) Physically inactive	Participants assigned to either a weight neutral program or weight-loss program. 1 x 90min group session for 6 months. Assessment at baseline, 6months and 24 months. IE was measure using the IES	<ol style="list-style-type: none"> 1) Weight loss program showed greater weight loss post intervention (p=<0.001) which was maintained at 24months. 2) Weight neutral program had no significant weight loss. 3) Significant reduction in LDL cholesterol post intervention (p=0.010) and at 24months was observed in weight neutral program. 4) Significant improvements in IE was shown in both group post-intervention however only weight-neutral program-maintained improvements at 24months (p=<0.001) 5) Significant improvement in physical activity (p=0.007), fruit and vegetable consumption (p=<0.001)) was seen in both groups post intervention. .
Romano et al. (2018) (Southeast USA)	Cross-sectional study	To examine the relationship between self-weighing, calorie counting and IE- relative to eating disorder severity of college student.	Student (n=902) Normal weight (BMI 18.5-24.9 kg/m ²) Mean age of 24.4 years old	A web-based survey using the following questionnaires IES-2, EDE-Q and self-monitoring and calorie counting questions.	<ol style="list-style-type: none"> 1) Frequent self-weighing and calorie counting predicted heightened ED severity. 2) Higher levels of IE predicted lower ED scores.
<i>Mindful eating studies</i>					
Bush et al (2014)	Skill based intervention	To examine the efficacy of mindfulness based intuitive eating intervention within a workplace.	University workers, Females (n=124)	10 x 1 to 1.5-hour weekly group classes on campus based on mindfulness and intuitive eating. Body appreciation, intuitive eating, eating behaviour, mindfulness assessed at baseline and 10weeks.	<ol style="list-style-type: none"> 1) Post 10 weeks average body appreciation, intuitive eating and mindfulness was significantly higher in intervention group vs waitlist group.

Author	Study design	Purpose	Population	Methods	Results
Dalen and Colleagues (2010) (New Mexico)		To assess a group curriculum for providing mindfulness training to obese individuals.	N= 10 (7 women, 3 men). Mean BMI 36.9kg/m ² . Mean age 44 years	6x2hour weekly group with 2 monthly follow-up classes based on mindful eating, mindfulness, group discussion, emotions body sensations and triggers to overeat. Data collected at baseline, 6 weeks (end of program), 12 weeks(follow-up)	1) Significant decrease in weight, eating disinhibition, binge eating, depression, stress, negative affect, physical symptoms. 2) Significant increase in restraint
Schnepper et al (2019) (Salzburg, Austria)	Randomised control trial	To investigate the effectiveness of a 4-session mindfulness and prolonged chewing intervention	Female (n=46) Mean age 32 years olds (Intervention group), 38.9 years old. (control) Participants motivated to improve eating behaviour	Combination of group and individual sessions consisting of mindful eating, stress and emotional eating. Goal setting, exercise information. Measure of weight, emotional eating, IE and trait food cravings.	1) Significant decrease in BMI (p=0.001) in intervention group which was maintained at 4-week follow-up. 2) Intervention group: Decrease in food cravings, emotional and external eating and increase in intuitive eating.
Tapper et al (2009) (Cardiff, UK)	Randomised control trial	To explore the efficacy of a mindfulness-based weight loss intervention for women	Female (n=61) Age: 19-64 years old BMI: 22.5-52.1 (kg/m ²)	Participants assigned to intervention or control. Four 2-hour workshops were attended. Data collected (BMI, physical activity, mental health) at baseline, 4 and 6 months.	1) Physical activity significantly (p=<0.05) increased in intervention vs control group. 2) Mental health difficulties (binge eating p=0.047) decreased in the intervention group compared to control group.

Author	Study design	Purpose	Population	Methods	Results
Timmerman and Brown (2012) (Austin, Texas (USA))	Randomised control trial	To evaluate the effect of a mindful restaurant eating intervention on weight management.	Female (n=35) Age: 40-59 years old Eat out at least 3 times/week	6x2hour group sessions focused on decreasing fat and calorie intake. Using education behaviour change and mindful eating meditations.	1) Intervention group lost significantly more weight (p=0.03), lower energy intake (p=0.002), fat intake (p=0.001 and lower barriers to weight management. 2) Control group had significantly greater energy intake, weight gain, fat intake, barriers to weight management and self-efficacy for eating behaviour.

N= number, BMI= body mass index, IE=intuitive eating, HAES= health at every size, CVD= cardiovascular disease, LDL= low density lipoproteins, HDL= high density lipoprotein, IES= intuitive eating scale, HAES= health at every size, USA= United States of America

Intuitive eating and mindful eating based studies were generally based on females (Schnepper et al., 2019, Tapper et al., 2009, Hawley et al., 2008, Mensinger et al., 2016) and university students (Romano et al., 2018, Anglin, 2012b, Bacon et al., 2005) which cannot be generalised to the entire population. The majority of participants were overweight or obese with minimal co-morbidities (Bacon et al., 2005). The intervention programs were based on weekly group sessions ranging from 1 to 2 hours long (Bush et al., 2014, Tapper et al., 2009) with interventions from 6-to 20 weeks.

2.6.3 Conclusion

These results highlighted the transient effect of restrictive eating / dieting can have on weight loss, and the long-term health improvements that can be achieved with an intuitive eating and mindfulness-based program in the absence of weight loss. Non-diet approach interventions have largely focused on overweight/obese individuals that are generally “healthy”. However, it has been well established that excess weight can result in chronic health conditions which can have an impact on weight loss and weight maintenance. Therefore, it is important to identify and evaluate the effectiveness of non-diet approach programs and interventions targeting participants with co-morbidities. It is also important to assess the long-term effects and outcomes of programs / treatments aimed at weight management due to difficulties associated with weight retention.

CHAPTER THREE

3.0 Methodology

3.1 Introduction

This research study is a one-year follow-up of individuals who were part of the non-diet approach program called “Eating for your Health”. The program was aimed at using an intuitive eating approach to provide participants with skills to make changes to their lifestyle and eating behaviour that were sustainable without any restrictions. The “Eating for your Health” program consisted of four 1.5-hour group education sessions over four consecutive weeks. The following topics were covered during the sessions;

- | | |
|----------------------|---|
| Session One | <ul style="list-style-type: none">• Introduction to behaviour change• Intuitive eating - Eating with awareness and non-hungry eating |
| Session two | <ul style="list-style-type: none">• Mindful eating• Motivation and barriers to change |
| Session three | <ul style="list-style-type: none">• Label reading• Everyday vs sometimes foods |
| Session four | <ul style="list-style-type: none">• Physical activity benefits• Goal setting and personal care |

The group sessions were followed by four 30-minute individual consultations with a New Zealand registered dietitian once a month, for a period of three months, concluding with a final individual data collection session after six months (calculated from program start date).

This research study is a follow-up study from the Eating for your Health study, aimed at collecting data from eligible participants one year after the first group education session. Therefore, the follow-up data was collected six months after the final dietitian consult (week 28). Data was

analysed from the final dietitian consult referred to as “baseline” for the current study, to the one-year follow-up done at week 52. A focus group was also conducted during the one-year follow-up to acquire participant’s insights, perception and knowledge gained from the overall program.

This chapter will explain the study design, methods and procedures used to carry out the quantitative and qualitative aspects of the research study.

3.2 Study Design

The current study is a longitudinal investigation of an Intuitive eating-based weight management programme for overweight and obese outpatients within Waitemata District Health Board in New Zealand. As shown in *figure 3.2*, data for the current study was replicated from the Eating for your Health study (week 24- final data collection) and collected at Week 52 (6 months post last intervention) in the form of questionnaires with the inclusion of a focus groups.

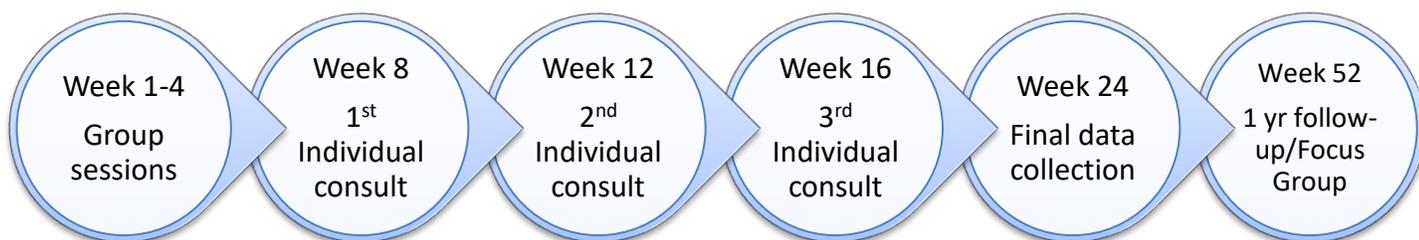


Figure 3.2: *Diagram showing study design*

3.3 Ethics approval

As the current research study was a follow-up study to the “Eating for your Health” study, amendments were made to the existing ethics application to allow for the addition of a researcher and focus group. Ethical approval was obtained from the Health and Disability Ethics Committee (14/NTB/90). In accordance with the ethics approval, participant’s consents were

obtained to participate in the follow-up study and focus group. Approval from Waitemata District Health board (WDHB), was also obtained to recruit participants and use the hospital facilities. Due to the sensitive nature of data collection and focus group, participants were given the option to withdraw from the study at any point in time (one-year data collection or focus group) if any pressure or discomfort was experienced. Permission was gained from all participants at the beginning of the focus group for recording the sessions for data analysis. To ensure participant's confidentiality was maintained, no names were used during data analysis with codes being used as identifiers.

3.4 Participants

The research study was conducted at North Shore Hospital, Waitakere Hospital, Massey University and at participant's homes to ensure low participant burden. Participant recruitment was aimed at all hospital referred adults who took part in the "Eating for your Health" study.

The inclusion criteria included the following:

- Attended 2 or more group sessions in the "Eating for your Health" study.
- Attended the final consultation with the dietitian.

Exclusion Criteria:

- One-year post study occurred after October (due to time restrictions for thesis completion).
- Moved out of Auckland, as anthropometric measurements and eating behaviour questions could not be completed.

3.5 Participant recruitment

All eligible participants were recruited via phone calls to take part in the study. They were first greeted and the purpose of the phone call was explained. Once they agreed to be part of the research study, a suitable time and location for the interview was agreed upon. If unsuccessful,

additional attempts were made at different times of the day to gain contact. Text message, email or voicemail were sent if contact was not established after five phone calls.

Three focus groups were conducted at Massey University and Waitakere Hospital to allow for data saturation. Focus group information and consent for participation was gained at the one-year follow up data collection. Participant's preferred time, day and locations were established to aid in recruitment and allocating a time and day that would suit the majority of the participants.

3.6 Cohort Retention

To retain all eligible participants, care was taken in minimizing participant burden. The follow-up data collection took place where participants felt most comfortable (own home or North shore/Waitakere hospital) and at a time that was most convenient to them. The focus group location and time was chosen to suit participant's preference and minimize traveling time. Taxi services were also offered to participants who had difficulties with transport arrangement to attend the focus group. Petrol vouchers were offered for attending the focus group along with refreshments and healthy snacks to create a comfortable and relaxed environment.

3.7 Data Collection and analysis

Anthropometry and Demographic information

The researcher was a trained level 1 International Society for the Advancement of Kinanthropometry (ISAK) accredited anthropometrist. ISAK guidelines were used to measure participants body weight, height, waist and hip circumferences (Arthur et al., 2012). Participants were weighed using a calibrated scale after removal of additional clothes (jackets, pockets emptied, without shoes). BMI was calculated as $[\text{weight (kg)} / \text{height (m)}^2]$ to define weight status. Using the WHO cut-off score, participants with $\text{BMI} \geq 25\text{kg/m}^2$ were considered overweight and $\text{BMI} \geq 30\text{kg/m}^2$ were considered obese (Organization., 2000).

Waist and hip circumferences were measured using a metal tape measure. Waist circumference measured the narrowest part of the abdomen between the 10th rib (lower costal border) and

top of the iliac crest, perpendicular to the long axis of the trunk. If narrowing of the waist was not apparent, the mid-point between the 10th rib and iliac crest was measured. The latter site is recommended for participants with obesity as waist narrowing could be difficult to identify (Gibson, 2005). Hip circumference was measured at the level of their greatest posterior protuberance, perpendicular to the long axis of the trunk. Participants were asked to stay relaxed with their feet together to keep the gluteal muscles relaxed and arms folded across their thorax. Waist to hip ratio (WHR) was calculated as waist (cm) divided by hip (cm) (Arthur et al., 2012). Participant's ethnicity and age were also recorded.

Eating Behaviour

Participant's change in eating behaviour from the end of intervention to the one-year follow-up period were assessed using the following questionnaires; The Intuitive Eating Scale-2 and The Dutch Eating Behaviour questionnaire.

Intuitive Eating

The Intuitive Eating Scale-2 (IES-2) (Tylka and Kroon Van Diest, 2013) questionnaire was used to measure participant's intuitive eating levels (see Appendix A). The IES-2 is a reliable and validated tool consisting of four-subcales that measures the level of adherence to the principles of Intuitive eating. The four subscales were; 1) Unconditional Permission to Eat (UPE), which reflects an individual's willingness to eat in response to their internal physiological hunger cues; 2) Eating for physical rather than emotional reasons (EPR), which measures the ability to eat whilst being physically hungry, rather than to eating for emotional reasons or distress (e.g. loneliness, boredom, anxiety); 3) Reliance on Hunger/Satiety Cues (RIH), which is placing trust in one's hunger and satiety cues to guide eating behaviour in determining when and how much to eat; 4) Body-Food Choice Congruence (B-FCC) that is selecting foods that promote one's body functioning and health and well-being (Herbert et al., 2013).

The items within the questionnaire were rated on a 5-point likert scale which ranged from strongly agree (1) to strongly disagree (5). Reverse scoring (e.g. 1 (strongly agree) to 5 (strongly disagree)) was applied to the following questions; 1, 2, 3, 7, 8, 9, 10. The responses were averaged as per questionnaire guidelines to determine the total score. A total intuitive eating score was

also generated, with a higher total score corresponding with higher levels of intuitive eating and indicates more positive eating habits.

Dutch Eating Behaviour Questionnaire (DEBQ)

Emotional, external and restrained eating behaviours were measured using The Dutch Eating Behaviour Questionnaire developed by van Strien et al (1986) (see Appendix B). It is an internationally recognized Gold Standard method for assessing cognitive, emotional and behavioural aspects of eating behaviour (Brunault et al., 2015). The self-reported DEBQ consists of 33 items which are answered on a 5-point Likert Scale (“Never, Seldom, Sometimes, Often, Very Often”). The questionnaire includes three independent dimensions; cognitive restraint (10 items), externality (10 items) and emotional eating (13 items). The subscale scores ranged from one to five, with a higher score indicative of a stronger characteristic value within the domains. A mean score is calculated for each domain.

External and emotional eating subscales will help identify any changes being made in eating behaviours over the one-year period, with a lower score indicating a positive change. The restrained eating subscale can be used as a proxy for dieting behaviours and aid in identification of chronic dieters and any changes in restrictive eating.

Dietary Intake

The purpose of the dietary intake was to identify any changes in participants food group intake and overall eating behaviour based on the Eating for your Health and Activity Guidelines (Ministry of Health, 2015b) which was taught during group education sessions (see Appendix C).

Twenty-four-hour diet recall

One twenty-four-hour food recall for each participant was conducted by the researcher (student dietitian) to gain an accurate record of their current intake six months’ post intervention completion (see Appendix D). The twenty-four hour food recall provides information on the participant’s exact food intake for the past 24 hours or preceding day (Gibson, 2005). Therefore, allowing an assessment of an individual’s actual food intake. A four stage-multiple pass interviewing technique was used (Gibson, 2005).

1. Participants were asked to give a list of all foods and beverages consumed within the past 24 hours or the preceding day.
2. Further details and probing questions were asked to gain descriptions of the food or beverage listed. E.g. what type of milk was it? (blue top, light blue, yellow etc.).
3. The amount of the food/beverage items consumed, generally in household measures such as cups or spoons.
4. All the items listed was reviewed including any vitamin or supplements to ensure all the items were accurately noted.

This method of data collection is inexpensive, quick, easy and has low respondent burden, thus resulting in high compliance. It also has an element of surprise therefore participants are less likely to modify their eating habits. It can be used equally in individuals with a low or high educational level. Environment familiarity (e.g. participant's home) encourages participation and aids in food recall and accuracy of amounts used by use of household utensils. Thus, the majority of the 24-hour recalls were conducted within the participant's home environment to facilitate high quality data collection.

Food group data analysis

Participant's data from the 24-hour diet recalls were segregated into different food groups to determine the contributions from each group to daily intake. The groups included the following; fruit, vegetables, starchy carbohydrates, meat, dairy, fat, sugar, alcohol, water, non-water. Food exchanges were used to calculate the portions/servings of each food item identified in the diet recall (Mahan et al., 2012). This information was used to determine dietary intake changes from the end of the intervention to the follow-up period. The data were also analysed to show adherence to the Eating and Activity Guidelines for New Zealand Adults (Ministry of Health, 2015b).

Table 3. 1: *The following rules were applied to allocate 24-hour diet recall data into food groups (Mahan et al., 2012)*

Food Group	One Portion size
Fruit	½ cup canned or fresh fruit or unsweetened fruit juice. 1 small fresh fruit 2 tablespoon dried fruit
Vegetables	½ cup of cooked vegetables or vegetable juice 1 cup raw vegetables
Starchy carbohydrates	½ cup cooked cereal, grains, starchy vegetables ½ cup cooked rice or pasta 1 slice bread
Sugar	1 teaspoon
Water/ plain tea/coffee	250ml
Non-water- high energy drinks	250ml + sugar (based on the label)
Alcohol	Beer (standard) 330ml Beer (reduced alcohol) 230ml Table wine 100ml
Meat + meat substitutes	Lean Meat 30g of lean meat High fat 30g + 1 fat exchange Egg 1
Dairy	Reduced fat milk 1 cup + 1 fat exchange Whole milk 1 cup + 2 fat exchange Yoghurt 1 cup Cheese 30g
Fat	Butter/margarine/oil/mayonnaise 1 teaspoon/ 5g Cream/cream cheese/salad dressing 1 tablespoon/5g Avocado ¼ small avocado/5g Tahini 1 teaspoon/5g

*Discretionary foods (cakes, biscuits, lollies, sugary drinks): food labels and Krause's food and the nutrition care process book was used to determine the carbohydrate and fat content of food (Mahan et al., 2012).

