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# **Use of a non-dieting approach to support weight management patients to improve eating behaviours and dietary intake.**

A thesis presented in partial fulfilment of the requirements for the degree of

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## Abstract

**Background/Aim:** Overweight and obesity numbers continue to increase locally and internationally. It is well known that the ability to make and maintain dietary changes long-term is difficult for many individuals. In recent years, weight management focus has moved towards understanding the impact of psychological factors on managing weight and supporting related changes. This pilot study explored whether a non-dieting programme is an effective intervention for people within the hospital system classified as overweight and obese.

**Methods:** Participants (n=31) were enrolled in a 28-week intervention study: 1-3 month normal diet run-in; 4-week group intervention programme; 24 weeks of follow-up including 3 individual follow-up sessions over 3 months. Data was collected at baseline, at the end of group sessions and at the individual sessions for anthropometry, behavioural and cognitive approaches to food, dietary intake and changes in eating habits.

**Results:** Positive change was observed in emotional and external trigger eating style scores, decreasing from  $2.67 \pm 1.04$  and  $3.06 \pm .67$  respectively at baseline to  $1.98 \pm .86$  ( $P < 0.002$ ) and  $2.56 \pm .63$  ( $P < 0.001$ ) at 6-month follow-up. Participants' reported mean ( $\pm$ SD) intuitive eating level increased from  $35.9 \pm 22.0$  to  $60.0 \pm 23.5$  from baseline to end of intervention ( $P < 0.000$ ), increasing further at the 6-month follow-up ( $67.50 \pm 26.356$ ) ( $P < 0.001$ ). Participant's median [95%CI] confidence levels increased significantly after completing the group sessions, from 6.0 [5, 7.5] up to 8.0 [7, 9] ( $P < 0.001$ ,  $r = 0.8$ ) and confidence levels remained higher, 7.5 [5, 8], at 6-month follow-up. Mean ( $\pm$ SD) weight did not change significantly during the study;  $112.33 \pm 26.67$  kg at baseline and  $112.04 \pm 28.52$  kg at 6-month follow-up.

**Conclusions:** Group-based intuitive eating weight management programmes can support participants to start making changes to improve their food-related behaviour and lifestyle to improve wellbeing and health.

**Keywords:** *Non-dieting, intuitive eating, group education, weight management*

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## List of Abbreviations

<b>BMI</b>	Body Mass Index
<b>CBT</b>	Cognitive Behaviour Therapy
<b>CM</b>	Centimetre
<b>DEBQ</b>	Dutch Eating Behaviour Questionnaire
<b>DHB</b>	District Health Board
<b>EI</b>	Energy In
<b>EO</b>	Energy Out
<b>FFQ</b>	Food Frequency Questionnaire
<b>HDEC</b>	Health and Disability Ethnicity Committee
<b>HRQL</b>	Health Related Quality of Life
<b>IES</b>	Intuitive Eating Scale
<b>iPMS</b>	Patient Information System
<b>Kg</b>	Kilogram
<b>M</b>	Metre
<b>MOH</b>	Ministry of Health
<b>OECD</b>	Organization for Economic Cooperation and Development.
<b>Q-LES-Q-SF</b>	Quality of life enjoyment and satisfaction Questionnaire – short form
<b>QOL</b>	Quality of Life
<b>REE</b>	Resting Energy Expenditure
<b>SD</b>	Standard deviation
<b>NZ</b>	New Zealand
<b>WG</b>	Wholegrain
<b>WHO</b>	World Health Organisation

## Contribution to Research

Table 0.1: *Contributions to this study*

Researchers	Contribution to this thesis
<b>Franica Yovich, NZRD</b>	Main researcher, Eating for your Health facilitator, participant recruitment, screening, and testing, data collection, data analysis, statistical analysis, interpretation and discussion of results.
<b>Associate Professor Rozanne Kruger</b>	Main academic supervisor and guidance with design of thesis, methods, statistical analysis, interpretation of results, and revision.
<b>Dr Beverly Haarhoff</b>	Academic supervisor and guidance with design of thesis, methods, statistical analysis, interpretation of results, and revision.
<b>Nikki Renall, NZRD</b>	Eating for your Health facilitator
<b>Reena Soniassy, NZRD</b>	Assessment and review of participants in clinic and data collection
<b>Erna van der Watt, NZRD</b>	Assessment and review of participants and data collection
<b>Zakiya Bi-Hussein</b>	Data collation and entry

## Chapter One: Introduction

Overweight and obesity is a growing problem internationally and the situation in New Zealand (NZ) is no different. The 2014/15 Ministry of Health (Ministry of Health, 2015a) data estimates that about 1.1 million adult New Zealanders (aged 15 years and over) are now obese. Obesity numbers have increased from 27% of the population in 2006/7 to current 31% (Ministry of Health, 2016). However within our ethnic populations the numbers are higher and 66% of Pacific Islanders and 47% of Maori are obese (Ministry of Health, 2015a). People living in deprived areas are 1.7 times more likely to be obese than those who live in areas not classified as deprived (Ministry of Health, 2016). In the 2015 OECD Health at a Glance statistics, New Zealand is sitting as the third most obese nation, after United States of America and Mexico (OECD, 2015).

Considering the growing obesity problem and the obvious cost associated with obesity it is important that services are offered which support people to manage their weight. However weight loss is not as simple as it may appear on the surface: several factors contribute to the cause of obesity. These include diet, exercise, environment, genetics and psychological factors. Often the focus is solely on diet and/or exercise however given the on-going increases in the rate of obesity in NZ year by year this is arguably not an effective approach.

The definition of a diet or dieting according to the Oxford Dictionary is to “restrict oneself to small amounts or special kinds of food in order to lose weight” (Oxford University Press, 2014). Weight loss diets come in many shapes and forms, and may involve avoiding foods, food groups, or reducing macronutrients (carbohydrate, protein, or fat) to achieve the goal of less energy (kilojoules) consumed. The traditional medical approach to weight loss is based on the premise that energy out should be greater than energy in. In addition to this approach, there are also myriad “fad” diets such as Atkins Diet, Paleo, low-carbohydrate high fat diet, and many more. Together with well-established weight loss companies such as Jenny Craig and Weight Watchers, these create a thriving diet industry fuelled by not only the ever-increasing need for more people to lose weight as NZ’s obesity rates and the associated medical complications sky-rocket, but also by the media and societal pressure to look a certain way.

Anecdotally, my personal experience as a Dietitian practising in the clinical environment for 19 years has increased my awareness that weight management isn’t just about changing what is eaten and exercising more, but that the psychological component plays a significant role. This was shown time and time again in practice when patients are keen to lose weight and make required changes,

successfully make changes and lose weight, but often old habits would resurface after a period of time and nullify the progress. This has especially been observed in those who appear to have an emotional attachment to food. Chronic dieters frequently have a “love/hate” relationship with food stemming from a belief that foods are “good” or “bad”. Patients will often avoid food types/groups based on other’s recommendations but with no obvious improvements in health or weight status.

In more recent years best practice guidelines have recommended that overweight or obese people should be encouraged to lose weight slowly, using a combination of lifestyle modification methods (diet and exercise) and behaviour change (Clinical Trials Research Unit, 2009). Ensuring an individual is ready to change may be an important key aspect in regards to weight management. Prochaska and Di Clemente (1982) developed the trans theoretical model of change, commonly known as the stages of change model in the late 1970s and it is a cyclic model which shows the steps an individual goes through when making change and can easily be applied to dietary changes (Greene et al., 1999).

As the majority of people who lose weight will regain over the next few years it is important to identify ways to better support people with weight management (Weiss et al., 2007, Sarlio-La Hteenkorka et al., 2000). Sarlio-La Hteenkorka et al. (2000) reported that only 6% of overweight individuals lost and maintained at least 5% weight loss.