Healthy Eating Guidelines Questionnaire

Eating behaviour and food choices was also assessed by using the Healthy Heart Questionnaire, which developed by a previous Masters student (Xia, 2014) which is based on the Ministry of Health Eating and Activity Guidelines for New Zealand adults (Ministry of Health, 2015b) (see Appendix E). It was a self-reported questionnaire consisting of nine questions with a 6-point scale (1= 'Not at all' to 6= 'completely'). It included how well they achieved having 3 meals per day, 5 +a day, consuming wholegrain breads and cereals (6 serves per day), 2 servings of low-fat dairy products/soy products, 1-2 serves of lean meats or alternatives per day, use of oil, margarine, nuts/seed, 6-8 serves of non-alcoholic drinks, alcohol intake. The questionnaire also assessed participant's use of fats, oils, sugar, salt and avoidance- of deep-fried and fatty foods/sweet bakery.

Food Composition

Participant's food choices and nutritional knowledge was assessed using the "Plate model" concept. This was developed by a Master's student based on the tool frequently used by Dietitians as a visual tool to illustrate the proportions of food groups consumed in a meal (Franica, 2017). This concept was part of the educational nutritional sessions in the "Eating for your Health" intervention. It aids in selecting healthy food choices whilst preparing or consuming a meal. The plate model guidelines recommend $\frac{1}{2}$ of the plate to be non-starchy vegetables, $\frac{1}{4}$ of the plate to consist of protein foods and $\frac{1}{4}$ to be carbohydrate based foods (Ministry of Health, 2015b).

Participants were given a blank circle representing a plate and were asked to draw lines illustrating what proportion of their "typical" plate would contain protein foods (meat, fish, chicken or alternatives), starchy carbohydrates (breads and cereals) and vegetables (see Appendix F). The healthy plate questionnaire would identify the participant's knowledge surrounding the plate model concept during the follow-up. This was also used as an aid in identifying the proportions of protein, carbohydrates and vegetables being consumed by the participants, allowing comparisons to the recommendations to be made (Camelon et al., 1998).

The plate model was analysed by creating a transparent pie chart template divided into 16 sections representing 6.25% each. This was placed over the top of the participant's answers to determine the proportion of carbohydrate, protein and vegetables perceived to be consumed (see Appendix G).

Quality of Life

The Quality of Life Enjoyment and Satisfaction Questionnaire - Short Form (Q-LES-Q-SF) is a self-reported questionnaire consisting of 16 items (Endicott et al., 2005) (see Appendix H). It is designed to assess the degree of enjoyment and satisfaction in participant's daily function (physical health, work, mood, household and leisure activities, social and family relationships, daily function, sexual life, economic status overall well-being and medications). Participant's responses are scored on a 5-point scale ('not at all' to 'all the time'). The responses are then calculated with the possibility of scoring between 14-70 points. Overall life satisfaction and medication questions are assessed independently. A score closer to 70 is reflective of having better life enjoyment and satisfaction (Stevanovic, 2011).

Self-evaluated progress by participants

A self-developed questionnaire was used to assess participant's perception of program progress from the end of the intervention to the one-year follow-up (see Appendix I). The questionnaire assessed specific changes that were made by the participants within the past 6 months, including physical activity, food intake and their relationship with food. The questions consisted of three options; stayed the same, no change or worsened. Participants were also asked to comment on what specific changes they had made.

The questionnaire also assessed the confidence of the participants to continue with the changes they had made on a 10-point scale (1=not confident, 10= very confident). Intuitive eating over the past week was also measured using a scale of 0% to 100% (0%=Never, 50%=half the time, 100%=all the time). This questionnaire was used to gain a better understanding of the impact the education classes and individual dietetic interactions.

Long-term program evaluation

Focus groups were used to assess the overall program during the one-year follow-up with the aid of a moderator's guide.

Focus group

A focus group was conducted to gain an insight into the participant's perception of the overall program. It was also a means to assess the amount of information retained and understanding of concepts taught in the education classes during the intervention. Due to the sensitive nature of the topic ("weight management") the size of the group was aimed to be kept to a minimum. It is recommended to have a group size of between four to eight participants to allow for lively interactions between the participants (Holloway, 2005). Therefore, between five to six participants were recruited per group session to allow for drop-outs, and to ensure a minimum of four participants attended the session.

The focus group was conducted by the researcher (student dietitian) with a NZ registered dietitian present for the first focus group. This was to provide support for the facilitator, feedback and ensure appropriate content was being addressed during the sessions. The session facilitator had a pre-prepared session outline consisting of questions and prompts to be discussed during the focus group. This ensured all the required contents were covered during the session within the allocated time frame.

A set of questions/prompts were developed for the moderator guide based on the four education sessions the participants attended (see Appendix J). The moderator guide consisted of three parts. Part one was based on the participant's journey throughout the program and their overall perspective of the program and its structure. Part two related to their knowledge surrounding intuitive eating. Part three was based on the nutrition education sessions to assess their knowledge and how it is practiced in their daily lives and to make recommendations for future programs. The moderator guide was compiled by the student with assistance from the researcher involved with the student and an NZRD subject specialist.

The majority of the questions/statements were open ended to allow for group discussions. A set of prompts/hints were set out for each question to help guide the discussion in an event of lack of discussion or misinterpretation of questions. Following development of the moderator's guide, a pilot study was conducted to test for understanding and the ability to answer the questions within the allocated time frame. Modifications to these questions were made based on time and feedback from the participants to ensure clarity and time limits were being met. All focus group sessions were recorded. The data were transcribed, and grouped according to results from all the sessions to each question / probe. Similar concepts that emerged from the data were then grouped into corresponding themes.

3.8 Statistical analysis

Statistical analyses were completed using SPSS version 23. The variables were tested for normality using Shapiro Wilk and Kolmogorov-Smirnov test. Non-normal data was tested for homogeneity using the Levene's test. If significant variance was shown between group whilst using the Levene's test, the data was log-transformed, and tested for normality again. Normally distributed data was expressed as mean \pm standard deviation (SD), and non-normally distributed data was expressed as medians (25th, 75th, percentiles). *P*-values were used to highlight significance with a value less than 0.05 considered to be statistically significant.

A paired sample t-test was used to compare the difference between different time points. A One-way Anova was conducted to examine the differences in a variable within different groups. An effect size was calculated to magnitude of the observed effect if the test statistics was significant; $r=0.1$ (small effect), $r=0.3$ (medium effect), $r=0.5$ (large effect).

CHAPTER FOUR

4.0 Results

The objective of this chapter is to present the one-year follow-up results from participants in the Eating for your Health study using the non-diet approach. The aim of this study was to evaluate the program from the end of the intervention (referred to as 6Mbaseline) to the one-year follow up. Quantitative data will be highlighted first followed by qualitative results from the focus group. These will be presented in the following order. Firstly, the participant demographics will be presented, followed by the anthropometric measurements and the amount of weight lost, gained and maintained will be highlighted as a group. Participants eating behaviours based on foods, nutritional guidelines and food composition will be highlighted, followed by changes in quality of life and program progress. Lastly, a qualitative analysis of the overall program will be highlighted based on acquired themes from focus groups.

4.1 Sample size and participant characteristics

Participants took part in the Eating for your Health study which was based in the Waitemata district health Board catchment area (at North Shore and Waitakere hospitals). In total, 49 participants that completed the intervention from the Eating for your Health study were screened to take part in the current study. The inclusion criteria were for participants to have been in the study six months after their last dietitian's consult and before the first of October 2016, to comply with the study timeframes and to reside in Auckland. From the screening process 33 participants met the inclusion criteria and were invited to take part in the study via phone calls. Of the 33-eligible participant's, 5 declined to be part of the study and 28 accepted the invitation as shown in *figure 4.1*. After accepting the invite and consenting to be part of the study, 5 participants withdraw due to either health concerns, lack of time or re-locating from Auckland. Participants were excluded from analysis if 6Mbaseline data from the questionnaires were not available for comparisons to be made between the two-time points as shown in *figure 4.1*.

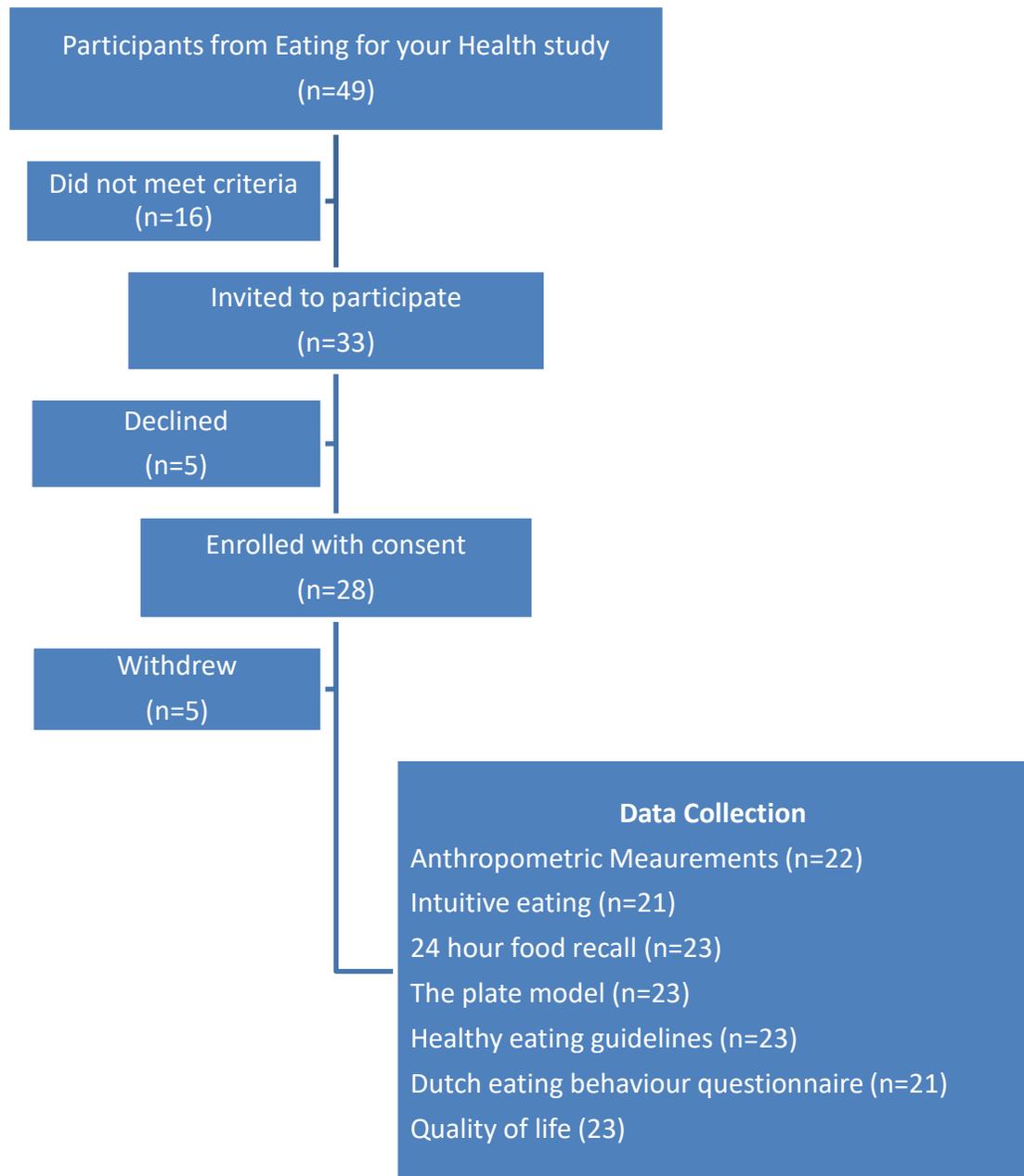


Figure 4.1: Flow chart illustrating participants screening, recruitment, inclusion and withdrawal

From table 4.1 it can be seen that a large proportion of participant's were from NZ European decent (65%) followed by Asian (22%) and Pacific Island (13%) ethnicities. The mean age of participant's were 51 years with the majority (91%) being female. Sixty five percent of participant's were in a relationship and a small proportion (9%) were current smokers.

Table 4. 1: *Demographics of participants who completed the study.*

Characteristics (n=23)		N (%)
Age(years)	22-44	9 (39)
	45-64	8 (35)
	65+	6 (26)
Ethnicity	NZ European	15 (65)
	Pacific Island	3 (13)
	Asian	5 (22)
Gender	Female	21 (91)
	Male	2 (9)
Relationship status	Married/domestic partner	15 (65)
	Single	8 (35)
Smoking status	Non-smoker	11 (48)
	Current smoker	2 (9)
	Ex-smoker	10 (43)

4.2 Anthropometric measurements

There was a statically significant decrease in hip circumference ($p=0.035$) from baseline to the one-year follow-up, with none of the other measures changing significantly (*see Table 4.2*). However, as a group it was clear that the participants were able to maintain these measures for the period of 6 months, with none of the measures increasing.

Table 4. 2: Anthropometric measurements of participants at the end of the intervention in comparison to the one-year follow-up.

Measure (n=22)	6Mbaseline	Follow-up	Trend	95% CI	p-value
	M(SE)	M (SE)			
BMI (kg/m ²) [€]	41.1±2.11	40.67±2.00	↓	-0.28, 1.49	0.29
Weight (kg)	109.7±6.18	108.5±6.01	↓	-0.82, 3.76	0.32
Hip circumference (cm)	131.1±4.03	127.9±3.52	↓	0.98, 7.6	0.04[£]
Waist circumference (cm)	118.8±4.38	116.8±4.92	↓	0.00, 3.87	0.08
Waist: Hip ratio (cm)	0.91±0.91	0.90±0.01	-	-0.40, 0.02	0.61

*Values are mean ± standard error of mean, Trend ↓= decrease, ↑= Increase, - = no change

€ BMI=body mass index; calculated as kg/m², 95% CI= confidence interval

£Significant between groups (p<0.05) based on paired t-test.

4.2.1 Anthropometric measurements based on weight loss

Based on the 2013 guidelines released by the American Heart Association (ACC), American College of Cardiology (AHA), and The Obesity Society (TOH) obesity management guidelines, 22 participants were grouped into the following categories: weight maintenance, weight loss or weight gain (*see figure 4.2*). Weight maintenance was classified as ≤3% body weight change from baseline to the one-year follow-up point, weight loss as ≥3% body weight lost, and weight gain as ≥3% weight gained within the period.

As shown in *figure 4.2*, more than half (n=13, 59.1%) of the participants maintained their weight, whereas 27.3% (n=6) achieved weight loss (ranging between 3.1 and 12.9%). However, within six months, 13.6% (n=3) of the participants gained weight, with a minimum weight gain of 3.60% and maximum of 8.50%.

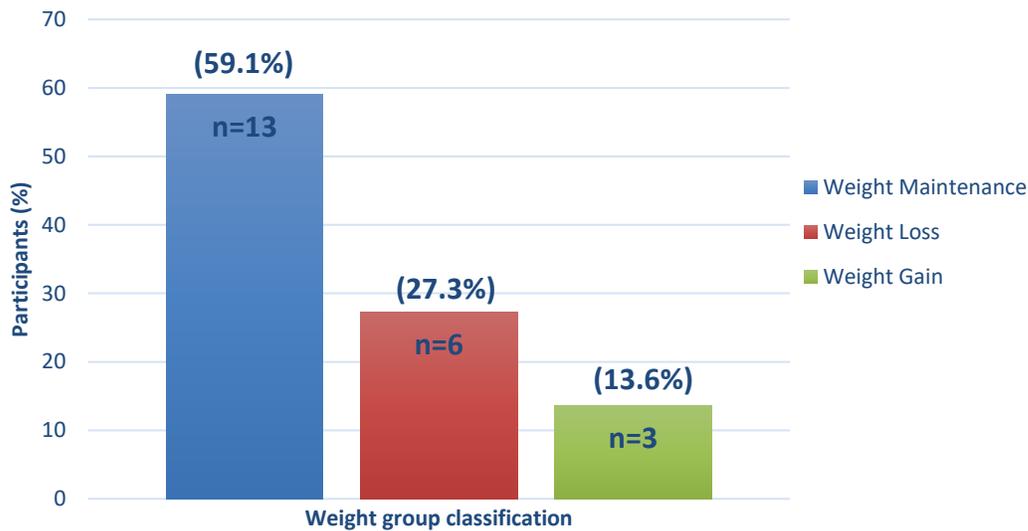


Figure 4.2: Participants segregated into groups based on percent of body weight lost ($\geq 3\%$), gained ($\geq 3\%$) or maintained from baseline to the one-year follow-up.

4.3 Eating behaviour

Intuitive Eating

Overall, there were no significant differences in participant's intuitive eating levels in all four domains (unconditional permission to eat, reliance on internal hunger/satiety cues, eating for physical reasons and body-food choice congruence) 6 months' post intervention. There was a statically significant ($p=0.04$) difference in mean total Intuitive eating level within all four domains improved from 3.36 to 3.52 from baseline to follow-up, indicating a more positive eating approach (Table 4.3).

Dutch Eating Behaviour Questionnaire

There was a non-significant decrease in the mean cognitive restraint ($p=0.81$), emotional eating ($p=0.35$) and eating in response to external triggers ($p=0.5$) between 6Mbaseline and one-year follow-up for all participants. It is important to highlight there was no increase in these measures within the first 6 months (Table 4.3).

Table 4. 3: Comparison of eating behaviour between baseline and one-year follow-up.