Research has shown that a weight neutral approach known as non-dieting or intuitive eating is effective with weight management (Ahern et al., 2012, Anglin, 2012a, Bacon et al., 2002, Katzer et al., 2008, Keeler et al., 2013, Provencher et al., 2009, Tanco et al., 1998). Research shows that individuals develop improved attitudes and relationships with food (Ahern et al., 2012, Bacon et al., 2002, Humphrey et al., 2015, Keeler et al., 2013). By changing the approach and taking the focus off weight loss, patients can develop more helpful ways to manage situations which lead to unhelpful eating and in turn manage their weight. This includes patients identifying the cognitions behind the behaviours and learning how to manage their thoughts, so not leading to guilty or negative thoughts about eating or overeating episodes (Kausman, 1998).

When working within the public health system it is important to ensure services provided meet the needs of patients but are also sustainable in an environment where need is always growing but resource is often stagnant. Waitemata District Health Board (DHB) Nutrition and Dietetic Services’ receive approximately 30 new weight management referrals per month, and it is not possible to see each individual in one to one sessions only due to dietetic resource. Resources are constantly under

review and it is important that the service can provide an effective evidence based weight management solution, which can both be run with existing resource and is sustainable long term.

The majority of patients referred to the Waitemata DHB service have co-morbidities such as osteoarthritis, heart disease, diabetes and respiratory issues. This group of patients often find it difficult to lose weight due to the associated medical problems. Non-dieting research already published has focused on “healthy” overweight/obese people (Ciampolini et al., 2013, Madden et al., 2012, Van Dyke and Drinkwater, 2013); not those with co-morbidities or chronic conditions which are seen within a hospital service.

This pilot study focused on identifying whether a non-dieting based programme is an effective intervention for people who are classified as overweight or obese and are already within the hospital system due to their co-morbidities and chronic diseases. The key components of the “Eating for your Health” programme include a non-diet approach, mindful eating and cognitive behaviour therapy (CBT). The non-dieting content is based on the “If Not Dieting” (Kausman, 1998) programme developed by Australian doctor Rick Kausman in the 1990’s after his own experiences supporting patients to lose weight. “If Not Dieting” is a person-centred approach to healthy weight management and is based on Dialectical Behavioural Therapy (combination of cognitive-behavioural techniques, reality testing and mindful awareness).

### 1.2 Aim

To ascertain the effectiveness of, and adherence to, the “Eating for your Health” four week programme run at North Shore and Waitakere Hospitals to support patients classified as overweight or obese who have been referred for weight loss.

### 1.3 Objectives

1. To evaluate the effectiveness of a non-dieting programme for weight management of hospital-referred overweight or obese patients to improve:
  - a. Eating behaviours (for example intuitive eating ability, non-hungry eating, emotional and habit eating).
  - b. Dietary intake.
  - c. Quality of life.
2. To evaluate the hospital-referred overweight or obese patient’s adherence to the programme and follow-up sessions.



#### 1.4 Hypotheses

It is anticipated that the non-dieting approach used in the 4-week “Eating for your Health” programme offered by the Nutrition and Dietetic Services outpatient service at North Shore and Waitakere Hospitals will:

- 1a. Improved eating behaviours for participants.
- 1b. Improved reported dietary intake for participants.
- 1c. Result in an improved quality of life for participants.
2. Result in clients demonstrating better adherence to treatment plans.

#### 1.5 Research Structure

This thesis has been set out in six chapters. The first chapter introduces the topic of weight management particularly in relation to the non-diet approach. The second chapter is the literature review, and covers an overview of overweight and obesity, methods of weight loss and alternate approaches to dieting. Chapter three includes specific details on the methods of this study. The fourth chapter contains the results. Chapter five consists of the discussion of this study findings and chapter six concludes the thesis with a brief summary the limitation of this study and recommendations for applicability and future research.

## Chapter Two: Literature Review

### 2.1 Overweight and Obesity Overview

#### 2.1.1 Prevalence and cost of obesity

When a person is carrying too much body fat they are classified as either overweight or obese. The most common measure of weight status is body mass index (BMI) using the World Health Organisation Body Mass Index (BMI) thresholds (World Health Organisation, 2000). Body mass index provides a good estimate of “fatness” and is simple to measure and easy to calculate using weight in kilograms divided by the square of height in meters.

$$BMI = weight (kg)/height(m)^2$$

For adults, overweight is defined as having a BMI greater or equal to 25. Obesity is defined as a BMI greater or equal to 30, and it is split into three classes indicating the scale of obesity (see table 2.1).

Table 2.1: World Health Organisation Body Mass Index classification for adults (18+ years)

Classification	BMI (kg/m <sup>2</sup> )	Risk of health conditions
<b>Underweight</b>	<18.5	Not applicable
<b>Normal Range</b>	18.5 – 24.99	Average
<b>Overweight</b>	25.0 - 29.99	Increased
<b>Obese</b>	>30.0	Substantially increased
<b>Class I</b>	30.0 – 34.9	Moderate
<b>Class II</b>	35.0 – 39.9	Severe
<b>Class III</b>	≥40.0	Very severe

Adapted from World Health Organisation (2000)

For many years it has been well known that carrying extra weight increases the individuals risk to multiple co-morbidities including diabetes, heart disease and some cancers (James, 2004, Willet, 1999). Excess weight is also associated with gallstones, osteoarthritis, sleep apnoea and impaired fertility among others (James, 2004, Willet, 1999). Table 2.1 includes the relative risk of health conditions in relation to BMI, however as this relationship is continuous there is no point where there is a sudden increase to the risk of disease (Ministry of Health, 2015b).

Internationally the prevalence of overweight and obesity has been increasing since the 1980's, from 28.8% in 1980 to 36.9% in 2013 (Europe PMC Funders Group, 2014). The number of New Zealanders who are overweight or obese has also increased in recent decades. Table 2.2 shows the percentages of adult and childhood obesity levels since 2006/7. In the 2015 OECD Health at a Glance statistics,

New Zealand continued to sit as the third obese nation, after the United States of America and Mexico (OECD, 2015), this remained the same as in 2011.

Table 2.2: *New Zealand adult and child obesity levels since 2006/7*

Year	Total (%)		Maori (%)		Pacific (%)	
	Adults	Children	Adults	Children	Adults	Children
<b>2015/16</b>	31.6	10.7	47.1	14.7	66.9	29.8
<b>2011/12</b>	28.6	10.7	44.1	16.7	61.4	25
<b>2006/7</b>	26.5	8.4	41.6	11.8	63.4	23.1

Ministry of Health (2016)

The latest NZ Health Survey (Ministry of Health, 2015a) estimated that approximately 1.1 million (30.7%) adult New Zealanders are now obese and a further 24% are overweight. Females are more likely to be obese (32%) than males (29.4%) and there are an estimated 777,000 obese adults between the ages of 25 and 64 years old. Within our ethnic populations, nearly 70% of Pacific females are obese and 62% of Pacific males and approximately 45% of female and male Maori adults (46.5% and 45.4% respectively) are classified as obese.

In recent years, calculations have been made to estimate the cost of the growing weight problem in New Zealand. A 2006 Auckland University study (Lal et al., 2012) estimated that overweight and obesity was costing New Zealand between \$722 and \$849 million per year in costs related to healthcare and lost productivity. At the time, these healthcare costs represented 4.4% of the total health care expenditure in New Zealand. Lost productivity included absenteeism, premature death, recruitment and training of replacement staff and was estimated to cost NZ companies between \$98 and \$225 million. This study shows that overweight and obesity not only put a financial burden on the healthcare system and employers, but a personal burden on the individuals in terms of their quality of life and stress on their families.

### 2.1.2 Causes of weight gain

Sorensen (2008) discussed the challenges regarding the cause of obesity and explained the energy balance equation. If Energy In (EI) equals Energy Out (EO) then weight will basically remain stable and increasing EI above EO results in weight increasing. However a review of the literature by Clark (2015) found that reducing calorie intake doesn't necessarily mean a resulting reduction in body composition, indicating that it isn't a simple case of EI being less than EO. Rather, there are a number of factors influencing this equation which adds to its complexity. One such factor is

genetics, and there is on-going research in the link between genetics and an individual's weight status. Twin and adoption studies have shown evidence of genetic predisposition to obesity (Clement and Sorensen, 2007). Other research has shown possible influences on obesity to include maternal age at first birth and time spent awake (Keith et al., 2006), or increased likelihood of obesity in three year old children who watch greater than 8 hours of television per week on average (Reilly, 2005).

The body maintains weight homeostasis by creating hunger and satiety signals, such that an individual eats when hungry, and stops eating when full (Schwartz et al., 2000). This practice ensures that energy balance is in equilibrium and weight remains stable. However, people can override their internal hunger cues for a number of reasons, including emotional or habitual reasons, and for weight control. Outland and Rust (2013) found that the 60% of the nurse participants in their study reported overriding hunger/fullness giving the following reasons, "being too busy to stop and eat" and eating due to "stress" or "boredom", but would also eat past hunger in an attempt to extend good feelings associated with eating.

Socio-economic status and where someone lives also impacts on the incidence of obesity. The NZ Health Survey found that people living in deprived areas are 1.7 times more likely to be obese than those not (Ministry of Health, 2015a). An Australian study that compared metropolitan men and women to non-metropolitan men and women showed that, non-urban participants were more likely to be overweight or obese even though they did more occupation related activity. However, they also tended to have a less desirable food intake compared to dietary guidelines and eat more extras compared to their urban counterparts (Patterson et al., 2014). The effect of geography on obesity is further supported by another study, that showed that children who live in high safety/low deprivation areas were significantly less likely to be obese than children living in other areas (Tu et al., 2016). This study also found that obesity in high rural/high safety areas could not be accounted for by differences in physical activity and television time, despite establishing a positive association with obesity and TV watching, and a negative association with unorganised physical activity time. Changes in the food environment also have an effect on the incidence of overweight and obesity (National Institutes of Health, 1998). There is an abundance of food both inside and outside of the home which influences food choices people make. In some communities fast food is very prominent and difficult to avoid, for example Lincoln Road in West Auckland has greater than 50 fast food outlets along a three kilometre stretch of road (Herald, 2015, Braunias, 2016). The size of portions and what others eat also influences how much a person eats, which comes into effect with buffet

style or restaurants with large portions and eating with others. Versluis and Papies (2016) found that the amount the participants expected to eat varied depending on what was on offer and how it was described to them. That is, if they were told a group of people similar to them ate less then they said they would also eat less and the reverse if told ate more. Poelman et al. (2015) found that the mean serving size of individually packaged sweetened drinks in supermarkets in NZ and three other countries were greater than the manufacturers' recommended serving size. The inconsistency with sizing encourages over consumption, as individuals are often guided by what they view as being an individual serve.

Also in recent years, the digital platform is having a greater influence on what and where a person chooses to eat. There has been an influx in food and health blogging, which affects where and how a person gathers information about food and health (Stephenson, 2017, Noy, 2016). People are now using mobiles to not only decide where to eat but also find and use dining promotions and coupons (RetailMeNot Inc, 2016). The marketing and advertising of food is also a hot topic, with on-going calls to restrict advertising to children. A NZ study reported that while there wasn't an abundance of food advertising to children on non-food related websites, on food branded websites the advertising of unhealthy food was engaging and varied (Vandevijvere et al., 2017). In another study where children were shown commercials containing either a healthy or non-healthy fast food option, Ferguson et al. (2011) found that children tended to choose the advertised item, regardless of what it was and their parent's encouragement on what to choose did not have much impact on the decision made.

In New Zealand there is no legislation regulating the advertising of discretionary ("treat") food to children, despite there being a wealth of evidence to show that such legislation is likely to have a positive effect on consumption of these food by children (Vandevijvere et al., 2015). Overall there is limited government direction regarding the food environment and Swinburn et al. (2011) discussed how obesity needs to be addressed at a number of levels. Starting from the need for policy to influence the environment; to social marketing and programmes to affect behaviours and finally to treatments including drugs and surgery to change physiology. Work at the environmental level would have the greatest impact on our population but requires political intervention which has been limited over the years. In recent years, calls for reducing marketing to children and taxing unhealthy foods have gone nowhere in New Zealand (Vandevijvere et al., 2015). An expert panel in 2015 put forward a list of potential actions the New Zealand government could support which would improve the food environment and work towards reducing obesity. The top four of which were to improve

food composition, to implement regulation to reduce promotion of unhealthy food to children, to implement policy to ensure children's settings are free of commercial promotion of unhealthy foods and to ensure children's settings provide healthy food (Vandevijvere et al., 2015)

Alongside the increased availability of food the environment has also changed, which has reduced the amount of physical activity undertaken. More people travel by vehicle to and from work, school and social engagements than ever before. A study of Mexican-Americans showed that US born participants were less likely to do active work or activity as a mode of transport compared to participants who immigrated to America (Swift et al., 2014). Though the longer a person lived in America, then the more leisure time activity they did while decreasing work or transportation activity. Research has shown that weight increases with decline in physical activity (Sorensen, 2009) and also that exercise is required to prevent weight gain and to maintain weight lost (Swift et al., 2014). There are many benefits to physical activity, notably reduced risk of lifestyle-related diseases including overweight and obesity. Regular activity also promotes cardiovascular health, psychological well-being, and increasing lean muscle mass which help with weight loss long term (Warburton et al., 2006).

Physical activity can be undertaken in a variety of ways – it can include incidental activity such as walking to and from work, taking the stairs, or housework and gardening, or it may be more formal such as exercising at a gym, playing sport, or recreational activity such as mountain biking or surfing (Ministry of Health, 2015c). In the latest review of the NZ eating and activity guidelines, the Ministry of Health has published five simple activity statements to guide the public and health professionals regarding physical activity (Ministry of Health, 2015c).

1. Sit less, move more! Break up long periods of sitting.
2. Do at least 2½ hours of moderate or 1¼ hours of vigorous physical activity spread across the week.
3. For extra health benefits, aim for 5 hours of moderate or 2½ hours of vigorous physical activity spread throughout the week.
4. Do muscle strengthening activities on at least two days each week.
5. Doing some physical activity is better than doing none.

### 2.1.3 Effects of weight loss on health

Research has long shown that modest weight loss of around 5-10% does result in health benefits related to diabetes, blood pressure and hyperlipidaemia, such as improved glycaemic control and lower cholesterol levels (Goldstein, 1992, World Health Organisation, 2000). The Diabetes

Prevention Program reported a decrease in the rate of diabetes when weight loss occurred (Diabetes Prevention Program, 2002). Fayh et al. (2013) reported that people who were overweight but with no cardiovascular disease had improved lipid levels and reduced inflammation with weight loss of five percent. These results were independent of whether exercise was included in the programme or not. Another study evaluating the long-term effect of weight loss on blood pressure, found that participants who lost at least 4.5kg and maintained this weight loss for 36 months had the largest reduction in blood pressure and a lower relative risk for hypertension (Stevens, 2001). Participants in this study who lost then re-gained weight in a shorter timeframe gained no benefit over those who failed to lose weight; or those in the control group – nor did they have higher blood pressure at three years compared to the control group. This shows that losing then re-gaining weight has no benefit on blood pressure long term, thus reinforcing the importance of maintaining weight loss long term.

It is also important to consider the psychological health benefits of weight loss. In 2013, Warkentin et al. (2014) completed a systematic review and meta-analysis to examine the effect of weight loss on Health Related Quality of Life (HRQL). Thirty-two percent of the 53 trials saw HRQL significantly improve. In 17 trials weight loss was at least 5% and of these 10 trials had significantly improved HRQL. In further support of the psychological benefits, the effect of weight loss and exercise on cognition in obese older adult population was examined by Napoli et al (2014). It was found that generally the combination of weight loss and exercise or exercise alone had the greatest effect on cognitive measures and HRQL. The change in HRQL in these two study groups were significant compared to the groups who were assigned to just diet and the control group.