Measure	Baseline	One-year Follow-up	p-value
IES-2 Scores (n=21)			
Total Intuitive eating score	3.33±0.39	3.52±0.46	0.04
Unconditional permission to eat (UPE)	2.94±0.52	2.93±0.46	0.89
Reliance on internal hunger/satiety cues (RIH)	3.42±0.76	3.61±0.71	0.2
Eating for physical reasons (EPR)	3.56±0.67	3.57±0.76	0.95
Body-Food Choice Congruence (B-FCC)	3.67±0.65	3.82±0.62	0.17
DEBQ (n=21)			
Restrained	2.65±0.78	2.61±0.77	0.81
Emotional	1.92±0.88	1.86±0.85	0.35
External	2.51±0.64	2.45±0.70	0.5

Mean ± Standard deviation

DEBQ- Dutch eating behaviour questionnaire; lower value = less restraint, emotional eating and external influence.

IES-2 – Intuitive eating score-2; Total intuitive score; scores range from 1 to 5; higher score represents higher level of intuitive eating. Unconditional permission to eat subscale; Reliance on internal hunger/satiety cues; Eating for physical reasons; Body-food choice congruence; scores range from 1 to 5; Higher scores represent higher levels of permission, eating for physical reasons, reliance on internal cues and body food choice congruence.

Significant between group ($p < 0.05$) based on paired t-test.

Eating Behaviour and weight classifications

Given the small and uneven sample size between the weight classification groups, a correlations test could not be performed. Therefore, eating behaviour based on the DEBQ and dietary intake (food groups) for weight maintenance, weight loss and weight gain groups were examined separately.

The Dutch Eating Behaviour Questionnaire (DEBQ) score of < 2.5 indicates eating behaviours that occur seldom (i.e. never or seldom), whereas the score ≥ 2.5 indicates eating behaviour that occur more than just sometimes (i.e. often or very often).

As shown in *figure 4.3a* participants that maintained their weight within the 6-month period ate in response to emotional eating less often, with 31% of participants engaging in this eating

behaviour sometimes or more. Results further showed that restrained eating and eating in response to external cues was seldom for more than half of participants. However, more participants (46%), ate in response to their external cues and restrained eating sometimes or more in comparison to eating in response to emotional cues.

There were only three participants (2, 12, and 13) within this group that engaged in all three eating behaviours more than sometimes.

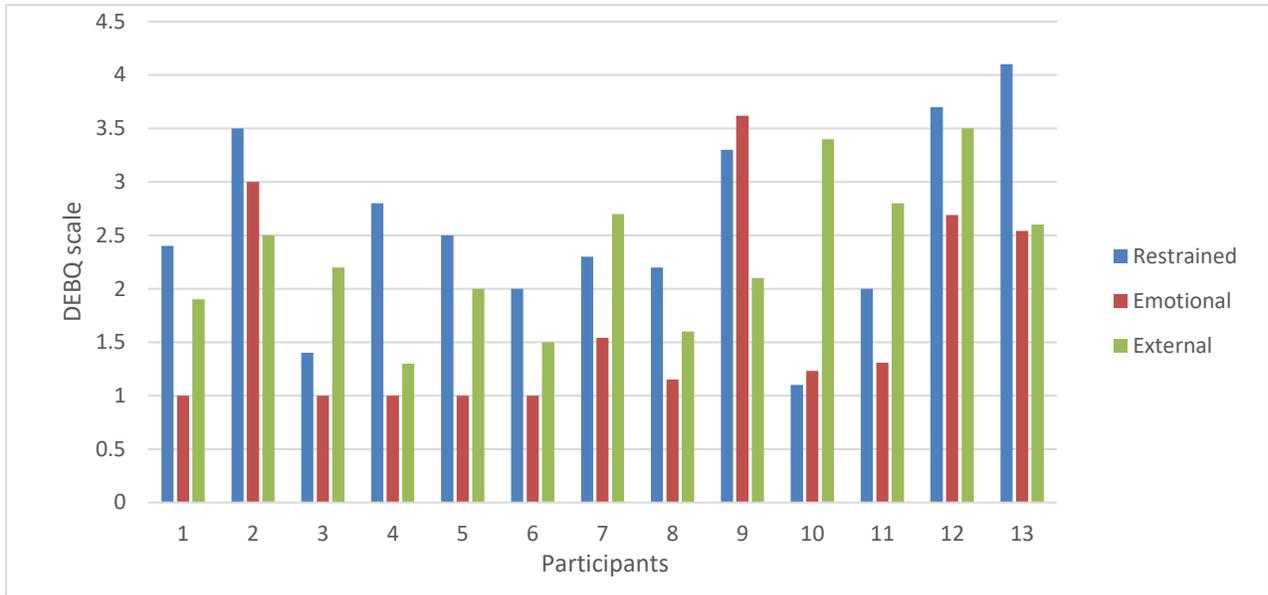


Figure 4.3a Eating behaviour of each participant who achieved weight maintenance.

Participants who achieved weight loss within 6 months had lower rates of eating in response to external cues, with 37% of participants reporting to eat in response to external cues sometimes or more. Half the participants reported eating in response to their emotions and restricting food intake sometimes or more. Higher level (≥ 2.5) of restrictive, emotional and eating in response to external cues was only reported by participant 6 (Figure 4.3b), whereas participants 1 and 3 both reported higher levels of restrictive eating. The overall mean for eating in response to external cues, emotions and restrictive food intake was 2.3, 2.1, and 2.4 respectively.

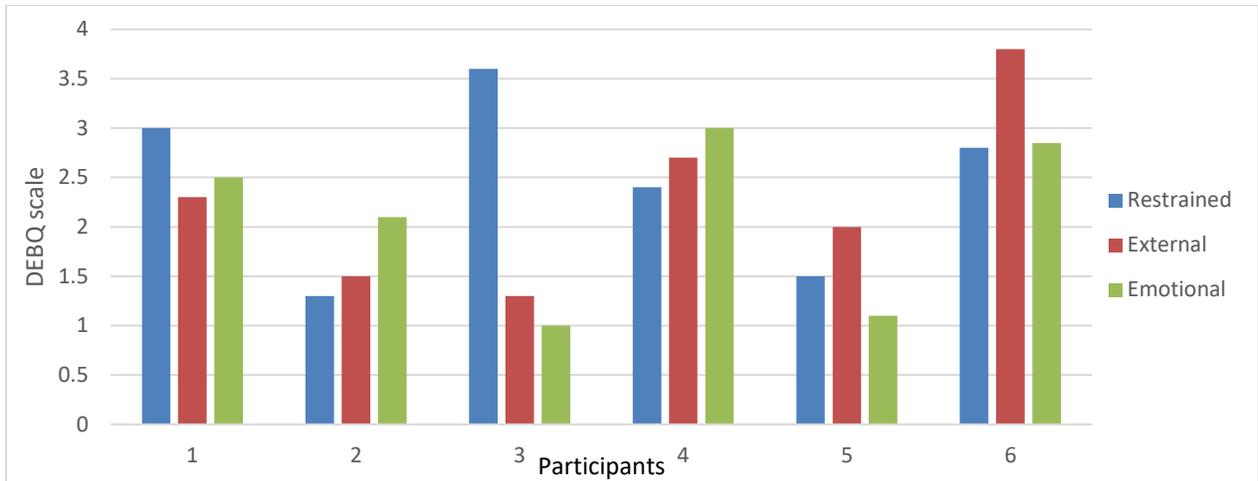


Figure 4.3b: Eating behaviour of each participant who achieved weight loss.

Overall, three participants gained weight within 6 months, with a mean score of 2.7, 2.2, and 2.9 for restrictive eating and eating in response to emotional and external cues respectively. As shown in *figure 4.6c*, participants 1 and 2 reported lower levels of eating in response to their emotions. They also reported eating in response to their external cues and restricting food intake more than sometimes. Participant 3 reported engaging in restrictive eating more than sometimes and eating in response to external and emotions often.

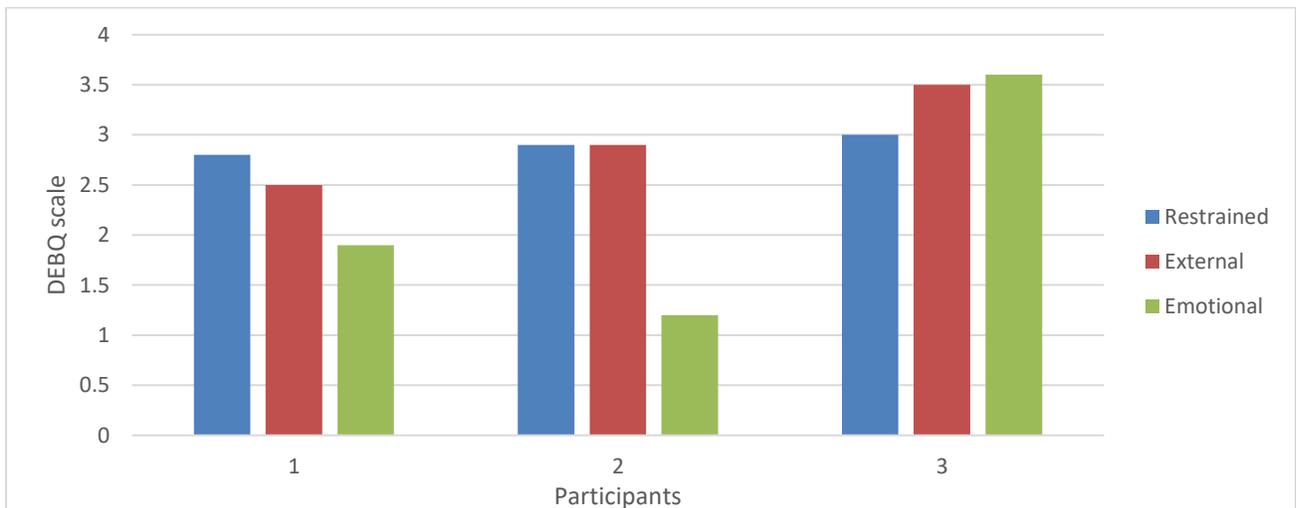


Figure 4.3c: Eating behaviour of each participant who gained weight at one-year follow-

Changes in food groups

As shown in *figure 4.4* there was no significant difference between fruit ($p=0.48$), vegetable ($p=0.34$), starchy carbohydrate ($p=0.94$), dairy ($p=0.59$), alcohol ($p=0.67$) and water ($p=0.64$) intakes between the two-time frames. There was, however, a significant increase in meat ($p=0.05$) intake from an average of 2 servings at 6Mbaseline to 3 servings at follow-up. Within the 6-month period a statically significant ($p=0.001$) increase in mean fat intake from 2.5 to 4.3 servings occurred. A statistically significant improvement in sugar ($p=0.02$) intake was also shown from baseline to follow-up with mean intake reducing from 4.2 to 2.2 servings.

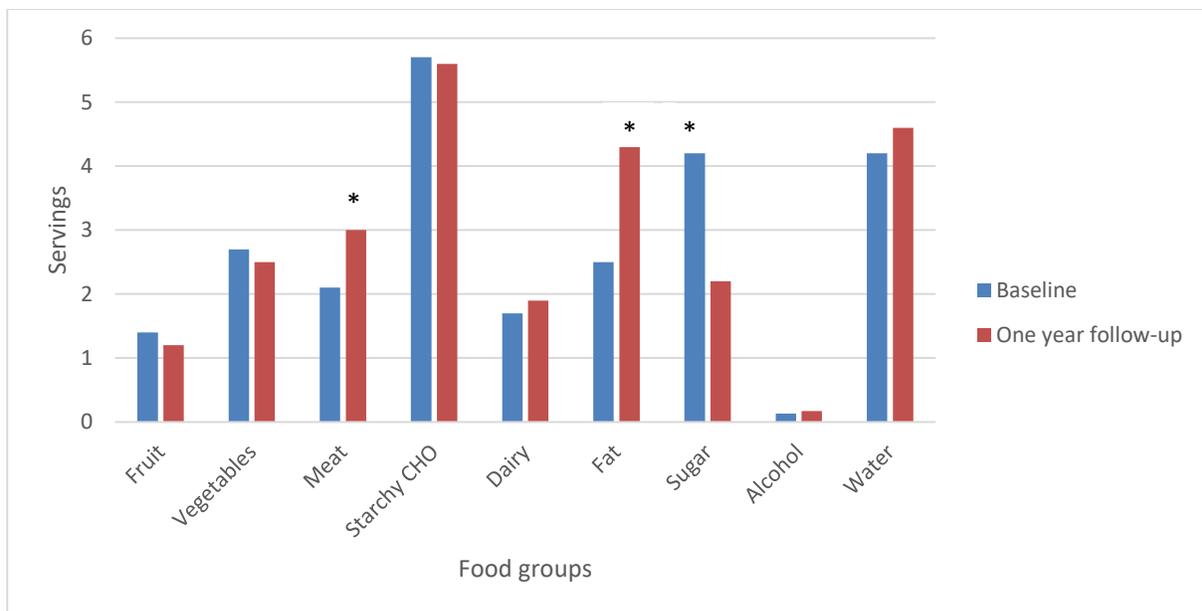


Figure 4.4: Number of servings of macronutrients, dairy products, fat, sugar and fluid intake between the end of intervention and one-year follow-up.

*Significant difference between groups ($p < 0.05$) based on paired t-test.

Food group intake and weight change

Participants who gained weight consumed fruit, meat, bread, grains and cereals and milk products above dietary recommendations and vegetables below the recommendations. Between 6Mbaseline and one-year follow up a decrease in the amount of fruit, breads, grains and cereals was shown, with no changes in vegetable intake and an increase in milk products and meat intake (Figure 4.5a).

Participants that lost weight changed their dietary intake to consuming fruit, vegetables and milk products within the dietary recommendations at the one-year follow-up. No changes were observed in the amount of meat being consumed with a decrease in breads, grains and cereal intake (Figure 4.5b).

Participants within the weight maintenance group decreased their fruit, vegetable and milk product intake from 6M baseline to the one-year follow-up. There was also an increase in the amount of meat consumed and breads, grains and cereals intake met the recommendations at the one-year follow-up (Figure 4.5c).

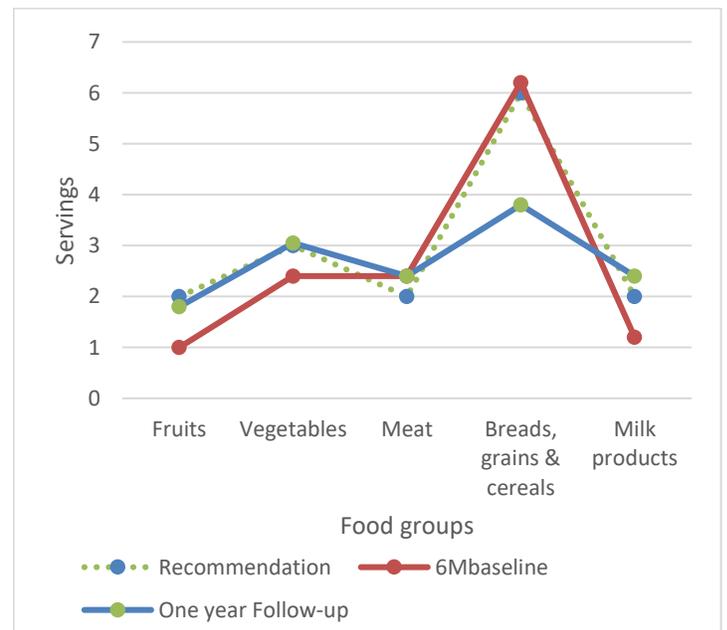
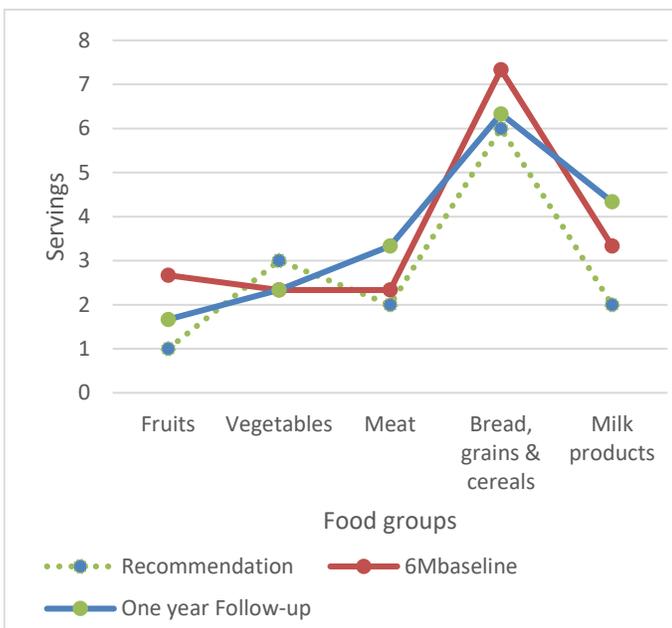


Figure 4.5a: Comparison of food groups between baseline and one-year follow-up to the recommendations for participants that gained

Figure 4.5b: Comparison of food groups between baseline and one-year follow-up to the recommendations for participants that lost weight.