The main risk associated with weight loss that is crucial to consider, is the strong likelihood of long term weight cycling with dieting. Research has shown that the majority of people, regardless of what programme they used to lose weight, will regain most of the weight after five years – in fact, within the first year of dieting people will regain between 33-50% of any weight loss they've achieved (National Institute Health, 1992, Wadden et al., 2007, Weiss et al., 2007). Sarlio-La Hteenkorka et al. (2000) reported that over a nine year period only 5% of women and 7% of men lost and maintained at least 5% weight loss. Another study (Korkeila et al., 1999) which followed participants for 6-15 years showed that dieters tended to have higher risk of weight gain compared to the control group who were not dieters. Weight change was greater over 15 years for the majority of the dieting subjects, and significantly so for the older women and nearly significant for

the younger men. What couldn't be accounted for in the study were the potential benefits on health status of weight loss periods and behaviour change.

One of the hypotheses' for weight cycling is that weight loss and gain affects fat tissue distribution and resting energy expenditure (REE) which leads to easier weight gain. Bosy-Westphal et al. (2013) explored this concept comparing a weight stable group to weight re-gainers and found that while weight regain didn't negatively affect body fat distribution it did lower REE for the weight re-gainers group. Which could mean it is more difficult to lose weight and easier to regain weight.

Dieting as a predictor of weight gain was also supported by Lowe and colleagues (2013) who reviewed restrained eating behaviours studies versus dieting literature. Restrained eating was classified as those who are 'weight watchers' and dieting as those 'wanting' to lose weight. The review found that dieting predicted weight gain in 75% of studies and restrained eating measures predicted weight gain in 5% of studies examined. Vergnaud et al. (2008) identified that regular weight fluctuations increase the risk for metabolic syndrome for individuals. There is also a significant psychological effect of weight cycling on individuals, with increased feelings of life dissatisfaction, increased psychopathology, and increased incidence of binge eating (Brownell and Rodin, 1994, Kuehnel and Wadden, 1994, Venditti et al., 1996)

## 2.2 Methods of Weight Loss

There are several different methods by which an individual can lose weight. Lifestyle changes such as diet and exercise is a common approach, and if unsuccessful there are more medical methods such as medication that can suppress the appetite, or bariatric surgery. Common weight loss strategies used by men include eating less food, having less fried foods or sweets and starting to exercise (James et al., 2015). The same study found the less used strategies to be skipping meals, consuming less alcohol, and using shakes or meal replacements or diet pills.

Changing food intake is commonly referred to as a "diet", which is to restrict food intake in amount consumed or to restrict or avoid specific types of food (Oxford University Press, 2014) – but it is worthwhile to consider how effective dieting is as a weight-loss method. Dieting is often perceived as a short term change in order to get a desired outcome. In a study of women and dieting practices, Savage et al (2009) reported that dieters weighed less when dieting, suggesting it may be a good short term option for weight loss. However, they also concluded that dieting may not be an



effective long-term weight gain prevention strategy, as they found that women who were dieting at baseline ultimately gained more weight than women who weren't dieting.

Similar results were found in another study (Quick and Byrd-Bredbenner, 2012), which looked at the occurrence of restrictive eating (defined as going for greater than eight hours without eating in effort to change body shape or weight) in women and men. Twenty-five percent of the female respondents and 20% of the males who were practising restrictive eating habits were significantly more likely to have a higher BMI than those who were not restrictive eaters.

This raises the question of what is the best method of weight loss if not dieting. A moderated approach to weight loss focusses on incremental small manageable lifestyle changes. This approach is often promoted by dietitians and others as being a more sustainable approach that will lead to long term changes. As part of this approach, dietary modifications are based on a healthy eating approach without unnecessary restriction of entire food groups. The NZ Ministry of Health Eating and Activity Guidelines for Adults (2015c) recommends making changes based on what and how much a person eats, and includes eating plenty of vegetables and fruit, limiting amount of sugary foods and drinks, reducing intake of highly refined foods containing high levels of fat, sugar and salt and increasing activity.

Weight loss surgery is another tool in weight management and uses a combination of dietary changes and surgery to obtain weight loss. Weight loss surgery is often seen as the final option attempt for weight loss by many people but can have significant impact of people's lives. A study reviewing the effectiveness of gastric sleeve surgery found at the three year follow-up that on average participant's BMI's had decreased from 47 to around 30 (Albanopoulos et al., 2016). In a study by Liebl et al. (2016), people who had bariatric surgery reported that two years post-surgery they experienced life in positive ways which they previously had not before. Participants reported that support systems were essential in their success, though many also reported receiving negative influences regarding the journey they were on from individuals around them. Weight gain post-surgery is also possible; Groven and Glenn (2016) tell the stories of three women who regained the majority of lost weight between 2-3 years after surgery. Feelings of inadequacy were high and previous eating behaviours and emotional eating returned as the weight increased.

#### [2.2.1 Diet and Exercise Literature](#)

A number of systematic reviews have been completed looking at the effectiveness of different weight loss diets. Foreyt and co-workers (2009) examined two common diets: low carbohydrate

versus low fat in relationship to weight lost. They concluded that while there was greater weight loss on a low carbohydrate diet under controlled conditions, there were other factors which likely also affected the success of this type of diet, including satiety and hunger sensory triggers, palatability and metabolic response. A systematic review and meta-analysis completed in 2015 (Clark, 2015) reviewed studies using diet, exercise, or a combined diet and exercise approach for the effectiveness of weight loss. Clark concluded that if a diet only approach is to be taken, then a high protein/low carbohydrate diet is more effective in changing body composition than low calorie/lower fat diets. However, the review also found that the addition of exercise to diet, especially resistance exercise, prompted more beneficial changes to body shape and weight. Notably, the higher intensity exercises, whether it is resistance or endurance, produced more pronounced effects. Clark (2015) concluded that if overweight and obese people started resistance exercise with diet changes then at least 55% should have favourable changes to body composition. For those that choose to do endurance training, if that training is completed at a high intensity then at least 40% of the population would have beneficial changes.

Johnston et al. (2014) found evidence supporting the belief that any diet works as long as a person continues to follow it. They reviewed the literature relating to named diet programmes focusing on the outcomes of weight and BMI at six and twelve month periods, finding that significant weight loss occurred regardless of being a low fat or low carbohydrate based program and differences between the programs were small.

It is thought to be important to identify the different factors that may support weight maintenance and going forward these should be included in interventions or programmes to help people to maintain lifestyle changes, regardless of weight loss. Johns et al (2014) reviewed eight studies comparing a combined approach (behavioural plus diet and/or exercise) to a diet or exercise only intervention. Short term results (three to six months) showed little difference in weight loss for the combined approach versus diet only - however at 12 months the combined approach had significantly higher mean weight loss. Comparatively, the combined approach had a significantly greater weight loss at three to six months and at 12 months when compared to exercise alone, reinforcing the importance of behavioural interventions for successful long term weight loss.

Elfhag and Rossner (2005) identified that the following factors helped to maintain weight loss: having regular meals, high self-efficacy, social support and self-monitoring. Other factors likely to assist in weight maintenance include a flexible approach to diet and decreasing emotional eating

(Teixeira et al., 2009). Hofmann et al. (2014) found that success depended on a person's inhibitory control response. Dieters with high impulse control were more likely to engage in self-control when encountering tempting foods and situations than those with low impulse control. The authors recommended focussing on psychological interventions to help improve impulse control. A systematic review and meta-analysis of 37 studies relating to behavioural based weight management programmes showed that the majority of behavioural programmes are effective for weight loss, and that programmes that use either a dietitian or calorie counting are more effective than those that don't (Hartmann-Boyce et al., 2014). A summary of the literature regarding weight management using diet, diet and exercise or a combination of diet, exercise and behaviour change is shown in Table 2.3.