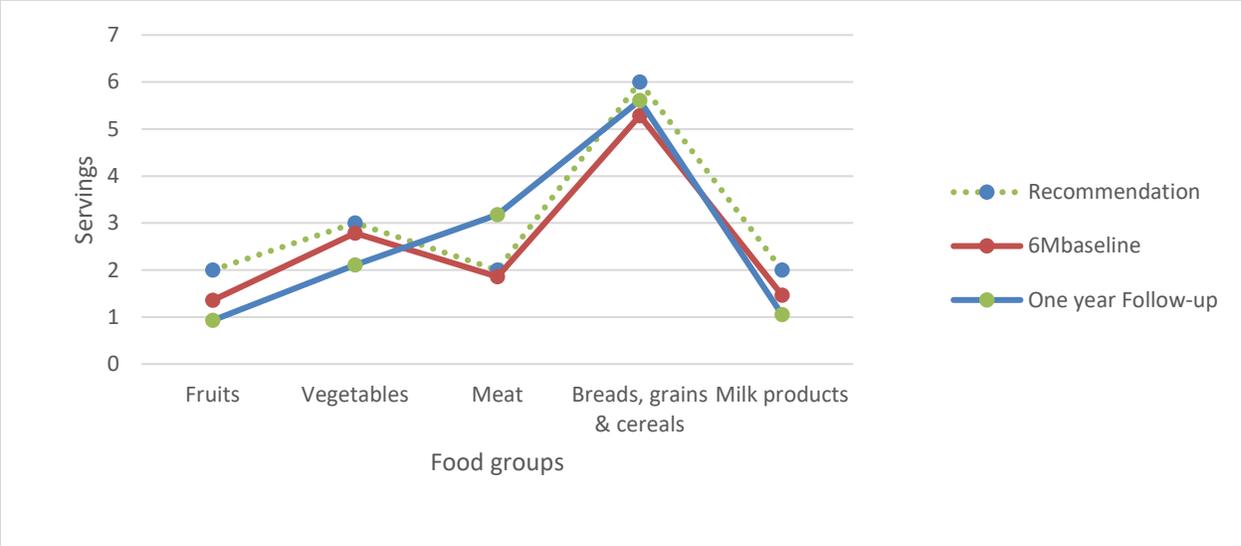


Figure 4.5c: Comparison of food groups between the baseline and one- year follow-up to the recommendations for participants that maintained weight.

Fat and sugar intake

Mean fat intake in the weight loss group increased by 2.2 servings, with mean sugar intake decreasing by 1.6 servings within the 6-month maintenance period. There was also an increase in mean fat intake in the weight maintenance group by 1.8 servings and a decrease in mean sugar intake by 1.8 servings within 6 months. Within the weight gain group mean fat intake increased by 2.2 servings while mean sugar intake decreased by 3.8 servings within 6 months.

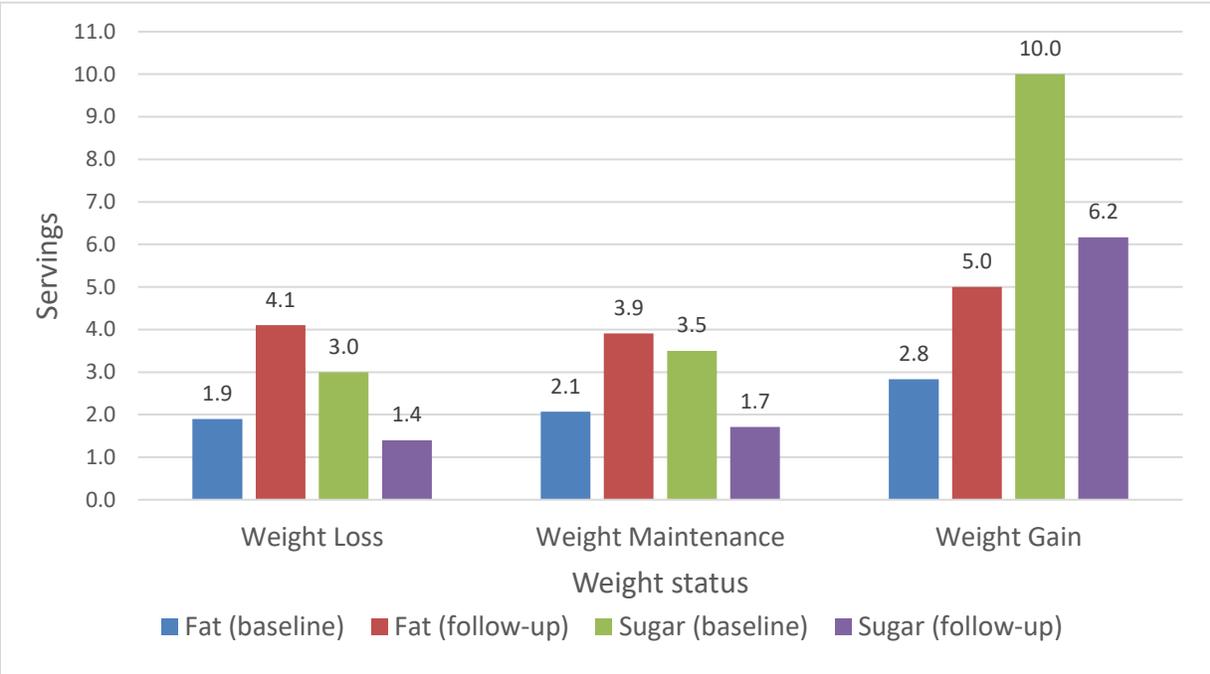


Figure 4.5d: Comparison of fat and sugar intake from 6Mbaseline to follow-up between groups that had lost, gained or maintained their weight.

Eating behaviour based on nutritional guidelines

Between baseline and one-year follow-up there was no statistically significant difference in participants eating behaviour based on the healthy eating guidelines. Interestingly, on average, all participants reported close to (score ≥ 4) “completely” achieving the healthy heart eating guidelines (Table 4.4).

Table 4. 4: Participants eating habits based on the healthy heart eating guidelines from 6Mbaseline to follow-up.

Measure (n=23)	6Mbaseline	Follow-up	Trend	95% CI	p-value
1. Enjoy three meals each day.	4.65 _± 1.42	4.35 _± 1.46	↓	0.43,0.96	0.47
2. Choose fruits/vegetables at every meal & most snack (3 servings vegetables & 2 servings of fruit).	3.90 _± 1.44	4.40 _± 1.31	↑	-0.96,0.48	0.49
3. Select whole grains/high fibre breakfast cereals & breads at most meals & snacks (at least 6 servings per day).	4.10 _± 0.33	4.10 _± 1.14	-	0.39,0.96	0.38
4. Include a small serving of low fat meat, poultry, fish, or legumes at 1 or 2 meals each day.	4.45 _± 1.15	4.20 _± 1.20	↓	0.17,1.22	0.14
5. Choose low fat milk or products, or replace with soy products (at least 2 servings per day).	4.35 _± 1.84	4.00 _± 1.89	↓	0.26,0.74	0.23
6. Use small amounts of oil, margarine, nuts or seeds (no more than 3-5 servings per day).	4.60 _± 1.35	4.35 _± 1.46	↓	0.13,1.12	0.15
7. Drink 6 to 8 non-alcoholic drinks per day.	5.05 _± 1.19	4.90 _± 1.61	↓	1.04,0.65	0.68
8. Limit alcohol to less than 3 drinks per day.	4.95 _± 2.18	4.80 _± 2.35	↓	0.39,1.74	0.27
9. Use small amounts of fat, oil, sugar & salt in food preparation & choose ready-prepared foods low in these ingredients.	4.85 _± 1.04	4.55 _± 1.54	↓	0.17,0.87	0.27
10. Mostly avoid deep-fried & fatty foods, or sweet bakery products.	4.45 _± 1.54	4.10 _± 1.55	↓	0.35,0.92	0.41

*Values are mean ± standard deviation(SD), Trend ↓= decrease, ↑= Increase, - = no change

BCa 95% CI= bootstrap confidence interval. Scores from 1-6 for meeting guidelines (1= not at all, 6=completely).

[‡]Significant between groups (p<0.05) based on paired t-test.

Food composition

In comparison to the results from 6Mbaseline to the one-year follow-up there was a non-significant slight decrease ($p=0.709$) in vegetable intake from 42% to 41%; vegetable intake between both time points were below the recommendation of 50% on the plate for meals. Protein intake increased by 2% ($p=0.453$) with the overall intake being above the recommended level (25% on the plate). Starchy carbohydrates increased by 6% ($p=0.201$), further increasing the gap by 5% from the recommendation (25% on the plate) (figure 4.4).

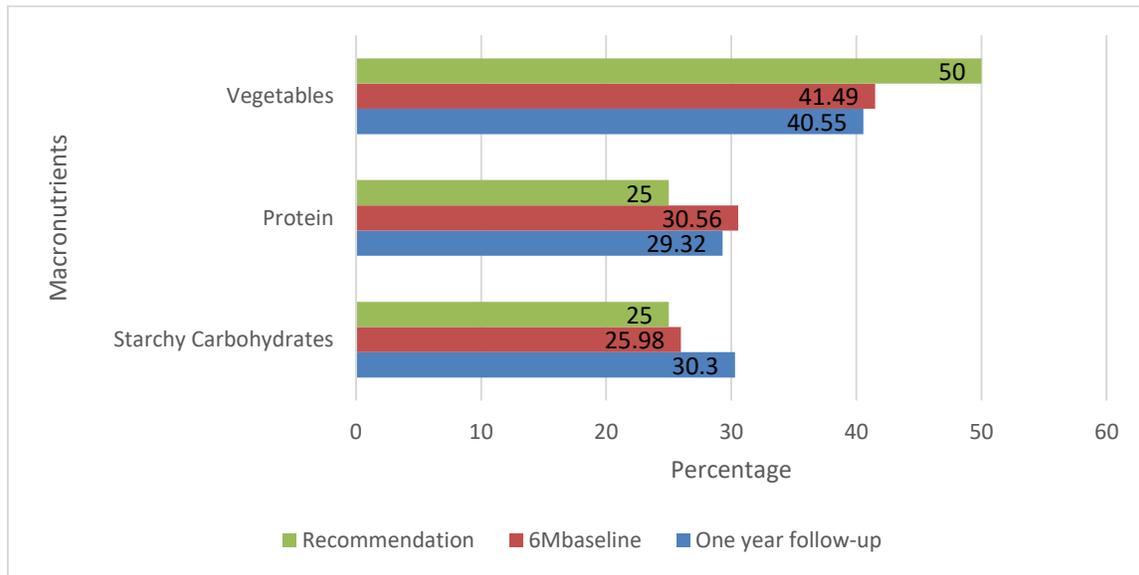


Figure 4.6: Contribution of Vegetables, Protein and Starchy Carbohydrates on the plate between time points.

Quality of Life

The mean scores for quality of life were not significantly different between 6Mbaseline and follow-up for quality of life ($p=0.84$), overall life satisfaction ($p=0.84$) and use of medications ($p=0.53$) as shown in Table 4.5.

Table 4. 5: *Participants quality of life based on the Quality of life enjoyment and satisfaction questionnaire- short form (Q-LES-Q-SF) from 6Mbaseline to follow-up.*

Measure	Baseline	One-year Follow-up	p-value
Q-LES-Q-SF (n=23)			
Total score	47.9±2.48	48.2±11.1	0.84
Overall life satisfaction	3.74±0.26	3.78±0.90	0.84
Medication	2.83±1.90	3.04±1.66	0.55

Q-LES-Q-SF- Quality of life enjoyment and satisfaction questionnaire- short form. Higher score= good quality of life and enjoyment. ^fSignificant between groups (p<0.05) based on paired t-test.

Self-evaluated program progress

Overall more than half of the participants perceived their attitudes towards food, eating behaviour, relationship with food, ability to intuitively eat and overall food intake improved 6 months' post intervention (Table 4.5). Frequency of eating due to comfort improved for approximately half of the participants with the remainder reporting no changes. Planned physical and incidental activity levels were reported to decrease the most, by 30% and 20% respectively.

Table 4. 6: *Participant's perception of change (%) in their relationship with food and physical activity levels in the weight maintenance period.*

Behaviour	Improved	Stayed the same	Worsened
Attitude towards food	70	30	0
Eating behaviours	52	39	9
Relationship with food	61	35	4
How often you comfort eat	48	48	4
Your ability to intuitively eat	61	35	4
Your overall food intake	65	31	4
Your planned exercise/activity level.	48	22	30
Your incidental activity	44	35	22

values reported in percentages

4.6 Long term program evaluation

Focus groups were conducted with the objective to gain an insight into the participant's overall experience, acquired knowledge, behavioural changes elicited from the programme and their recommendations for improving the program. Twenty-four participants were invited to attend the focus group sessions, of which thirteen accepted the invitation. A total of three focus groups was conducted at either Massey University (Albany campus) or Waitakere hospital. Focus groups were one hour in duration, as two morning sessions and one evening session. *Table 4.7* highlights the characteristics of participants who took part in the focus groups.

Table 4. 7: *General characteristics of participants in the focus group.*

Characteristics	Total (n=13)
Age(years) *	50 ± 16.61
Gender[‡]	
Female	11(85)
Male	2(15)
Ethnicity[‡]	
NZ European	9(69)
Pacific Island	2(15)
Others	2(2)
Anthropometry*	
Weight(kg)	105 ±34.15
BMI (kg/m ²) [€]	40 ±9.76
Waist circumference (cm)	114±24.03
Hip circumference(cm)	124±15.92
Waist-Hip Ratio	0.91±0.11

*data reported as mean ± SD

[‡]data reported as frequency(average)

[€]BMI=body mass index; calculated as kg/m²

4.6.1 Data Transcribing

The moderator's guide (including statements, questions and probes) were structured based on seven themes, as shown in *Table 4.8*; these include the participant's journey, programme structure, intuitive eating practices, nutrition knowledge, physical activity and programme-related recommendations. Data was captured and transcribed within these seven themes. The themes were further broken down into sub-themes prior to data analysis. This section of the results will present the data within these major themes and the thematic elements that emerged following data analysis across all three focus groups.

Table 4. 8: *Qualitative approach for exploring participant’s nutrition knowledge, application of contents learnt, programme journey and further recommendations for the Intuitive eating programme.*

Focus group questions based on these themes	Data coding	
	Themes- Prior to transcribing	Thematic Elements
Journey	<ul style="list-style-type: none"> • Overall experience: positive or negative 	<ul style="list-style-type: none"> • Environmental influences • Support • Knowledge
Programme Structure	<ul style="list-style-type: none"> • Duration of the programme • Learning in a group setting; peer learning. • Individual contact with dietitian. 	<ul style="list-style-type: none"> • Nutrition Education Content • Supportive learning environment • Program duration
Intuitive eating practices	<ul style="list-style-type: none"> • Understanding mindful eating • How is this applied? 	<ul style="list-style-type: none"> • Interpretation of Intuitive eating • Enablers • Barriers
Nutrition knowledge	<ul style="list-style-type: none"> • Understanding of the main topics from nutrition session. • How is this applied in their daily lives? 	<ul style="list-style-type: none"> • Socioeconomic status • Cooking skills • Eating practices
Physical Activity	<ul style="list-style-type: none"> • Physical activity and health • Applying the strategies for incorporating exercise daily. 	<ul style="list-style-type: none"> • Barriers • Enablers
Participants recommendations	<ul style="list-style-type: none"> • Additional content 	<ul style="list-style-type: none"> • Additional nutrition content
	<ul style="list-style-type: none"> • Follow-up 	<ul style="list-style-type: none"> • Extended follow-up period • Refresher course

4.6.2 Programme journey

On reflection of their journey throughout the program, three key themes emerged from the discussions across the focus groups. These were the environmental influences, importance of support during the programme, and the influence of acquired knowledge from the nutrition sessions regarding their weight loss.

Environmental influences: the work environment had a major impact on participant's application of the content learned from the programme to manage their weight. The presence or high availability of food at work was a challenge for individuals in the workforce. Work functions such as morning tea, with an abundance of energy dense food available and consumed ad libitum by their colleagues was challenging. Participants felt compelled to eat in order to socialise and not cause any offence. It was also difficult for participants who were drawn to sweet foods to resist consuming them regardless of their hunger cues. Some of the participant's verbatim comments are presented in italic text in the following sections to support findings.

"I find workplace morning tea the hardest, they generally over cater, and there is a lot of them and I find myself eating even though I am not hungry".

"I go off the wagon. I have a sweet tooth, especially at work there is always morning teas, muffin, chocolate. Not easy".

Importance of support: All education sessions were held within a group setting where participation and mutual discussion was encouraged. Participants reported feeling motivated to try the strategies and tips being taught during the sessions, particularly due to the supportive group environment.

They were able to relate and learn from each other's experiences. Participants attending the group sessions with a support person found it to be helpful as they were able to go along the journey with them and help them with their goals. They also saw it as a motivation, as their support person would serve as a reminder of what they were trying to achieve and take on board the strategies and tips learnt in the nutrition sessions.

“If you go with just one person, you get the information, and you’re like let’s go do this. It’s so motivating”.

Some participants resorted to outside support to help them achieve their weight loss goals after completing the programme. For instance, joining weight watchers as a means of support despite acknowledging repetition of content being taught the absence of support between the follow-up periods were voiced, as participants felt they lacked motivation and gained weight during the waiting period. In their opinion, this could have been prevented or minimised with more support from this programme.

“The moment we went to the 3 months till it was final checking I put on about another 4kg in that 3 months. So realistically I felt like yaay I’ve done that, now I can go back to my old way again”.

“I found it fairly easy, or okay to stay on plan when I was coming weekly”.

Acquired knowledge: Participants reported that learning healthy eating guidelines, intuitive eating approaches, strategies and tips helped them tremendously during their weight loss journey. The main learning outcome that all the participants agreed upon, was not eating when not physically hungry. Both intuitive and mindful eating strategies helped participants control their food intake by reducing portion size, and by paying more attention to their body’s hunger and fullness cues. Participants reported eating less than half the amount of chocolates and chips by applying mindful eating practices. By using these strategies, they were able to enjoy eating their food more and make better food choices. For instance, no longer buying ice-cream during grocery shopping; instead going out and having it as a treat. Participants were also using outside resources such as nutrition books to further support and expand their knowledge gained from the program.

“It’s taught me that I don’t have to eat, I used to eat because I thought, oh I haven’t eaten anything yet, but I wasn’t really hungry”.

“I’m more mindful of what to eat and how much to eat, and that you don’t have to eat if you are not hungry, was the biggest thing I got out the program”.

“I enjoy the food so much better and I’m making so many different recipes with healthy foods”.

4.6.3 Programme structure

Participant’s discussed their perspective on the overall structure and layout of the programme. Three main themes emerged from their discussions, namely the nutrition education content, the learning environment, and the duration of the overall programme.