Table 2.3: *Summary of diet and exercise related studies for weight loss*

Author	Design	Purpose	Population	Methods	Main findings
<b>Randomised Control Trial</b>					
Austel et al. (2015)		To assess the effectiveness of a fat modified Mediterranean-type diet for weight loss	Men and women with BMI 25-30 kg/m <sup>2</sup> , aged 25-70 years. Some co-morbidities excluded. (n=212)	Recruited via newspaper and randomised to intervention or control group (waitlist). 12 week intervention period – 6 weeks of detailed diet plans and 6 weeks weight maintenance.	<ol style="list-style-type: none"> <li>13 participants excluded due to non-compliance.</li> <li>Highly significantly weight loss, BMI reduction, decreased waist in intervention group compared to control group.</li> <li>At one year follow-up completers gained 1.9kg on average, still less than baseline weight.</li> </ol>
Brinkworth et al. (2016)	Randomised control trial	To explore the long-term effects of different carbohydrate weight loss diets	Men and women with BMI >30 kg/m <sup>2</sup> , with Type 2 Diabetes	Randomised to either: <ol style="list-style-type: none"> <li>1. Energy restricted planned isocaloric low-carbohydrate diet</li> <li>2. High-carbohydrate, low-fat diet</li> </ol> Both groups were combined with supervised exercise programmed (3 days/week)	<ol style="list-style-type: none"> <li>At one year body weight reduced by 19.6kg in females.</li> <li>Mean reduction of 11cm in waist circumference.</li> <li>Reduction in metabolic syndrome by 50%.</li> <li>Statistically significant weight loss at 3 years even after gain of 15.1%.</li> <li>Mean weight loss at 3 years was 5.9kg, 4.2% of initial body weight.</li> </ol>
Gardner et al. (2016)	Randomised pilot trial	To examine the effect of insulin resistance on weight loss in response to different diets	Men and women with BMI 28-40 kg/m <sup>2</sup> , aged 18-50 years. Stable body weight and medications with no co-morbidities (n=61)	Randomly assigned into four groups: <ol style="list-style-type: none"> <li>2 x Low fat (LF)</li> <li>2 x Low carbohydrate (LC)</li> </ol> All groups had approximately 50% insulin resistant (IR) and 50% insulin sensitive (IS). Classed based education with 14 1 hour classes over six months.	<ol style="list-style-type: none"> <li>Average class attendance = 81% for LF and 85% for LC classes.</li> <li>49 (80%) participants completed at six months.</li> <li>Average weight loss after 6 months was 9.0±6.5kg and 8.9±5.7% of baseline weight.</li> <li>No significant interaction between diet and IR or IS status seen.</li> </ol>
Geiker et al.	Randomised control	To examine effect of adapting weight-loss	Pre-menopausal	Randomly assigned to either intervention (n=30) or control	<ol style="list-style-type: none"> <li>Dropout rate 38% for intervention group and 61% in control group.</li> </ol>

(2016)	trial	programme to menstrual cycle	women (n=31)	(n=30) group. Individual dietetic counselling at weeks 0, 2, 4, 12, 16, 20 and 24. Dietary intake and exercise was synchronized to menstrual cycle for the intervention group	<ol style="list-style-type: none"> <li>Non-clinically significant greater weight loss for intervention group (<math>p=0.07</math>).</li> <li>Waist circumference reduced more in intervention group than control group.</li> </ol>
Madid et al. (2016)	Randomised control trial	To examine effect of different frequency of physical activity on weight loss	Healthy women with BMI 27-35kg/m <sup>2</sup> , 18-40 years, sedentary lifestyle, non-smoker and no cardiovascular disease, stroke, diabetes, or depression (n=75)	<p>Randomly assigned to either</p> <ol style="list-style-type: none"> <li>Diet plus high-frequency physical activity (n=38)</li> <li>Diet plus low-frequency physical activity (n=37)</li> </ol>	<ol style="list-style-type: none"> <li>Low frequency physical activity resulted in significantly higher weight loss.</li> <li>Changes to lipid profiles and carbohydrate metabolism significant in both groups.</li> </ol>
Sacks et al. (2009)	Randomised clinical trial	To examine the possible advantages for weight loss of a diet	Men and women with BMI 25-40 kg/m <sup>2</sup> , 30-70 years, no diabetes or unstable heart disease or use of medications which affect weight (n=811)	<p>Participants randomly assigned to one of four diets</p> <ol style="list-style-type: none"> <li>Low fat/average protein (n=204)</li> <li>Low fat/high protein (n=202)</li> <li>High fat/average protein (n=204)</li> <li>High fat/high protein (n=201)</li> </ol>	<ol style="list-style-type: none"> <li>Average of 6kg (7% of initial weight) lost at 6 months for each diet.</li> <li>At 2 years, weight loss remained similar in those assigned to 15% protein diet and 25% protein diet.</li> <li>80% completed the trial (n=645)</li> <li>31-37% lost at least 5% of initial body weight.</li> <li>Approximately 15% of participants had a reduction of at least 10% of their initial body weight.</li> <li>All diet types reduced risk factors for cardiovascular disease and diabetes at both six months and two years.</li> <li>Attendance was strongly associated with weight loss</li> </ol>

					(0.2kg/session)
Saslow et al. (2014)	Randomised pilot trial	To compare effects of moderate versus very low carbohydrate diet	Women with BMI >25 kg/m <sup>2</sup> , aged 18 years or over with diagnosis of type II diabetes or pre-diabetes and able to speak English (n=)	Randomised to either 1. Moderate carbohydrate, low fat, calorie restricted diabetic diet (MCCR) (n=18) 2. Very low carbohydrate ketogenic diet (LCK) (n=16) Attended 13 x 2 hour weekly group education classes.	1. Both groups reported significantly reduced carbohydrate and sweet cravings, emotional eating, hunger and eating disinhibition. 2. Both groups reported increased dietary restraint. 3. -5.5kg mean weight change for LCK group and -2.6kg for MCCR group
Tay et al (2015)	Randomised control trial	To compare the effects of a very low carbohydrate low saturated fat diet with high unrefined carbohydrate low fat diet	Men and women with BMI 26-45 kg/m <sup>2</sup> , aged 35-68 years with Type II diabetes (n=115)	Randomly assigned to either: 1. Low carbohydrate, low saturated fat diet (LC) 2. High carbohydrate, low saturated fat (HC) Intervention period was 24 weeks.	1. Both diets improved glycaemic control and CVD risk markers. 2. Improvements and reductions greater with LC diet 3. High completion rates for both groups (LC 79% and HC 82%) 4. Concluded LC diet may be effective diet for diabetes management.
Tay et al (2015)	Randomised control	To compare effectiveness of two different carbohydrate content diets on diabetes management after one year	Men and women with BMI 26-45 kg/m <sup>2</sup> , aged 35-68 years with Type II diabetes (n=115)	Randomly assigned to either: 1. Low carbohydrate, low saturated fat diet (LC) 2. High carbohydrate, low saturated fat (HC) Follow-up at 24 weeks and 52 weeks.	1. Similar completion rates for both groups (LC 71% and HC 65%). 2. Weight loss not significantly different (LC-9.8kg and HC -10.1kg). 3. Greater change for LC diet for lipid profile and diabetes control.
Varady et al. (2013)	Randomised control trial	To examine effect of alternate day fasting on body weight and CHD risk	Women with BMI 20-29.9 kg/m <sup>2</sup> , aged 35-65 years, lightly active, weight stable for 3 months, non-diabetic or CVD and non-smoker (n=32)	Randomised to either 1. Alternate fasting group (n=15) 2. Control group (n=15) 12 weeks parallel arm feeding trial	1. Reduction of approximately 5.5kg (6.5%) on initial body weight for alternate fasting group. 2. No change in perceived hunger at 12 weeks. 3. Dietary satisfaction and feelings of fullness increased over study period.