Nutrition education content: All participants thoroughly enjoyed the topics taught within the four nutrition-related sessions of the programme. Furthermore, the incorporation of activities throughout the sessions helped with their understanding of the concepts being taught. However, some participants felt they would have benefited more if some of the content being taught was more in-depth to facilitate their understanding, or more time was spent to facilitate both learning and understanding of new content. Time was therefore considered a limitation in this regard, as well as being able to practice what is being taught in a practical manner. For instance, inclusion of examples of preservatives and different forms of sugars used in packaged food whilst learning how to read labels. Participants also felt it would be beneficial to have disease specific examples for the content being taught, as all the participants had some form of health condition. Participants believed this would have allowed them to make more informed food choices and helped them further in their weight management.

“Reading the labels activities was helpful, but I’m still not 100% with that. I think that could have been a bit more time spent on that.”

“I really like the card to watch how much sodium, fat, sugar to see when buying things but I have diabetes, and sugar is a biggy for me, more information on the types of sugar in foods and where to find them would have helped me a lot more.”

Learning environment: Participants valued the different learning environments they encountered in the programme. Learning within a group environment with like-minded individuals going through a similar situation was seen as a positive and supportive environment. Participants felt they were able to learn from each other’s experiences and apply the strategies

that worked for them in their own lives. Activities during the session also initiated peer learning through group discussion.

Individual consultation with the dietitian also allowed the participants to share any personal issues they were experiencing. This environment allowed for individualised goal setting with the dietitian and seeking advice which was individualised for them to progress.

“It was good to be listening to what everyone else is going through and how they are handling it and that I could try them as well if I wanted to”.

“You feel like you are not the only one going through it all, group is better, as you all have the same problem and you feel part of something.”

“I think the group was better than being by yourself, you were not alone and you just identified with everything that happened and everybody that was there and you could see the struggles that they had and it just motivated you even more.”

“I found individual sessions useful coz she gave me advice and also I had that down time to share the lows and what I was experiencing and just to get advice on how to get over things to progress”.

Programme duration: Participants felt the one-hour nutrition sessions were an appropriate time allocation for learning. However, they believed they would have benefitted from additional nutrition sessions, thus extending the programme period. This would allow more learning opportunities whilst also providing a support group which would act as a motivator for them to continue with the changes they were making at the time. Participants also suggested having a refresher course approximately 6 months after the programme for one and a half hour to two hours long. The purpose would be to help consolidate their learnings and to see other group member’s progress, as this would enhance their own motivation.

“I think 6-8 weeks would have been better, with the group sessions and the one on one sessions because I don’t feel like those were enough.”

“Having a balance of both group and individual sessions would be good, I think the individual sessions were too spaced out”.

“Even having a refresher course for 2 weeks, like 2 sessions monthly or even at 6 months. I think it’s good us all catching up, taking about and seeing how everyone is doing and what has worked for them”.

4.6.4 Intuitive eating

The participant’s interpretation of intuitive eating and barriers and enablers for application of these strategies and tips taught during the session in their daily lives were also discussed.

Interpretation of intuitive eating: All except one participant had the correct interpretation for the meaning of intuitive eating. Participants stated this concept to be the most useful for their weight management. Eating intuitively and applying a mindful eating approach lead to participants being more in control of food choices and portion sizes. For instance, all participants reported consuming less than half the amount of treat foods (e.g. chocolate, chips, ice-cream) than prior to the programme. It was also clear from the discussions that everyone experienced greater enjoyment of their foods and were more willing to trying new foods and healthy recipes.

“Umm yea I let myself eat what I want or else I am just gonna say oh nah just gona eat a heathier choice then I am gona end up eating what I want also. So, I have a little bit of what I wana eat. Let say with chocolate usually I can eat half a chocolate or the whole things but now it’s like when I feel like chocolate I eat a line instead of half of the block.”

“I even go and get the little packs of chocolate now instead of the big one.”

“I feel really proud of that I can buy a bar of chocolate and not eat the whole thing anymore, I don’t have to do it. Yaaaay.”

Enablers: The enablers for applying intuitive eating in daily life included using several strategies and tips taught during the sessions. Participants avoided stressful eating situations by walking away to a quieter area where they could pay more attention to what they were eating. Another approach was to pay more attention to presenting their food on the plate in an appetising way;

thus, it would look more appealing and they would enjoy it more. Having only foods they consider to be healthy in their home environment was another strategy being used. This was most useful for participants who were “grazers” (eating throughout the day). Eating without distractions was another strategy that individuals felt worked well for them, as it allowed them to be more in tune with their body and what they were eating. Participants felt all these strategies were helping them manage their weight whilst feeling good about themselves.

“Even if you are not hungry, a lot of people will just eat so just to listen to body and to eat and to stop and eat slowly and stop when you feel full even you have to push some of the food away or put the food away for the next day/meal. Listening to the body was the main thing that helped me.”

“I buy only what I need to and I don’t have crackers or biscuits so I don’t have it so I won’t eat it”.

“I tend to present my food better at home now than I used to, and surprisingly I enjoy them more”.

Barriers: Barriers/challenges to implement learnings faced by some participants were their home and work environment’s as well as cultural beliefs and practices. Work environments were challenging as participants felt they were less in control of their eating environment; for example, during break times they would eat food regardless of their hunger cues. The work environment further encroached on time to practice mindful eating due to time restraints. The presence of food at work was another challenge. Participants felt compelled to eat in order to socialise. Individuals drawn to sweet foods found it extremely challenging to resist the food and were more likely to give into their cravings.

“I find workplace morning teas the hardest times, its’ like generally people over cater”.

“I still go off the wagon at times, with meals as I have a sweet tooth, especially at work there is always morning teas, muffin, chocolate. And it’s free. Not easy”.

Unsupportive home environments also resulted in individuals being influenced by their family and living situations. Participants living alone found it easier to eat their meals in front of the television as opposed to sitting alone at the table, whereas participants with partners were more

inclined to eat where their partners ate. For example, if a participant's partner preferred to eat in front of the television, they would conform and eat most of their meals on the couch whilst watching their programme.

"Sitting down at a table and eating a meal, I don't have a family to do it with so it's just easy to just lay down on the couch and eat".

Cultural beliefs and practices appeared to have a significant impact, as those of Māori and Pacific descent found it difficult to practice eating intuitively and making healthy food choices in their cultural environment. They felt that refusing foods from their elders, family members and friends were seen as being disrespectful. As a means of overcoming this barrier, some participants reported using their medical conditions as a means of turning down food.

"I get hassled, people in my environment always try and feed me, you know I'm Māori and once put on your plate you gotta eat it, you are expected to eat it".

"It's like that in the Samoan community too".

"Some people get quite offended you know when you say no to their food, but it seems to be okay if I say I can't eat that because I've had bowel cancer, that's completely acceptable".

4.6.5 Nutrition Knowledge

A series of questions based on the four nutrition sessions were opened for discussion to determine participant's understanding of the content taught to them, whether it was retained, and how it was being applied, if at all. From these discussions, it was clear that the main impact of the nutrition sessions was on participant's food choices, and that their food choices were further driven by their socio-economic status, cooking skills and eating practices.

Socio-economic status: All the participants believed that all healthy foods are always more expensive. Despite having the knowledge of nutritious food groups and the appropriate quantities to consume from these food groups and from discretionary items like fat, participants with money concerns consumed more staple foods / filler foods like rice, bread and potatoes compared to vegetables to prevent hunger. Participants believed vegetables were expensive and

they were able to feed their family better with bread's, rice, potatoes and at times packaged foods.

"Bread, bread, bread is the only things that I eat coz its cheap".

"Instead of vegetables I turn to bread or rice, because it's cheap".

On a positive note, participants reported using some of the shopping strategies, such as "shopping on a full stomach", and "only buying foods on their shopping list", to help reduce the cost of their overall shopping.

Cooking skills: Poor cooking skills were seen as a barrier to cooking fresh produce. Participants reported poor knowledge and skills to prepare healthy foods were limiting factors for them eating a variety of vegetables. They also reported frequent purchasing of pre-prepared foods and takeaways due to the inability to put together a meal.

Eating practices: Health conditions largely affected the types of foods participants consumed and the tools they could apply in their daily lives. Those who had health conditions such as bowel cancer, did not use the plate model as they were omitting meat from their diets, hence they felt that this tool was not applicable to them. Participant's with diabetes did not use this tool as well, as they weighed their foods to work out their portions as instructed by their general practitioner.

"I suppose I don't use the plate model because we don't have any meats in the house so we don't eat meat as a rule we don't eat chicken as a rule we don't eat anything like that when we go out we'll eat meat when we go to peoples places we'll eat meat but at home we have got into the habit of not eating meat so its yeah."

"I am diabetic you see. I get told by my GP to eat more and how much to eat, so I normally weigh out all my foods. I only do a 100g of meat."

4.6.6 Physical Activity

All participants expressed their understanding of the importance of physical activity for healthy living and weight loss and/weight management and identified enablers and barriers for taking part in physical activity.

Enablers: Exercising with a friend or support person was seen a great motivator for taking part in exercise. It encouraged participants to see the transformation in one another's weight and overall health and well-being. Participants took their friends dog for a walk, joined the gym together and went for bush walks together. Strategies learnt from the nutrition session for taking part in incidental activities were also utilised by participants, for example taking the stairs instead of lifts and parking further away whilst going to work or shopping.

"I go with my friend and she makes me go you know, if I say no, she just takes no excuse and I do the same for her."

"I think it did teach me that you can exercise anywhere you don't have to you know it's about like where you park your car. I park my car one side of Browns Bay and when I've got something then I've got to walk the length of the street and back again."

Barriers: Lack of motivation to exercise was a factor, as participants felt they were limited by their medical conditions. Other barriers identified included a lack of time to taking part in any physical activity and the inability to commit to an exercise regime.

"I could get out and do exercise if I wanted to but it's just finding the time"

"I didn't do any and I still don't do any, I don't do exercise because I have a medical condition. It's just about my limitations with not being able to do the exercise."

"It's about how committed you are to the program I guess, I use to go for walks after work. But now I just don't have time and it get dark earlier."

As shown in *table 4.9* a summary of recommendations was collated based on discussions from the focus group. The reasoning is a combination of the comments from the participants and interpretation by the researcher.

Table 4.9: *Participants recommendations for inclusion of content within the programme*

Suggestions	Application/Content	Reasoning
Addition of Learning Content	<ul style="list-style-type: none"> • Cooking on a budget. • Information on availability of different fruits and vegetables. • Additional tips/strategies e.g. exercise, saying no to foods from friends or family in a culturally appropriate manner, cooking in different seasons. 	<ul style="list-style-type: none"> • To help individuals with limited cooking abilities and food supply knowledge. Also, helps individuals working within a limited budget.
Social support	<ul style="list-style-type: none"> • Create a blog/forum/Facebook for participants within the programs to ask questions, share their experiences, suggestions, recipes and progress. • Organise group events, set up exercise groups with individuals living in close proximities. 	<ul style="list-style-type: none"> • Provide a form of support group and a safe sharing space. Also, a way of keeping in touch with group members.
Program Duration	<ul style="list-style-type: none"> • Additional group and individual sessions with the registered dietitian. Suggestions to increase individual and group interactions to six instead of four. 	<ul style="list-style-type: none"> • Provide additional support and time to thoroughly learn the nutritional components of the program. • Facilitate further group interaction and support.
Resource Provisions	<ul style="list-style-type: none"> • Recipe books containing quick, simple and healthy to prepare meal ideas. • Nutritional information pamphlets for specific health conditions. • Course book outlining all the information from the nutrition sessions. 	<ul style="list-style-type: none"> • To help individuals with limited cooking abilities. Books and pamphlets for reference and help consolidate content learnt within the program.
Refresher Course	<ul style="list-style-type: none"> • Within a group setting, education session underlining key aspects of the non-diet approach program taught during the intervention. 	<ul style="list-style-type: none"> • Help re-enforce previously learned content.

CHAPTER FIVE

5.0 Discussion

5.1 Introduction

This study examined the efficacy of an outpatient weight management intervention for overweight and obese outpatients within the Waitemata District Health Board. The intervention “Eating for your Health” used an intuitive eating approach to assist participants in improving their health and wellbeing. In addition to the evaluation, the study also aimed to carry out qualitative measures to identify aspects of the programs that worked well, perceived barriers along with recommendations for improvements from the participants involved in the program. The objective of this chapter is to discuss the results as presented in chapter four. This will include a discussion of the quantitative measures followed by the themes of the focus group discussions. Lastly, recommendations for improving the weight management program will be discussed.

5.2 Summary of outcome

The main outcome of this study was that the majority of the participants were able to either maintain their weight or lose weight at the one-year follow-up mark, and also reported higher levels of intuitive eating. However, no improvement was reported in quality of life from baseline to follow-up. Based on the 24-hour diet recall analysis, an increase in fat intake and a decrease in sugar intake were reported. Upon completion of the program, participants perceived their overall eating habits and relationship with food to be improved, whereas physical activity levels declined. The structure of the program was well liked, with participants wanting additional group sessions with topics being taught more in-depth. Ongoing support in between dietetic consults and post intervention in the form of a refresher course or social support forum was also recommended by participants.

5.3 Characteristic of the study participants

Participants from the “Eating for your Health” study were recruited for the current research study. There were a large proportion of participants from the study who were NZ European (65%), followed by Asian (22%) and Pacific Island (13%) heritage. According to the 2006 census the population within Waitemata is made up of 57% European, 14% Asian and 6% of Pacific Island origin (Ratana and Sam, 2007). Therefore, the participants within this study were a good representation of the ethnic group residing within the Waitemata region.

5.4 Anthropometric measurements

As discussed in the literature review, anthropometric measures are a practical way to assess changes in weight and determining an individual’s health risk. BMI is a tool commonly used to diagnose/categorise individuals who are overweight and obese (Ministry of Health and Clinical Trials Research Unit, 2009a). In the present study, there was a non-significant reduction in mean BMI from 41.13 kg/m² to 40.67 kg/m² at one-year follow-up. A decreasing trend in weight was seen between the two-time frames, with the results being non-significant. Similar results were found in a randomised clinical trial by Bacon et al (2005) who compared participants using the non-diet approach to participants following a diet program. Participants in the non-diet approach group maintained their weight throughout the study, whereas a non-significant weight loss of 3.2kg was observed in the diet program, with a gradual weight regain at the end of the study. Mensinger et al (2016) also found greater weight loss in a traditional diet program in comparison to a weight neutral program, however after 24 months, weight loss difference was non-significant. On the other hand, long-term studies based on the non-diet approach have reported significant reduction in weight, however, energy intake was controlled (between 1200-1800kcal/day) to induce weight loss during these study periods (Anglin, 2012a).

There was no statistically significant difference in waist circumference between baseline and one-year follow up. However, as a group, a decreasing trend in waist measures was observed. This can be seen as a positive result as waist circumference measurements are considered to be a good measure for determining an individual’s health risk. Excess abdominal fat has been associated with increased health risks with waist circumference above 102cm in men and 88cm

in women (Ministry of Health and Clinical Trials Research Unit, 2009a). A statistically significant ($p=0.04$) mean decrease in hip measurement from 131cm to 128cm was observed from baseline to the follow-up period. Studies using the non-diet approach have found similar results, with waist and hip circumferences falling steadily in studies having a short follow-up (6months to 1yr) time, however the changes obtained at short term, were not evident at long term follow-ups (>2yrs) (Anglin, 2012a, Mensinger et al., 2016). This could be due to the measures being taken at different time-points, resulting in intra-individual variations. For instance, a limitation for the current study could be inter-individual variations between waist and hip circumference measures due to different researchers obtaining the measures from the participants, despite using the same method.

Achievement of ideal body weight is not necessary in the management of obesity with some individuals, particularly those suffering from several comorbidities, thus weight gain prevention is rather the aim for treatment (Wilding, 2007). Clinical studies have found that implementing the intuitive eating approach results in weight maintenance as opposed to weight loss in overweight and obese individuals (Van Dyke and Drinkwater, 2014, Schaefer and Magnuson, 2014b). The results from this study were no different, with approximately 60% (n=13) of participants being able to maintain their weight and a further 27% (n=6) losing weight using this approach at one year follow up. This was promising to see as traditional diets often result in the majority of participants regaining lost weight, and in some instances gaining more weight, whereas the results from this study showed only a small proportion (13%, n=3) of participants gained weight (Wilding, 2007). These results suggest weight sustainability is possible using an intuitive eating approach, however a longer term (2-5yrs) follow-up period would be able to confirm these findings.

5.5 Eating behaviour

Few studies based on mindfulness and intuitive eating have used the recently revised Intuitive Eating Scale-2 self-administered questionnaire to measure eating behaviour. This questionnaire measures four eating behaviour dimensions; unconditional permission to eat, reliance on internal hunger/satiety cues, eating for physical reasons and body-food choice congruence (Tylka

and Kroon Van Diest, 2013). Several studies have found positive physiological (e.g. improved blood pressure and cholesterol levels) and psychological (e.g. eating disorder, body image and depression) benefits in individuals that practice eating intuitively even in the absence of weight loss (Denny et al., 2013, Van Dyke and Drinkwater, 2014). Randomised controlled trials and cross-sectional studies have also demonstrated that implementing an intuitive eating based program enables participant's that are overweight and obese to lose (Ciampolini et al., 2010) or maintain their weight (Bacon et al., 2005, Provencher et al., 2009, Van Dyke and Drinkwater, 2014). Similar results were found in the current study, which showed that overall participant's intuitive eating levels had significantly ($p=0.038$) improved between baseline and follow-up from 3.33 to 3.52. This is a highly promising result, as one of the main objectives of the program was to give participants the tools to apply the practice of eating intuitively in their everyday life.