Verreijen et al (2017)	Randomised control trial	To examine effect of a high protein diet and/or resistance exercise on fat free mass (FFM) during weight loss	Overweight and obese men and women (n=100)	Recruited via flyers and advertisements. Randomised to 10 week one of two hypo caloric diets with or without exercise 1. High protein 2. Normal protein	1. Significant reduction in weight, fat mass and waist circumference at 10 weeks for all groups. 2. No significant change in FFM from high protein diet only 3. Significant improvement in FFM on high protein diet with resistance exercise. 4. 31% drop out rate during study period.
Whitham et al (2013)	Randomised control trial	To examine weight maintenance after diet of meal provision or self-directed diet	BMI 27-35 kg/m <sup>2</sup> , aged between 30 – 70 years. No history of diabetes or eating disorders. (n=86)	Randomised to 12 week intervention of either: 1. Meal provision 2. Self-directed energy restriction Participants re-consented to further 12 week follow-on period of either of these diet or another diet	1. 85 of original 86 participants consented for follow-up study. 2. No significant changes in further weight loss between the groups. 3. After 24 weeks of meal provision, 67% lost at least 10% body weight. 4. Those switching from self-directed diet to meal provision had lower mean weight at 12 months than at start of follow-on study.
Wycherley et al (2014)	Randomised control trial	To compare effects of different diet compositions on exercise tolerance and capacity	Men and women (n=66)	Randomised to either 1. Energy restricted very low carbohydrate diet 2. Isocaloric high carbohydrate diet Included a 52 week intervention period.	1. 43 (65%) Completed intervention and had week 52 assessment. 2. Similar reductions in body weight and fat mass between groups. 3. Both groups had a similar increase in percentage fat free mass. 4. Long-term consumption of LC diet doesn't negatively impact on physical function.
<b>Interventional</b>					
Gu et al. (2013)	Interventional	To examine the effects of weight loss of a very low carbohydrate diet	Healthy men and women with BMI ≥28 kg/m <sup>2</sup> , aged 18-52 years, non-smoker, no CVD or endocrine	Eight week <800kcal/day prescribed diet	1. 86.8% completion rate. 2. Mean weight loss was -8.7±0.6kg. 3. Mean reduction BMI of -3.0±0.2 kg/m <sup>2</sup> . 4. Mean waist circumference change was -5.9±1.2cm.

history (n=53)			
Jakicic et al. (2015)	Interventional	Effect of a behavioural weight loss intervention (BWL) on physical activity levels, energy intake and weight.	Men and women with BMI 25 – 39.9 kg/m <sup>2</sup> , aged 18-35 years, no past or planned weight loss surgery, eating disorder or CVD (n=470)
			<p>Six month behavioural weight loss intervention programme which included weekly support sessions and prescribed diet and physical activity plan.</p> <ol style="list-style-type: none"> <li>1. Significant weight change at six months, median was -7.8kg and percentage weight change -8.8%.</li> <li>2. 90% of participants completed programme.</li> <li>3. Significant reduction in daily energy intake and percentage fat intake.</li> <li>4. Significant increase in percentage carbohydrate and protein intakes.</li> </ol>
<b>Other Studies</b>			
Neild and Kelly (2016)	Prospective observational study	To investigate the physical, psychological and dietary impact of a community weight management programme	Men and women with BMI >35kg/m <sup>2</sup> with a co-morbidity or >40kg/m <sup>2</sup> without co-morbidities, aged 18 years or above, registered with GP, not pregnant and motivated to make change (n=288)
			<p>Initial appointment with MDT member for assessment followed by 12 contacts via telephone, email, group or individual over 12 week intervention period. Final follow-up at six months post intervention.</p> <ol style="list-style-type: none"> <li>1. Only 115 patients still enrolled at six months (40%). Significant loss to follow-up.</li> <li>2. Patients were engaged well if attended seven or more of the sessions.</li> <li>3. 33% completed 10 or more of the 12 sessions.</li> <li>4. Significant mean weight loss at 3 and 6 months (3.28% and 3.82% respectively).</li> </ol>
Skender et al. (1996)	Randomised experimental design	To compare the long-term weight loss trends of 3 behaviour modification treatment conditions	Men and women, 25-45 years, at least 14kg overweight and not engaged in exercise (n=127) (Diet only = 42, Diet and exercise = 43, Control = 38)
			<p>One year intervention including 12 x 60 minute weekly group instructional sessions, followed by 3 biweekly sessions, then 3 monthly maintenance sessions.</p> <ol style="list-style-type: none"> <li>1. At one year no significant difference in weight loss</li> <li>2. At two years diet group regarding weight to 0.9kg above baseline and combination group regained to 2.2kg below baseline.</li> <li>3. 33% drop out at one year and further 30% two years</li> </ol>



### 2.2.2 Psychological effects of dieting

People want to lose weight for various reasons. It might be to feel better, or wanting to take part in social activities or to prepare for surgery, or not wanting to die. The person's reasons are usually personal and relevant for them, and are their motivation (Thomas et al., 2008). Generally people report improved physical and emotional wellbeing once weight is lost but the reverse when weight loss doesn't occur, describing it as "failure" and they will blame themselves for not having enough willpower (Brownell and Rodin, 1994, Kuehnel and Wadden, 1994, Venditti et al., 1996).

Most people can generally successfully lose weight using which ever dietary or lifestyle measure they choose, however maintaining changes is the challenge (Chambers and Swanson, 2012, Thomas et al., 2008). Many people may also begin a cycle of weight loss and weight regain followed by weight loss again, continuing on a downward spiral. This is often the cause for a preoccupation with dieting and subsequently suffering from the negative effect of poor success (Tanco et al., 1998). However, Clark and King (2000) found the opposite and saw no change in eating confidence for those who lost and then regained weight, indicating that not all people may suffer negative psychological effects of weight cycling.

Gibson (2006) reviewed studies examining the emotional influences on people's food choice. One study showed that compared to the control group, women who self-identified as "chocolate addicts" felt increased guilt after eating chocolate. They also reported a higher negative and lower positive effect prior to eating. Another study in the review reported that women who reported greater tendency to eat in response to emotions had greater increase in negative mood (Gibson, 2006).

People will often report they lack the will power to resist certain foods and there is evidence to indicate that unsuccessful dieting weakens the ability to resist temptation. Houben et al. (2012) examined the relationship between previous dieting attempts and dietary restraint. They showed that those who had been more successful with weight control were better able to resist tempting foods than those who had less weight control success. Unsuccessful weight controllers had increased cravings after and while seeing food and they consumed more during a taste test compared to the controls.

Those actively trying to lose weight can have heightened weighing practices and a preoccupation with weight (Chambers and Swanson, 2012). Feelings of deprivation are associated with dieting for those gaining weight and feelings of depression and anger are associated with failing to lose weight

or, when making comparisons to family and friends (Thomas et al., 2008). People reported feeling pressure once they had lost weight to maintain that weight loss; they also report family or friends trying to “sabotage” efforts.

Dieting also affects people’s behaviours and feelings around food. Thomas et al. (2008) reported dieters to having an increased focus on food and what to eat next. Ogden (1995) studied a small group of dieters comparing them to a non-dieting control group. The dieters showed increased restraint around food and greater out of control feelings around food than the control group. In this study dieting also appeared to influence the occurrence of depression in the short term. Similar results were also seen in a group of 14 (seven women and seven men) normal weight individuals who were placed on a caloric restricted diet. They reported an increased sense of being out of control compared to baseline (Warren and Cooper, 1988). Massey and Hill (2012) also showed that dieting significantly increases cravings, as compared to non-dieters. Dieters experienced an increased number of cravings, cravings of greater strength and dieters reported finding it more difficult to resist a craving. Only four percent of dieters didn’t record a craving over a seven day period, whereas 32% of non-dieters reported no cravings. Strategies to resist cravings included using distraction (doing something else) on 48% of the occasions, 22% by having a drink and in 8% of the times eating something else.