All four intuitive eating dimensions showed no significant difference between the baseline and follow-up periods. The "eating for physical reasons" (EPR) dimension measures an individual's ability to eat in order to satisfy their hunger rather than coping with negative emotions. Negative emotions such as anxiety, depression, or boredom can result in changes in eating behaviours, particularly affecting individuals who are overweight and obese (Camilleri et al., 2016). Despite the intuitive eating sub scales showing no significant change over the 6-month period, the EPR scores were moving towards a positive direction from 3.56 to 3.57 within the intervention group from baseline to follow-up. Similarly, participants were relying more on their physiological cues with improvements seen in reliance on the internal hunger/satiety cues (RIH) subscales from 3.42 to 3.61. Body food choice congruence results also showed an improvement (from 3.67 at baseline to 3.82 at follow-up), suggesting participants were selecting foods that were more nutritious to allow their body to perform more efficiently. A key concept of intuitive eating, is allowing individuals unconditional permission to eat, as diets rely on rules or avoidance of specific food which can result in weight obsession and disordered eating patterns (Omichinski and Harrison, 1995, Tylka, 2006, Tylka and Kroon Van Diest, 2013). Studies based on the non-diet approach that do not have rules and dietary restrictions result in participants achieving weight loss or weight maintenance (Schaefer and Magnuson, 2014b). Similar results were observed in the current study despite no changes being observed in unconditional permission to eat (2.94 to

2.93) subscale within this questionnaire. These results are positive as overweight and obese individuals have been shown to consciously ignore their physiological hunger and satiety cues in stressful environments and resort to dieting rules to achieve weight loss (Lemmens et al., 2011).

5.5.1 Eating behaviour and weight classification

It has been well established that overconsumption of food is attributed to weight gain (Champagne et al., 2011a, Raynor and Champagne, 2016). There are different types of overeating derived from the psychosomatic theory (emotional eating), externality theory (external) and restraint theory (restraint eating). Each of these theories have their own aetiology and treatment, thus treatments can be individualised by assessing individual's eating behaviour based on these theories (van Strien et al., 2009, van Strien et al., 1986). Results from the current study showed no statistical difference in restrictive, emotional or eating in response to external cues from baseline to follow-up. This could have been due to the follow-up period being too short (6 months post intervention) and small sample size to see any behaviour changes.

Participants (n=13) that maintained their weight, ate the least in response to their emotions in comparison to the participants who lost weight and gained weight, with a mean DEBQ score of 1.70, 2.09, and 2.23 respectively. Similar results have been found in studies examining the association between emotional eating and weight loss. For instance, Braden et al (2016) found greater weight loss success 6 months post a weight loss intervention with 1.7 times higher weight loss success in participants with decreased emotional eating levels at 12 months. This comes as no surprise as emotional eating has been associated with increased snacking, higher intake of energy dense and high fat food, all of which lead to weight gain (Camilleri et al., 2014, Adriaanse et al., 2011). Higher levels of emotional eating has also been associated with less weight loss (Niemeier et al., 2007).

Restrictive eating is a common practice employed by many individuals to achieve weight loss (Quick and Byrd-Bredbenner, 2012). Despite the intuitive eating approach having no restrictions on the types of food that can be consumed, participants in the current study engaged in restrictive eating more often in the weight maintenance group and weight gain group with a mean DEBQ score of 2.6 and 2.7 respectively. The weight loss group had a mean DEBQ score 2.4,

thus engaging in restrictive eating the least. According to the restraint theory, restraint eating can result in loss of contact with hunger and satiety cues thus leading to overeating and eventually weight gain (van Strien et al., 2014a). Studies have reported similar results to the current study showing that weight maintenance/weight loss is achieved by participants who engage in less restrictive eating practices with higher restraint resulting in weight gain (Ball et al., 2002, Drapeau et al., 2003, Coakley et al., 1998, van Strien et al., 2014a). In contrast to these results, other research have found that high levels of restrictive eating resulted in weight loss, however these results could only be maintained short-term as participants are unable to adhere to the restrictions (Drapeau et al., 2003, Rogerson et al., 2016, Galgani and Ravussin, 2008). Thus, long term studies (>1 year) can confirm the findings from this study, as the results for the current study measured results for a period of 6 months.

High levels of food intake in response to external cues were reported by participants that had gained weight. The mean DEBQ score was 2.9 for participants that had gained weight with low response to external cues reported in participants who were in the weight maintenance and weight loss groups (DEBQ score 2.3). Similarly a lifestyle intervention for individuals who were obese found participants with a higher external eating score gained more weight one year post intervention (Halberstadt et al., 2016). However, this study was conducted in adolescent children. Limited studies have been conducted in overweight and obese adults, which have found no associations with weight gain or BMI (Sung et al., 2009, Dohle et al., 2014, van Strien et al., 2009).

5.5.2 Changes in food groups

Along with teaching participants strategies for eating intuitively, the program also incorporated nutrition education to encourage healthier food choices. Programs based on intuitive eating have found mixed results on participant's diet quality. For instance, in a cross-sectional survey, Madden et al (2012) found a positive association between eating intuitively and vegetable intake with no associations between fruit and refined carbohydrate intakes. Hawley et al (2008) compared three non-dieting interventions in overweight women and found improvements in diet quality at one-year follow-up, which was maintained over a period of two years. Within the

current study, positive changes were observed in some aspects of the diet, based on the information collated from participant's 24-hour diet recalls. The intervention did however not have an influence on their fruit and vegetable intakes, with consumption being below the New Zealand dietary guideline recommendations. This finding was not surprising, as based on the 2013/14 nutrition survey, less than half (41%) of New Zealand adults ate the recommended amount of fruits (2 servings/day) and vegetables (3 servings/day) (Ministry of Health, 2015a). There was a statistically significant increase in meat intake from 2 servings to 3 servings/day, which was above the recommended serving of one per day. Participants also reported eating twice the amount of fat from the end of the intervention to the follow-up time point. On a positive note, sugar intake was significantly reduced by half between these two-time frames. Improvements in diet quality in the results from Hawley et al (2008) could be explained by their eight months support phase which was conducted through group sessions and newsletters. These results highlight the need for the intervention to place emphasis on ways to increase foods that are nutrient dense and use effective techniques (e.g. goal setting, self-monitoring, action planning, support groups) and strategies to reduce fat intake within their diets.

5.5.3 Food group intake and weight change

Macronutrient intake and change in body weight were also explored to see if any differences existed between participants that were able to maintain, lose or gain weight. Few studies have evaluated the association between changes in intakes from different food groups compared with body weight. Some studies have found changes in specific food groups (e.g. fruits, vegetables, fat, and dairy) result in significant improvements in body weight (Champagne et al., 2011b, Drapeau et al., 2004, Jeffery et al., 1993), whereas some have found no impact (Parker et al., 1997). Ello-Martin et al (2007), conducted a 1-year clinical trial in obese women, which incorporated counselling sessions to reduce fat intake and increase fruit and vegetable intake. The intervention led to a significant decrease in energy intake and showed the method to be an effective strategy for managing body weight and controlling hunger. This could have been largely due to fruit and vegetables being good sources of fibre, which has shown to reduce the risk of weight gain (Tucker and Thomas, 2009). Similar results were found in the current research with participants that ate the least amount of sugar, fat and increased their fruit and vegetable intake

led to weight loss in comparison to participants that gained weight. The study also highlighted that participants that lost weight adhered to the New Zealand recommended eating guidelines for fruit (2 servings) and vegetables (3 servings) (Ministry of Health, 2015c).

5.5.4 Eating behaviour based on healthy heart nutritional guidelines and food composition.

There was no significant difference in eating habits reported by participants from the end of the intervention to 1-year follow-up. Cole et al (2010) found similar results in a 10 week “My body knows when” intuitive eating program, where no significant improvements in dietary intake were seen 6 months after the program. The participants found it challenging to improve their food choices, with the author recommending more emphasis to be placed on improving quality of food choice (e.g. portion control, reduction in saturated fats, increased fruit and vegetable intake along with low fat dairy intake) within the program. In contrast, a 15 month web based nutrition and physical activity program which used the Health at every size approach found significant improvements in fruit and vegetable intake. (Greene et al., 2011). However, this study only analysed fruit and vegetable intake using the National Cancer Institute Daily Fruit and Vegetable Screener to determine if the recommendations were being met. Studies based on the HAES/Intuitive eating programs have used different methods to analyse eating habits thus a direct comparison is difficult to ascertain. Surprisingly, in the current study, on average all participants perceived their eating habits to be meeting the healthy heart guidelines. Unfortunately, this was not reflected on their 24-hour diet recalls, which suggests that a more comprehensive form of dietary history needs to be implemented in future studies to obtain a more comprehensive overview of eating habits. Alternatively, participants may require further education.

Choice of food portion sizes have a significant influence on an individual’s overall energy intake (Rolls, 2014). Weight management programs employ various methods to create awareness of consuming appropriate portion sizes of foods and of meals (Camelon et al., 1998). Strategies and visual tools such as using individual’s hands or a plate are used to demonstrate appropriate portions of specific food or meal compositions. The plate model is a visual tool that enables

individuals to put together a balanced meal without the need for counting or measuring foods. Several randomised controlled trials have shown the utilisation of the portion-control plates is effective in reducing body weight, however limited data is available on whether this method leads to long term changes in eating habits (Pedersen et al., 2007, Huber et al., 2015, Kesman et al., 2011, Ford et al., 2009). The current study demonstrated no significant change in vegetable, protein or starchy carbohydrate intake from the end of the intervention to the one-year follow-up. Participants were consuming 10% less vegetables than the recommended amount (50% of plate), and greater amounts of protein-based foods (30% of plate) and starchy carbohydrates (30% of plate) than the recommended 25% each. Studies have used various methods to analyse changes in portion size, thus a direct comparison cannot be made. For instance Ford and colleagues (2009) saw reduction in portion size post intervention, however the participants weighed their food, which was then used to calculate any changes. This study demonstrated that despite the plate model being seen as a great visual tool, other strategies should be explored to control portion sizes.

5.6 Quality of life

Research based on the non-diet approach have found positive outcomes with significant improvements in quality of life being observed (Schaefer and Magnuson, 2014b). For instance a randomised control trial (Mensing et al., 2016) in women with obesity found an improvement in overall quality of life in the absence of weight loss in the non-diet approach program vs a traditional weight loss program. However, the current study found no significant differences in quality of life (QOL) between the end of the intervention and one-year follow-up. This finding was across all QOL domains, including overall life satisfaction ($p = 0.84$) and medication intake ($p = 0.55$). Data from Mensinger et al were collected at three time-points; baseline, 6 months and 24 months, whereas data for the current only analysed the results from the end of the intervention to the one-year follow-up, as opposed to the beginning of the intervention.

5.7 Program Progress

Over half of the participants reported their attitudes, eating behaviour and relationship with food improved significantly after the intervention. Whereas 48% of the participants believed the program did not have an impact on how often they ate due to comfort, whilst 48% reported improvement. Intuitive eating levels and change in dietary intake improved in 60% of the participants. Mixed results were shown for physical activity levels, as half of the participants believed the program led to improvements in their level of physical activity, where 30% reported it being worse. One aspect of the program was giving individuals strategies to improve their physical activity levels termed “incidental activities”. Incidental activities could be any form of activity such as parking the car a little further than usual, taking the stairs versus the lifts or walking instead of taking the car. This strategy improved activity levels in approximately half of the participants whereas 35% perceived their level of incidental activity to have stayed the same, and 22% reported it being worse.

5.8 Long term program evaluation

5.8.1 Characteristics of participants

Participants were recruited from the “Eating for your Health” study (Franica, 2017). Of the 13 participants that agreed to take part in the programme evaluation focus group, the majority (85%) were females with a mean age of 50 years. A large proportion (69%), of the participants were NZ European.

5.8.2 Program journey

This is one of the first studies evaluating a weight management program based on intuitive eating in overweight and obese individuals within a hospital setting. Participants from this research study described their weight management as an on-going challenge accompanied with successes and failures. Participant’s environment, social support and knowledge were key predictors of weight management throughout the program. The environment created difficulties for individuals in the group, which ranged from work related constraints to exposure to appetite-promoting stimuli. Having a stable environment seems to be an important factor for promoting

long-term weight maintenance (Elfhag and Rossner, 2005b). Participants voiced the availability of food at work along with the pressure to socialise with colleagues creating a challenging environment to carry out weight-loss or intuitive eating behaviours. Similar results have been found in other weight management programs, where food is consumed in the absence of hunger as a result of an individual's immediate food environment (Willig et al., 2014). It has been well documented that individuals who are overweight/obese show greater disinhibition, which is strongly associated with energy intake, binge eating and weight gain (Swinburn et al., 2007, Lattimore et al., 2011). This highlights the need to increase awareness of the effect of the environment on immediate food consumption, along with implementing strategies to control one's food environment, which could lead to better food choices.

Participants reported that improving their nutrition knowledge and learning new strategies to improve their health led them to make more informed choices and enhanced autonomy. Lack of knowledge has been identified as barriers in achieving weight loss within weight management programs (Zinn and Schofield, 2010). Based on the Theory of planned behaviour, perceived behaviour control along with individuals intentions to engage in that behaviour is largely due to the individuals confidence and ability to achieve/perform the desired behaviour, and is influenced by resources and opportunities (Palmeira et al., 2007). Therefore, increased knowledge may improve an individual's perceived behaviour control by creating the perception that they have more knowledge to successfully complete the behaviour. This was shown in this research as participants believed their understanding of intuitive eating and mindful eating approaches lead to improved eating behaviour.

Social support is seen as a fundamental element in weight loss management, regardless of the form of support (e.g. family, friends, spouse or support groups) (Elfhag and Rossner, 2005b, Metzgar et al., 2015, Hammarstrom et al., 2014). Previous studies have highlighted the importance of social support in making dietary and behaviour changes and increasing motivation to achieving set weight loss goals (Rogerson et al., 2016, Hindle and Carpenter, 2011). Participants from the current research were no different; the need for on-going support was highly warranted. In search for external support, a few participants resorted to other weight

management programs (e.g. Weight Watchers) to enhance/maintain their motivation for weight regulation. Other studies have also highlighted that lack of external accountability and structured support within programs led to decreased motivation in maintaining changes (Reyes et al., 2012, Hardcastle and Hagger, 2011). Group support has been shown to be an important element in weight management programs to assist in problem solving and sharing experiences (Rogerson et al., 2016, Metzgar et al., 2015). Similar facets were shared in the current research, with participant reporting nutrition sessions conducted within a group setting as a motivator for them to apply the strategies being taught and those being shared by their peers towards positive behaviour change. Attending the group session with a support person was seen an advantage, as it increased their motivation to carry forth with their weight loss journey, which is in agreement with evidence elsewhere (Stubbs and Lavin, 2013, Elfhag and Rossner, 2005b).

Improving an individual's nutrition knowledge is an important factor for stimulating dietary behaviour that encourages weight loss. Short term studies have shown nutrition education to increase knowledge and subsequently lead to improved food choice (Rustad and Smith, 2013, Dollahite et al., 2014). In the current research a combination of practical and theory-based education sessions were held, which was well received by all participants. However, the level of content covered during the sessions and time allocated for each topic was thought to be insufficient. A "state of the art" behavioural based intervention usually consist of 16-24 treatment based sessions within a period of 6 months (Butryn et al., 2011)., however the "Eating for your Health" program only consisted of 4 nutrition session along with 3 individual consultation sessions with a registered dietitian (Franica, 2017) Although the relationship between knowledge and behavioural change is controversial, studies have reported weight loss with increased nutrition knowledge (Klohe-Lehman et al., 2006). Therefore, it may be beneficial to increase the number of nutrition sessions to ensure all the topics are being taught in depth and are relatable to the participant's medical conditions.

5.8.3 Programme structure

The nutrition sessions were conducted as a group with a dietitian. This method of learning was well received by participants as they believed it encouraged peer learning, increased their motivation whilst providing social support, all of which facilitated weight management. Similar findings have been reported by other studies for group-based interventions, showing greater program outcomes (Renjilian et al., 2001, Metzgar et al., 2015). In addition to the group sessions, individual sessions were also conducted to allow for individualised care. Participants felt the individual sessions were highly valuable as it gave them an opportunity to discuss sensitive/personal issues that they were not able to share in a group setting. It also allowed them to seek help and follow their weight management progress. Participants also shared similar experiences in a primary care-based weight management study by Holdsworth et al (2017) reporting that their advisor provided them with empathy and unconditional support. Presently, no clear relationship has been established between increased effectiveness of interventions and delivery mode (e.g. group, individual or mixed) (Greaves et al., 2011, Leblanc et al., 2011, Liskov et al., 2012). Therefore, this research study suggests that weight management programs can be delivered successfully using a combination of group and individual sessions, as each method has its own advantages.

Short-term weight loss can be achieved by a number of individuals, however sustaining the changes long term proves to be challenging. Studies have shown that frequent contact during initial intervention periods, followed by regular follow-up is necessary to sustain weight loss (Wadden et al., 2006, Ross et al., 2012). Contact in the form of group sessions have shown to provide individuals the required support and motivation to continue with their weight loss journey (Butryn et al., 2011, Wing and Hill, 2001). For example, Perri and colleagues (1988) found group sessions twice a month led to greater weight maintenance in comparison to individuals that did not attend the sessions. Participants within this research study believed they would benefit from additional support in the form of a refresher course or additional nutrition sessions to sustain their motivation for weight loss. Therefore, increasing contact with the dietitian and having regular group sessions may be beneficial for the program.