### 2.2.3 Supporting Behaviour Change

While many people lose weight using weight loss programmes, the weight loss isn’t maintained for a large number of people. Individuals report the reasons that diets do not work include diets being “unsustainable”, “too expensive”, “focused on food rather than changing behaviour” and “boring” (Thomas et al., 2008). Grave et al. (2006) identified the following reasons for weight lost programme drop out; logistics, such as work and family problems, unsatisfactory results and lack of motivation. Having support plays on role on success levels, as does the lack of support decreasing success (Grave et al., 2006). However contrasting this, one study of black female participants actually found that as a friend’s support to exercise increased, so did their level of weight re-gain at 12 months (Brantley et al., 2014).

Unfortunately, it is not a simple case of deciding to make change and then change occurring. Changing health related behaviours is difficult as human behaviour is affected by multiple factors, including habit, automatic response, choice, environment, social life and culture (Michie et al., 2014). Often people planning programmes, or those outside the situation, think that providing knowledge is enough to make change. However, it has been shown that by just informing people of

the change required, how to do it, and negative effects if not done, are not enough to elicit change (Barker et al., 2008). Firstly it is important to remove any barriers that may stop change, for example financial, environmental, and motivation among others (NICE, 2007). In recent years, apps for smartphones have been developed and incorporated into interventions in the effort to support people to improve diet and activity levels by providing motivational messages, reminders or tips. Schoeppe et al. (2016) completed a systematic review focusing on the efficacy of interventions using apps and found that there is only modest evidence to support the use of apps to improve diet and activity levels, concluding that apps alone are not enough to be effective in supporting change but also called for further research in this area.

Motivational interviewing is a tool now commonly used to support a person to make long-term sustainable lifestyle change (Miller and Rollnick, 2014). Motivational interviewing was initially developed by Miller (1983) to support people with alcohol problems and it uses a collaborative person-centred counselling approach. Motivational interviewing focuses on supporting the person to empower themselves to change based on what is important to them by understanding their barriers and motivation. To do this it is important that the clinician expresses empathy and supports a patient to explore discrepancies so that the individual can identify that the health behaviour isn't aligned to what they really want. It is then possible to acknowledge and explore resistance so that barriers are identified (Johnston and Stevens, 2013).

There are four processes to motivational interviewing:

- Engaging is about establishing a connection and a working relationship. It is an essential phase so that therapy can occur.
- Focusing is where a person develops and maintains specific direction in the change conversation.
- Evoking is a central part of motivational interviewing and involves eliciting a person's motivation for change.
- Planning phase involves developing commitment to change and making a plan for going forward.

Toth-Capelli et al. (2013) suggested that to increase the effectiveness of interventions it would be beneficial to pre-screen patients to assess their readiness for change and where they sit within the stages of change model should occur. Doing so would ensure that those ready to change and involved in weight management programmes would be more likely to succeed, especially if their

personal barriers and obstacles are also addressed. Kelly and Barker (2016) also suggest that we keep asking why an event has happened in an effort to find the initial cause so to help change behaviour long term. This aligns with cognitive behaviour therapy (CBT) which has long been used to treat drinking problems, depression and eating disorders and is now being used in the diet and lifestyle fields.

CBT is a psychotherapeutic approach that seeks to understand the link between situational triggers, thinking, emotional response, and resulting behaviour patterns. The focus is on supporting people to change the way they think in an effort to improve how they feel and behave. CBT encompasses Cognitive Therapy which was developed by Aaron Beck (1975) and Rational Emotive Therapy (developed by Albert Ellis (1985). Traditionally Dietitians have not been trained to use CBT as part of dietetic treatment. Rapoport (1998) examined Dietitians use of CBT in practice and concluded that training in using key CBT theories and skills along with counselling skills to help patients develop the skills and tools to maintain changes long term would be a useful addition to dietetic training.

It is thought that clinicians could use the principles of CBT to support patients to develop skills and knowledge which enable them to manage their eating habits and their food intake without having to 'diet'. People would be encouraged to identify the thoughts and underlying beliefs which support unhealthy eating patterns, celebrating the small changes and learning to refocus their thoughts and the way they think about food and their weight.

In addition to intuitive and mindful eating and basic CBT tools and strategies, dietitians can also utilise cognitive reframing, problem solving, stimulus control, response prevention, self-reinforcement, identifying and challenging negative thinking, and relapse prevention as techniques to aid in the treatment of their clients (Beck, 2008, Kausman, 1998, Willer, 2013).

## 2.3 Alternate Approaches to Dieting

### 2.3.1 Intuitive Eating

Intuitive eating (also known by 'non-dieting', 'a non-diet approach' and 'conscious eating') is based on the premise that a person can regulate their eating habits by attending to their hunger cues and eating in response to hunger cues. Using intuitive eating principles can support people to achieve and maintain weight loss without calorie or nutrient counting (Robinson et al., 2013). The intention is to help the person develop healthy relationships with food, their mind, and body (Outland, 2010).

Van Dyke and Drinkwater (2013) completed a systematic review of the literature that examined the relationship between intuitive eating and health indicators. Findings generally showed that intuitive eaters have a lower BMI than non-intuitive eaters. Van Dyke and Drinkwater (2013) found little evidence to show intuitive eating will result in weight loss but summarised that an intuitive eating programme would likely reduce the occurrence of weight cycling.

While an intuitive eating approach has been around many years and research goes back to pre-1990s; recently, dietitians have become more aware of the benefits of intuitive eating and psychotherapy practices to use in clinical settings (Mathieu, 2009, Rapoport, 1998). There has been shift to a non-dieting approach with people focused on a more holistic approach to weight management and the growing “Health at Every Size” (HAES) movement (Bacon et al., 2005, Kausman, 1998, King, 2007, Napolitano and Foster, 2012, Willer, 2013). An intuitive eating approach has been adopted well in areas addressing eating disorders where the focus is on weight gain, however is still gaining acceptance in general health and treatment of overweight people.

There are many environmental factors which have been shown to work against establishing “intuitive eating” - for example, following trendy weight-loss diets, habitual eating (“it is time to eat” or being used to eating a certain type or amount of food), advertisements and having been encouraged throughout your life to clear all the food on a plate (Thomas et al., 2008). Ciampolini et al. (2013) showed that attending to hunger cues can be taught, and hunger cues can then be used to establish regular eating patterns thereby reducing weight within the first weeks of training.

### 2.3.2 Mindful eating

Mindful eating allows a person to become aware of the positive and nurturing opportunities that are available through food selection and preparation by respecting their inner wisdom. Mindful eating complements intuitive eating as it ensures the person is aware of the food and the eating process (Harris, 2013). Mindful eating involves listening to hunger, fullness and taste satiety cues, and reducing distractions and using all senses while eating (May, 2014). A person has the opportunity to acknowledge their response to the food without judgement (likes, dislikes and neutrality) and also reflect on the effects of unmindful eating (emotional eating, overeating, and negative feelings). When mindful eating, a person slows down the pace of eating, avoiding distractions and choosing food which is both pleasing and nutritious (Mathieu, 2009).

If a person is not eating out of physical hunger, then they are able to identify the reason for eating using the following series of questions (Harris, 2013).

- Why do I eat? What triggers led a person to eat, these may include a variety of influencing factors such as hunger, emotions and how feeling, or a response to challenging situations.
- When do I want to eat? This may depend on the time of day, how feeling, the situation (social occasions) and hunger cues.
- What do I eat? Examines what people consider when choosing food, such as taste, comfort, health and convenience.
- How do I eat? Do they eat quickly or take their time, do they notice what they eat or eat in secrecy or with guilt.
- How much do I eat? Explores how quantity is decided – fullness cues, habit or packet size.
- Where do I invest my energy? Does eating energise or cause tiredness and guilt or shame.