5.8.4 Intuitive eating

Understanding and applying the concept of intuitive eating was essential to succeed within this program. Studies have found that by applying the intuitive eating concepts, it can lead to a reduction in problematic eating behaviours and increased body appreciation (Bush et al., 2014). Participants from the current study were no different, as they reported their eating habits had improved, whilst applying the strategies learnt within the program. Strategies such as eating without distractions, avoiding stressful environments, and only having foods they believed are healthy, were some of the strategies that were applied regularly. This is not surprising as eating whilst being distracted and stressed has shown to lead to increased meal consumption and poor food choices (Jordan et al., 2014, Beshara et al., 2013). On the other hand, participant's cultural beliefs, home (e.g. family members, partners) and work environments, created challenges for them in applying the concept of intuitive eating. Cultural norms and values influence our eating habits from childhood, hence changing this behaviour will not only be difficult, but will take time and patience (Ministry of Health and Clinical Trials Research Unit, 2009a). Social support has however been identified as a facilitator for providing the motivation required in continuing weight loss behaviours (Rogerson et al., 2016). Unfortunately, family members and spouses can create barriers with little consideration of the participant's challenges. Andrews (1997) reported that the lack of support could be due to jealousy, changes in relationships or their shared lifestyle being disrupted due to the person wanting to lose weight leading a healthier lifestyle. In contrast, studies have shown improvements in weight loss outcomes when the support person acknowledges the participant's feelings, perspectives and minimises the pressures (Williams et al., 1996, Hindle and Carpenter, 2011). Thus, it may be beneficial to encourage spouses, partners or support persons to attend the program. The program may also benefit from incorporating cultural beliefs and norms of the participants within the program and providing strategies to overcome associated barriers.

5.8.5 Nutrition knowledge

Multiple factors influence food choice and thus the diet quality of individuals; for example, budget, cooking skills, and health motivators. Low socio-economic status has been associated with increased consumption of energy dense food (Otago. and Health., 2011). Participants within this study reported that despite having the nutrition knowledge, they consumed foods that were high in fat and sugar and opted to purchasing staple foods (e.g. rice, bread, potatoes) instead of vegetables solely due to cost. This suggests that having nutrition knowledge about healthy foods alone is not enough to induce behaviour change. Breads instead of vegetables/fruits were purchased more frequently by all participants, which is not surprising as it has been reported to be the common source of energy (staple food) within New Zealand (Otago. and Health., 2011). Other studies have found similar results, reporting price of healthy foods to be expensive, and a barrier to healthy eating (de Mestral et al., 2016, Ross and Melzer, 2016). Incorporation of food budgeting in the nutrition education section may benefit participants from this program as they found strategies such as only purchasing foods listed in the shopping list beneficial.

Previous research found that insufficient ability to cook or lack of cooking skills are contributing factors to having poor diet quality, which further encourage the reliance on pre-packaged food, processed food and ready to eat meals (Hartmann et al., 2013, Flego et al., 2014, Reicks et al., 2014). Similar results were found in the current study as participants perceived their lack of cooking ability limited them from eating healthy foods and led to regular purchasing of pre-prepared foods. Studies have shown meals prepared and consumed at home are associated with better diet quality and health outcomes (Fulkerson et al., 2011, Monsivais et al., 2014). Larson et al (2006) found that an increase in the variety of vegetables purchased occurred when an individual had confidence in preparing meals. Winkler et al (2010) reported that those who practiced regular food preparation at home, consumed less fast food and were more likely to meet dietary guidelines. Incorporating a module around preparing quick and healthful meals in the program may be a useful strategy for promoting food variety in the diet. This may be predominantly required for socioeconomically disadvantaged individuals but could be structured in such a way that it would benefit all participants.

All the participants within the program suffered from medical conditions which affected their food intake. Some participants did not find all the strategies being taught during the program useful. For instance, a participant felt the plate model was not applicable to them as they were in remission from bowel cancer, whereas a participant with diabetes weighed their food. This highlights the need to incorporate personalised nutrition education based on medical conditions within the program which can be applied to an individual's food intake.

5.8.6 Physical activity

Exercise was discussed as being unequivocally beneficial in weight management by all participants; however, a large majority of them did not exercise frequently. Some participants felt having a friend to exercise with them provided them encouragement, motivation and enhanced their weight loss. Similar results have been found in other studies where social support aided in physical activity adherence, leading to greater weight loss (Elfhag and Rossner, 2005a, Marquez et al., 2016, Johns et al., 2014b). Lack of time, motivation or medical conditions were reported as barriers in engaging in physical activity. Studies have found that despite having the knowledge of the benefits surrounding physical activity, participants reported time, monetary restraints and lack of motivation as common barriers (Ross et al., 2012, Kruger et al., 2006). Self-efficacy has been found to be higher amongst individuals who engage in the recommended levels of physical activity (Hankonen, 2011). Therefore, it may be beneficial to strengthen an individual's self-efficacy (confidence in the ability to achieve the recommended level of physical activity) in addition to knowledge, to increase physical activity levels. It is also important to assess each participant's stage of change to tailor the advice to suit their stage of readiness towards physical activity, as participants at different stages of change may differ in psychological factors, skills, experience, abilities and have different barriers (Ronda et al., 2001). A study based on matching interventions based on their stage of readiness was effective in increasing physical activity levels amongst sedentary patients (Calfas et al., 1996).

CHAPTER SIX

6.0 Conclusion

6.1 Research problem and aims of the research study

Overweight and obesity rates within New Zealand are on the rise. The increased prevalence of obesity is seen as an independent risk factor for type 2 diabetes, dyslipidaemia, hypertension, cardiovascular disease and cancer (Lenoir et al., 2015). As a result, obesity places a burden on health care cost and leads to increased mortality rates. To tackle the risk associated with obesity, weight loss is recommended as a public health recommendation (Ministry of Health and Clinical Trials Research Unit, 2009a, Ministry of Health, 2015c). Weight loss interventions such as restricting calories, popular diets modifying the macronutrient composition of the diet, commercial/fad diets (e.g. Weight watchers, Sure Slim), increased physical activity and lifestyle interventions have shown to result in short term weight loss, with poor weight maintenance outcomes (Shick et al., 1998).

Studies on weight loss maintenance in primary care are scarce (Goodyear-Smith et al., 2014). Currently, as part of their service to outpatients, Waitemata DHB in New Zealand are conducting a weight management program focusing on nutrition education and teaching patients' strategies to eat intuitively whilst taking the focus off weight loss. The program is a 6-month intervention consisting of four group sessions with a nutrition focus, followed by three individualised counselling sessions by a dietitian. Due to the limited data on long-term intuitive eating-based weight management programs within New Zealand, it would be beneficial to measure the effectiveness of this program within the primary care setting. Therefore, the aim of this research study was to assess the long-term effectiveness at one-year follow-up of an intuitive eating centred weight management program focused on eating behaviour and quality of life in overweight and obese individuals within the primary healthcare setting. The research study also assessed the participant's perceptions of the overall program at the one-year follow-up.

6.2 The main findings of the research study

The results from this research study indicate that it is possible to change an individual's eating behaviour to attain a positive outcome in the absence of weight loss. Qualitative analysis highlighted the importance of continuous support to provide a sense of belonging, motivation and confidence to continue with any changed behaviours. The overall findings of this study will be discussed according to the objectives set out in chapter one.

6.2.1 Objective one

The primary objective of this research study was to assess any changes in participant's anthropometric measures, eating behaviour and quality of life and program progress 6 months after completing the program. Weight, waist and hip circumference were measured using ISAK guidelines during data collection and analysed against data collected at the end of the intervention. The results were analysed as a group (n=23), which showed that the intervention did not lead to statistically significant weight loss and decrease in waist circumference. However, there was a statistically significant ($p=0.04$) decrease in hip circumference. Research has shown a weight loss of 3% - 5% can result in clinically meaningful health benefits (e.g. decrease in triglycerides, blood glucose, Hba1C, risk of type 2 diabetes), therefore in this study a cut-off of 3% in body weight change was used to classify individuals into three groups; Weight loss ($\geq 3\%$), weight maintenance ($<3\%$), weight gain ($>3\%$), to conduct further analysis (Jensen et al., 2014a). The results showed that the majority of the participants were able to either maintain (59%) or lose (27%) weight, with only a minority (14%) gaining weight.

One of the main objectives of the "Eating for your Health" program was teaching participants to eat in response to their hunger and satiety cues. This was explored by using the Intuitive Eating Scale-2 developed by Tylka (2006). The results were promising as the one-year follow-up data showed a significant ($p = 0.038$) improvement in participant's intuitive eating levels after the last dietetic input. Thus, suggesting that sustainability of this eating behaviour is possible.

Overeating eventually leads to weight gain and has been shown to be associated to practicing restrictive eating behaviour, responding to external cues to eat or eating in response to one's emotions (van Strien et al., 2009). At the one-year follow-up stage, there was no difference seen

in participants eating due to their emotions, external cues or practicing restrictive eating. Further analysis showed that participants that were able to maintain or lose weight, ate less in response to their emotions or external cues. However, two participants that achieved weight loss did report frequently restricting themselves from specific foods. The program did lead to changes in participant's eating behaviour, with a significant decrease ($p = 0.017$) in sugar intake from 4.2 to 2.2 servings, however fat intake significantly increased ($p = 0.001$) from 2.5 to 4.3 servings. However, based on the Healthy Heart questionnaire, participants believed their eating behaviour had improved and they were meeting the New Zealand Eating and physical activity guidelines. Physical activity was seen as a factor that required more attention, as despite all participants reporting the importance of being physically active, the majority of them did not engage in regular physical activity.

Quality of life was also assessed using the Q-LES-short form. The program did not have an impact on participant's quality of life or overall life satisfaction. This is an area that could be explored further, as other non-diet approach programs have found positive outcomes.

6.2.2 Objective two

The second objective of this study was to explore the participant's perception of the overall program. A focus group was used to gain the participant's perception of the "Eating for your Health" program and to gain insights into any recommendations that might improve the program. Overall the program was well-received, with the combination of group and individual sessions well liked, as they provided individuals with a sense of belonging, allowed for peer learning, motivation and strategies for problem solving. However, participants voiced the need for more sessions which would allow for content to be taught more in-depth and incorporation of eating strategies based on medical conditions. Emphasis on ongoing support in the form of a refresher course was also highlighted, in order for participants to follow their own and their peer's progress.

6.3 Strengths

This research is the first study to explore qualitative and quantitative measures of a weight management program based on intuitive eating in hospital referred patients within New Zealand at one-year follow-up. It provided evidence that intuitive eating can lead to the path for weight maintenance and weight loss. The qualitative nature of the research allowed for gathering data of sensitive nature and provided great insights into participant's perception of the overall program along with barriers and facilitators of their weight loss journey.

Weight management program data within New Zealand are very limited, thus the findings from this research add to the literature regarding weight management programs within health care in New Zealand.

6.4 Limitations

The sample size was small which limited statistical analysis that could have been carried out (e.g. correlation tests) to show directionality and associations. A 24-hour diet recall was carried out for dietary analysis, which relies on the participant's memory, thus data could have been missed. Furthermore, it only provided a snapshot of the participant's food intake and may have been adjusted by participants to please the researcher. Data collection was carried out by two different researchers which could have led to intra-individual variations. However, same equipment (e.g. calibrated scales) and measuring protocols were used to take measurements in order to reduce variations. There was only a small proportion of participants that took part in the focus groups therefore the focus group may not be representative of the views of all the participants. However, data saturation was demonstrated in the outcomes presented.

6.5 Use of the findings of this research study

With the increasing rate of obesity observed within New Zealand, the need for implementing weight management programs that are sustainable is essential. This evaluation of the weight management program based on intuitive eating has shown to result in weight maintenance and/weight loss. In addition, the program shows promising results in improving eating

behaviour. Thus, it will be beneficial to continue this program within the Waitemata DHB, with the potential to expand to other DHB's as well. The program could also be improved with small changes based on the qualitative results, thereby improving the benefits to this patient cohort.

6.6 Recommendations

- Although this research showed promising results, future studies with larger sample sizes are required to confirm outcomes.
- Taking into account ethnicity whilst recruiting to allow for data to be applicable at a population level.
- Using a more robust method of dietary assessment and analysing the nutrient content of the diet would be beneficial in future research projects.
- It would also be beneficial to carry out physiological analysis (e.g. lipid levels, blood pressure, glucose test) to see if the program had any effect on these biological measures.
- The key recommendations based on the research findings for improving the program are highlighted in Table 6.1

Table 6. 1: *Participants recommendations for future programs*

<p>Social support</p> <ul style="list-style-type: none"> ○ Blogs/forums/Facebook page to share experiences, progress and ideas ○ Group events, exercise groups with members living near close proximity ○ Encourage the accompany of a support person to the program. 	<p>Provision of resources</p> <ul style="list-style-type: none"> ○ Recipe books containing basic healthy recipes using minimal ingredients based on seasons. ○ Course book that provides all information provided during the sessions ○ Health condition specific nutritional information provided during nutrition session based on individual groups.
<p>Additional content</p> <ul style="list-style-type: none"> ○ Cooking on a budget ○ Cooking classes ○ Addition of more in-depth content in topics being taught education classes ○ How to prepare quick and easy meals ○ Physical activity tailored for specific medical conditions ○ Strategies e.g. how to deal with family members, increase exercise, cooking in different seasons. 	<p>Program duration</p> <ul style="list-style-type: none"> ○ Additional group sessions (from 4 to 6 sessions) ○ Additional individual sessions (from 4 to 6 sessions) ○ Allocate more time for nutrition-based learnings
<p>Refresher course</p> <ul style="list-style-type: none"> ○ Group education session covering key aspects of the program 6 months/1 year after the intervention. 	

CHAPTER SEVEN

7.0 References

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CHAPTER EIGHT

8.0 Appendices

Appendix A: *Intuitive Eating Scale - 2*

Intuitive Eating Scale – 2

Directions for participants-For each item, please circle the answer that best characterizes your attitudes or behaviours.

		Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1	I try to avoid certain foods high in fat, carbohydrates or calories.	1	2	3	4	5
2	I find myself eating when I'm feeling emotional (e.g. anxious, depressed, sad), even when I'm not physically hungry.	1	2	3	4	5
3	If I am craving a certain food, I allow myself to have it.	1	2	3	4	5
4	I get mad at myself for eating something unhealthy.	1	2	3	4	5
5	I find myself eating when I am lonely, even when I'm not physically hungry	1	2	3	4	5
6	I trust my body to tell me when to eat.	1	2	3	4	5
7	I trust my body to tell me what to eat.	1	2	3	4	5
8	I trust my body to tell me how much to eat.	1	2	3	4	5
9	I have forbidden foods that I don't allow myself to eat.	1	2	3	4	5
10	I use food to help me soothe my negative emotions.	1	2	3	4	5
11	I find myself eating when I am stressed out, even when I'm not physically hungry.	1	2	3	4	5
12	I am able to cope with my negative emotions (e.g., anxiety, sadness) without turning to food for comfort.	1	2	3	4	5
13	When I am bored, I do NOT eat just for something to do.	1	2	3	4	5
14	When I am lonely, I do NOT turn to food for comfort.	1	2	3	4	5
15	I find other ways to cope with stress and anxiety than by eating.	1	2	3	4	5
16	I allow myself to eat what food I desire at the moment.	1	2	3	4	5

17	I do NOT follow eating rules or dieting plans that dictate what, when, and/or how much to eat.	1	2	3	4	5
18	Most of the time, I desire to eat nutritious foods.	1	2	3	4	5
19	I mostly eat foods that make my body perform efficiently (well).	1	2	3	4	5
20	I mostly eat foods that give my body energy and stamina.	1	2	3	4	5
21	I rely on my hunger signals to tell me when to eat.	1	2	3	4	5
22	I rely on my fullness (satiety) signals to tell me when to stop eating.	1	2	3	4	5
23	I trust my body to tell me when to stop eating.	1	2	3	4	5

Scoring:

Positive scores (items 3, 6, 7, 7, 8, 12, 13, 15, 16, 17, 18, 19, 20, 21, 22, 23)

Strongly disagree = 1, Disagree = 2, Neutral = 3, Agree = 4, Strongly agree = 5

Reverse Scores (items 1, 2, 4, 5, 9, 10, 11)

Strongly disagree = 5, Disagree = 4, Neutral = 3, Agree = 2, Strongly agree = 1

Subscale	Unconditional Permission to eat	Eating for Physical Rather than Emotional Reasons	Reliance on Hunger/Satiety Cues	Body-Food Choice Congruence	Total Score
Items	1, 3, 4, 9, 16, 17	2, 5, 10, 11, 12, 13, 14, 15	6, 7, 8, 21, 22, 23	18, 19, 20	1 – 23
Total score for these items (keeping reverse scoring code as above)					
Divide by	6	8	6	3	23
Final Scores					

Appendix B: Dutch Eating Behaviour Questionnaire

Dutch Eating Behaviour Questionnaire (DEBQ)

This questionnaire measures your levels of restrained, emotional and external eating. Please answer honestly rather than what you think we might want you to answer. Your answers will help us to both tailor your program for your individual needs, and to assess the impact of the problem at the end of your sessions.

1	If you have put on weight, do you eat less than you usually do?	Not relevant	Never	Seldom	Sometimes	Often	Very often
2	Do you try to eat less at mealtimes than you would like to eat?	Not relevant	Never	Seldom	Sometimes	Often	Very often
3	How often do you refuse food or drink offered because you are concerned about your weight?	Not relevant	Never	Seldom	Sometimes	Often	Very often
4	Do you watch exactly what you eat?	Not relevant	Never	Seldom	Sometimes	Often	Very often
5	Do you deliberately eat foods that are slimming?	Not relevant	Never	Seldom	Sometimes	Often	Very often
6	When you have eaten too much, do you eat less than usual the following days?	Not relevant	Never	Seldom	Sometimes	Often	Very often
7	Do you deliberately eat less in order not to become heavier?	Not relevant	Never	Seldom	Sometimes	Often	Very often
8	How often do you try not to eat between meals because you are watching your weight?	Not relevant	Never	Seldom	Sometimes	Often	Very often
9	How often in the evening do you try not to eat because you are watching your weight?	Not relevant	Never	Seldom	Sometimes	Often	Very often
10	Do you take into account your weight with what you eat?	Not relevant	Never	Seldom	Sometimes	Often	Very often
11	Do you have the desire to eat when you are irritated?	Not relevant	Never	Seldom	Sometimes	Often	Very often
12	Do you have a desire to eat when you have nothing to do?	Not relevant	Never	Seldom	Sometimes	Often	Very often
13	Do you have a desire to eat when you are depressed or discouraged?	Not relevant	Never	Seldom	Sometimes	Often	Very often

14	Do you have a desire to eat when you are feeling lonely?	Not relevant	Never	Seldom	Sometimes	Often	Very often
15	Do you have a desire to eat when somebody lets you down?	Not relevant	Never	Seldom	Sometimes	Often	Very often
16	Do you have a desire to eat when you are cross?	Not relevant	Never	Seldom	Sometimes	Often	Very often
17	Do you have a desire to eat when you are approaching something unpleasant to happen?	Not relevant	Never	Seldom	Sometimes	Often	Very often
18	Do you get the desire to eat when you are anxious, worried or tense?	Not relevant	Never	Seldom	Sometimes	Often	Very often
19	Do you have a desire to eat when things are going against you or when things have gone wrong?	Not relevant	Never	Seldom	Sometimes	Often	Very often
20	Do you have a desire to eat when you are frightened?	Not relevant	Never	Seldom	Sometimes	Often	Very often
21	Do you have a desire to eat when you are disappointed?	Not relevant	Never	Seldom	Sometimes	Often	Very often
22	Do you have a desire to eat when you are emotionally upset?	Not relevant	Never	Seldom	Sometimes	Often	Very often
23	Do you have a desire to eat when you are bored or restless?	Not relevant	Never	Seldom	Sometimes	Often	Very often
24	If food tastes good to you, do you eat more than usual?	Not relevant	Never	Seldom	Sometimes	Often	Very often
25	If food smells and looks good, do you eat more than usual?	Not relevant	Never	Seldom	Sometimes	Often	Very often
26	If you see or smell something delicious, do you have a desire to eat it?	Not relevant	Never	Seldom	Sometimes	Often	Very often
27	If you have something delicious to eat, do you eat it straight away?	Not relevant	Never	Seldom	Sometimes	Often	Very often
28	If you walk past the baker do you have the desire to buy something delicious?	Not relevant	Never	Seldom	Sometimes	Often	Very often
29	If you walk past a snack bar or a café, do you have the desire to buy something delicious?	Not relevant	Never	Seldom	Sometimes	Often	Very often
30	If you see others eating, do you have the desire to eat?	Not relevant	Never	Seldom	Sometimes	Often	Very often

31	Can you resist eating delicious foods?	Not relevant	Never	Seldom	Sometimes	Often	Very often
32	Do you eat more than usual, when you see others eating?	Not relevant	Never	Seldom	Sometimes	Often	Very often
33	When preparing a meal are you inclined to eat something?	Not relevant	Never	Seldom	Sometimes	Often	Very often

Citation: Van Strien T, Frijters JER et al. (1986). The Dutch Eating Behaviour Questionnaire (DEBQ) for assessment of restrained, emotional, and external eating behaviour. *International Journal of Eating Disorders*. 5(2): 295-315.

Subscale	Restrained (items 1-10)	Emotional (items 11 – 23)	External (items 24 – 33)
Total of scores			
Divide by	10	13	10
Final subscale score			

Appendix C: Ministry of health eating recommendations



Vegetables and fruit (includes fresh, frozen and canned)

Advice

Eat at least 5 servings a day: at least 3 servings of vegetables and at least 2 servings of fruit

Serving size examples

Vegetables

½ cup cooked vegetable eg, pūhā, watercress, silverbeet, kamokamo (squash), carrot, broccoli, bok choy, cabbage or taro leaves

½ cup salad or mixed vegetables

1 medium potato (135 g) or similar sized piece of kūmara, taewa (Māori potato), yam (Pacific or NZ), taro, cassava, or green banana (technically a fruit)

Fruit

1 medium apple, pear, banana or orange

2 small apricots or plums

½ cup fresh fruit salad

½ cup stewed or canned (in juice)

Nutrients provided

Carbohydrates

Dietary fibre

Vitamins: especially folate, pro-vitamin A (carotenoids) (yellow and green vegetables) and vitamin C (dark-green vegetables and most fruit, potatoes)

Minerals: potassium, magnesium



Grain foods, mostly whole grain and those naturally high in fibre (includes some breakfast cereals, breads, rice and pasta)

Advice

Eat at least 6 servings a day

Serving size examples

1 whole-grain bread roll

1 sandwich slice whole-grain bread

½ cup muesli

½ cup cooked porridge

1 cup cooked pasta

1 cup cooked rice

Nutrients provided

Carbohydrates

Dietary fibre

Protein

Vitamins: all B group (except B12), E (rich in wheatgerm)

Minerals (particularly in whole grain foods): magnesium, calcium, iron, zinc and selenium



Milk products (includes milk, yoghurt, cheese) and alternatives

Advice

Eat at least 2 servings a day (choose low- or reduced-fat options)

Serving size examples

- 1 glass milk (250 ml)
- 1 small pottle yoghurt
- 2 slices cheese (40 g)
- 1 glass calcium-fortified soy milk (250 ml)

Nutrients provided

Protein

Fats: higher proportion of saturated than poly- or mono-unsaturated fats, especially in full-fat products

Vitamins: riboflavin, B12, A, D (levels of A and D are naturally lower in low-fat milk products, but addition of A and D up to levels in standard milk products is permitted)

Minerals: especially calcium, phosphorus, zinc and iodine



Legumes, nuts, seeds, fish and other seafood, eggs, poultry or red meat with fat removed

Advice

Eat at least 2 servings of legumes, nuts, and seeds a day

OR

Eat at least 1 serving of fish and other seafood, eggs, poultry or red meat a day

Serving size examples

- ¾ cup cooked dried beans, split peas or lentils
- 30 g nuts or seeds (small handful)
- OR
- 1 medium fillet of cooked fish (100 g)
- 1 egg (50 g)
- 2 drumsticks or 1 chicken leg (110 g)
- 2 slices cooked meat (approximately 100 g)
- ¾ cup mince or casserole (195 g)

Nutrients provided

Protein

Fats: both visible and marbled in meat (mostly saturated fat, cholesterol); mostly unsaturated fats in seafood, nuts and seeds

Vitamins: B12, niacin, thiamin

Minerals: iron, zinc, magnesium, copper, potassium, phosphorus and selenium

Iodine: particularly in seafood and eggs

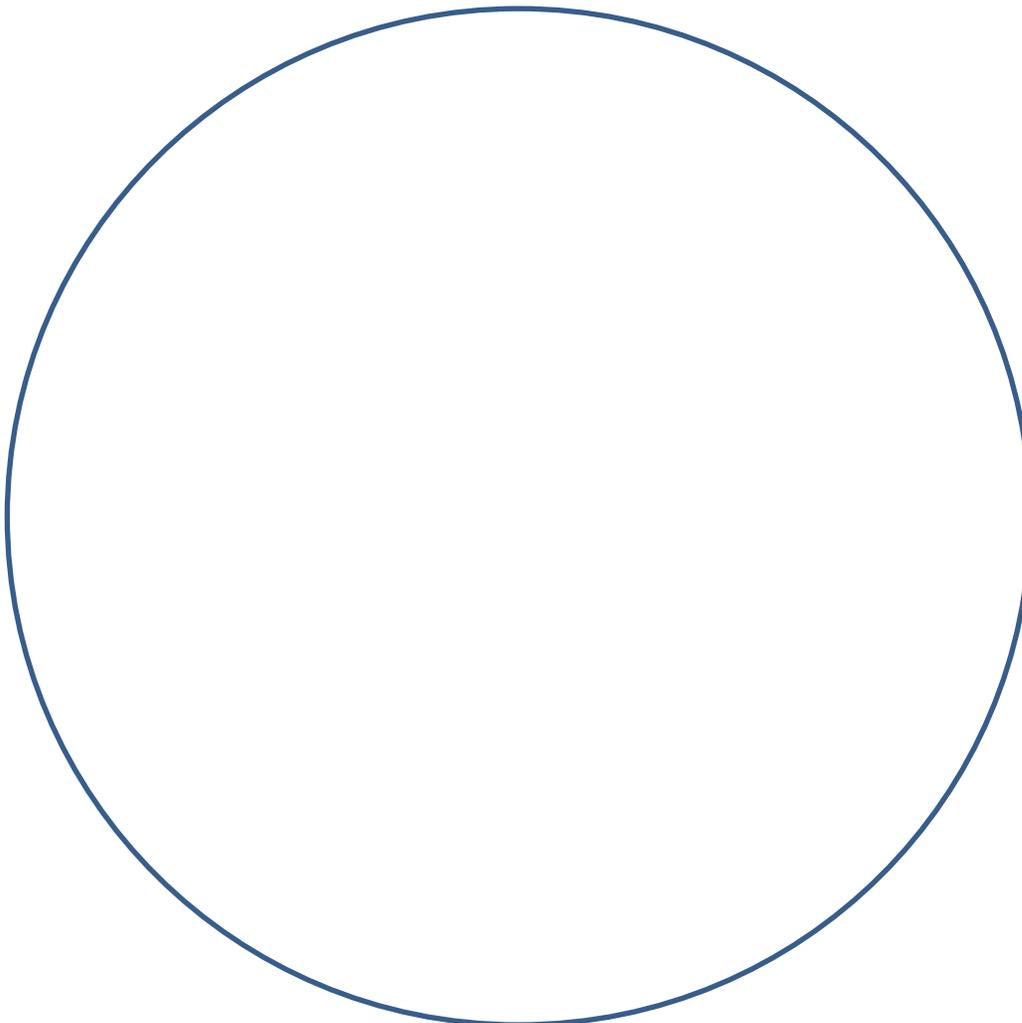
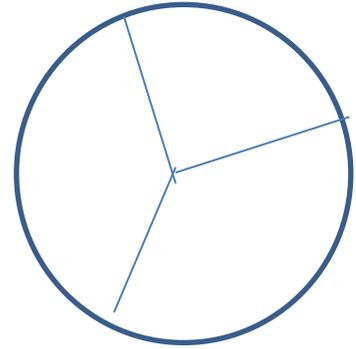
The serving size advice is under review, but it is current until new advice is published.

Ministry of Health (2015b)

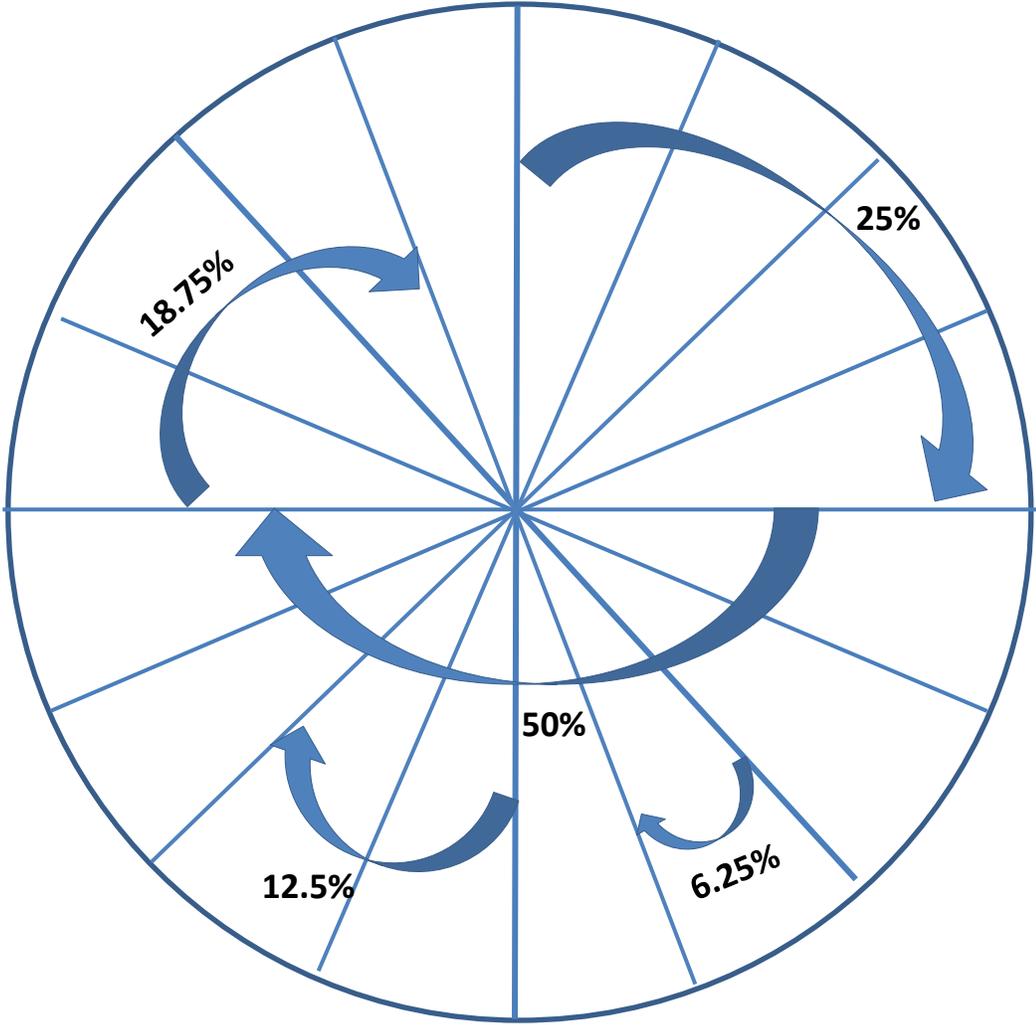
What does your plate look like?

On the circle below, use lines to separate sections. Show how much of these foods are on your main meal plate.

- Meat, chicken, fish or beans/lentils
(Protein foods)
- Potato, rice, pasta, noodles, taro, bread
(Starchy carbohydrates)
- Vegetables
(Peas, carrot, pumpkin, green beans, salad)



Appendix G: Plate Model Result Calculation Template



**Quality of Life Enjoyment and Satisfaction Questionnaire – Short Form
(Q-LES-Q-SF)**

Taking everything into consideration, during the past week how satisfied have you been with your.....

	<i>Very Poor</i>	<i>Poor</i>	<i>Fair</i>	<i>Good</i>	<i>Very Good</i>
<i>....physical health?</i>					
<i>....mood?</i>					
<i>....work?</i>					
<i>....household activities?</i>					
<i>....social relationships?</i>					
<i>....family relationships?</i>					
<i>....leisure time activities?</i>					
<i>....ability to function in daily life?</i>					
<i>....sexual drive, interest and/or performance?</i>					
<i>....economic status?</i>					
<i>....living/housing situation?</i>					
<i>....ability to get around physically without feeling dizzy or unsteady or falling?*</i>					
<i>....your vision in terms of ability to do work or hobbies?*</i>					
<i>....overall sense of well being?</i>					
<i>....medication? (If not taking any, check here _____ and leave item blank)</i>					
<i>....how would you rate your overall life satisfaction and contentment during the past week?</i>					

* If satisfaction is very poor, poor or fair on these items, please UNDERLINE the factor(s) associated with a lack of satisfaction

Appendix I: Participants final questionnaire

Participant Final Questionnaire

1. Did you complete the group sessions? Yes No
Which sessions did you attend 1 2 3 4(all)
2. Did you attend your individual sessions? Yes No
If yes, number of sessions 1 2 3 (all)

If you did not attend all four group sessions please answer Q.3

3. Was there anything in particular that stopped you from attending/completing the group sessions?

If you did not attend all three individual sessions please answer Q.4

4. Did you have specific reasons for not attending the individual sessions with your dietitian?

5. Overall did you find the programme useful? (not useful) 1 2 3 4 5 (very useful)
If yes, how? _____

6. Was there anything that you didn't like about the course or something you feel could be improved?

7. Any further comments

Please rate, on a scale of 1 to 10 where your confidence level for continuing to make changes is.



Appendix J: Focus group questions

Focus group: At one-year follow-up

Allocated Time: 45-60 minutes

Group Size: 4-5 participants

Aim: To evaluate participant's perception of the non-diet approach program.

Session structure

How has everyone's journey been through the program?

How did you like the overall layout of the group sessions?

Did you like having the sessions as a group? Prompt: why or why not

What did you like about it? Prompt: Group activities??

Was an individual session with the dietitian useful after the group sessions? Prompt: why or why not

What would you prefer to have more of: group session or individual sessions? Prompt: why or why not

Non-Diet Approach

Has anyone tried anything else besides this program? Prompts: jenny crag, sure slim, any special diets.

What was the major difference between the programs you have tried and this program?

Which one did you think was more beneficial for you? Prompt: why or why not

Do you think this program lead to any behavioural change? Prompt: why or why not; how?

If so, have you still managed to maintain those changes? How? Why not?

One of key message from this program was mindful eating. Can anyone remember what we meant by mindful eating? Prompt: how does it work for you?

What were some of the things you could do to eat mindfully?

In this busy lifestyle, we tend to eat when it suits us and not to our hunger/fullness cues. Did anyone find it challenging to know when they were feeling hungry or full? Prompt: why do you think this is the case? What can we do to change that?

Have you been able to eat to your hunger cues? If not. What is stopping you?

Nutrition Knowledge

Can anyone remember what the main food groups were? Prompt: please explain more

From the food groups which one's would you consider as your sometimes food? And your everyday foods? Prompt: why are we naming these foods in this way? Have anyone struggled to use them in this way?

Can anyone recall what the plate model was? Is anyone using the plate model?

Did the group activities used within the nutrition session helpful? Prompt: ask according to examples of the activities.

Was there anything else that you would have liked to know more about foods/nutrients in the nutrition section? Prompt: why these ones?

Has anyone used the nutrition tips? Name a few of the tips you implemented or used. Are there specific tips that are easier to use than others? Use the following examples as prompts in the discussion such as reading the labels, not going shopping while you are hungry or have had busy day?

What was one tip that you think really benefited you?

Did this lead to any changes in your eating habits while you were attending the session? If yes, are you still managing to maintain those changes? If no, why not?

Exercise also plays an important part in maintaining a healthy lifestyle. How has the tips from the sessions helped you engage in exercise?

Have you been able to continue with the changes you have made? Prompt: how, motivation's, barriers.

Refresher course

Would you have liked to have a refresher course after the group session and the individual sessions with the dietitian? Prompt: If yes. What would you have liked to have as part of the refresher? Prompt: why?