Robinson et al. (2013) reviewed 24 studies which focused on mindful (attentive) eating and looked at the effect on memory, distraction, awareness or attention and the effects that mindful eating has on food intake; concluding that mindful eating influences food intake, suggesting that reducing attention to food increases food intake. Robinson et al. (2013) also suggested that including mindful eating principles into interventions may aid weight loss and maintenance without the need for dieting.

Table 2.4 includes a summary of the intuitive and mindful eating research studies which have been conducted locally and internationally.

Table 2.4: Summary of intuitive eating and mindful eating studies

Author	Design	Purpose	Population	Methods	Main findings
Anglin (2012a)	Randomised control	To assess weight loss, BMI and waist circumference using diet or intuitive eating (IE) approaches.in obese adults	Obese (BMI≥30 kg m <sup>2</sup> ) students (n=16) aged 20 -40 years.	Calorie intake restricted by 500kcal/day. Participants exercised 3x/week. At baseline, mid-point and endpoint weight and waist circumference were measured and BMI calculated.	<ol style="list-style-type: none"> <li>1. Diet group had significantly total weight loss than IE group (<math>p=0.03</math>).</li> <li>2. Weight loss in IE group significantly less in 2<sup>nd</sup> half of the study (<math>p=0.05</math>).</li> </ol>
Bacon et al. (2002)	Randomised clinical trial	To evaluate the effects of a 'health-centred' non-diet wellness program and compare to traditional 'weight loss-centred' diet program	Obese, Caucasian, female, chronic dieters aged 30-45 (n=78).	<p>Six months of weekly group intervention + 6 months of monthly after-care group support. Attended for testing sessions: baseline, 12 weeks (mid-treatment), 24 weeks (post-treatment) and 52 weeks (post-aftercare).</p>	<ol style="list-style-type: none"> <li>1. Non-diet had significantly lower dropout rate than diet group (<math>p&lt;0.05</math>).</li> <li>2. Significant change in weight for diet group from baseline (<math>p&lt;0.05</math>)</li> <li>3. Both groups had significantly improved lipid profiles.</li> <li>4. Restrained eating measure significantly decreased for non-diet group at mid-point and was maintained post-aftercare.</li> </ol>
Borkoles et al. (2016)	Randomised Control trial	To examine the effects of a non-dieting lifestyle intervention on weight maintenance and psychological well-being	Morbidly obese (BMI≥35kg m <sup>2</sup> with at least one co-morbidity or BMI≥40 kg m <sup>2</sup> ), pre-menopausal Caucasian women, aged 24-55 years (n=62).	<p>Allocated to either 12 weeks of lifestyle intervention group (IIG) or delayed start control group (DSCG)</p>	<ol style="list-style-type: none"> <li>1. Initially IIG showed significant decrease in body weight</li> <li>2. No significant changes to weight for either group at 12 months compared to baseline</li> <li>3. Significant improvement to psychological functioning from 3-month intensive intervention</li> </ol>
Carroll et al. (2007)	Randomised control intervention	To examine the effects of a non-dieting lifestyle intervention	Healthy obese sedentary women (97% white) aged 24-55 (n=62)	<p>HAES approach used. Twelve weeks of lifestyle intervention (or delayed start) + 9 months maintenance. Excluded CVD,</p>	<ol style="list-style-type: none"> <li>1. Modest non-significant body mass reduction in lifestyle group compared to control.</li> <li>2. The lifestyle group showed significantly improved general</li> </ol>

Cole and Horacek (2010)	Randomised prospective study	To evaluate the effectiveness of the "My Body Knows When" intuitive eating (IE) program to assist in rejecting dieting mentality.	Women, ≥ 18 years with no significant dietary restrictions (n=61) (Intervention = 38, Control = 23)	10 x weekly sessions + 6 month follow-up. Sessions based on intuitive eating principles. Three groups of 12-15 participants.	kidney or liver disease and diabetes. Collected weight, BMI, waist and hip circumference, body fat % and fasting cholesterol and glucose and BP. Body dissatisfaction explored.	3. The control group body dissatisfaction increased significantly.	psychological well-being ( $p<0.01$ )
							<ol style="list-style-type: none"> <li>1. Dieting mentality significantly decreased in intervention group.</li> <li>2. 39% dropout rate for intervention and 67% for control group</li> <li>3. Dropout rate increased at six month follow-up to 52% for intervention group</li> <li>4. Top reasons for missing work or family time conflicts, self and/or family illness</li> </ol>
Hawley et al. (2008)	Randomised intention to treat	To compare three non-dieting interventions and sustainability of improvements focusing on lifestyle change rather than weight loss in women living in Dunedin, NZ	Overweight/obese women (BMI≥28 kg m <sup>2</sup> ) aged 25-68 (n=225) and at least one CVD risk factor.	Attended 10x2 hour weekly sessions + 8 months 12 x 2 hour sessions. Assessed at baseline, end of 10-week programs and 4 months, 1 year and 2 years post completion of programs.			<ol style="list-style-type: none"> <li>1. Relaxation group has significantly improved stress management behaviours than non-diet along group (<math>p&lt;0.05</math>)</li> <li>2. All three programs showed significant improvements in dietary quality and stress management at 1 year and 2 years.</li> <li>3. Mean body weight was unchanged at 1 year and 2 year for all three groups.</li> </ol>
Humphrey et al. (2015)	Quasi experimental	To assess changes in intuitive eating, body esteem, attitudes and eating behaviour of students using HAES approach	Female students (HAES = 45, HAES inspired = 66, Control = 46)	Deliver of nutrition course, interventions included HAES course, HAES inspired nutrition course and traditional diet/weight focus nutrition course. Pre and post intervention surveys and			<ol style="list-style-type: none"> <li>1. Significant improvements in intuitive eating behaviours for HAES course students (subscales unconditional permission to eat and reliance on hunger).</li> <li>2. No significant changes in BMI for any group.</li> </ol>



				questionnaires. Assessed intuitive eating, cognitive behavioural dieting, body-esteem and anti-fat attitudes.	
Keeler et al. (2013)	Non-equivalent control group	To examine the effectiveness of HAES program on eating (behaviours and diet quality), exercise and body image factors	Full time university female students (Intervention = 17, Control = 16)	Self-selected intervention group. Peer led using nutrition and exercise mentors and individually tailored.	<ol style="list-style-type: none"> <li>1. Majority of intervention group reported improved dietary patterns/thoughts (82.4%) and exercise patterns/thoughts (76.5%).</li> <li>2. Intervention had positive influence on subscale score for eating for physical rather than emotional reasons.</li> <li>3. Reduction in perceived barriers to eating healthy post intervention.</li> <li>4. Over 65% of intervention group progressed along the stages of change scale in relation to exercise (only 20% of control did).</li> </ol>
Leblanc et al. (2012)	Randomised control	To determine changes in dietary intakes and eating patterns in response to a HAES intervention compared to social support	Free-living premenopausal overweight/obese (BMI 25 – 35 kg m <sup>2</sup> ) women (HAES = 48, social support (SS) = 48 and control = 48)	<p>Randomly assigned to 4 month intervention period (HAES =13 x 3 hour weekly sessions + one full day, SS = 14 x 2 hour weekly sessions). Outcomes assessed at baseline, 4 months (end of intervention)</p>	<ol style="list-style-type: none"> <li>1. Energy intake and snack frequency decreased similarly across the 3 groups.</li> <li>2. HAES group showed that a decrease in hunger and external hunger were associated with a decrease in total daily energy intake (<math>p&lt;0.001</math> for both).</li> </ol>
Leske et al. (2012)	Randomised control trial	To assess the impact of a HAES intervention on psychological variables	Free-living premenopausal overweight/obese (BMI 25 – 35 kg m <sup>2</sup> ) women (HAES = 48, social support (SS) = 48 and control = 48)	<p>Randomly assigned to 4 month intervention period (HAES =13 x 3 hour weekly sessions + one full day, SS = 14 x 2 hour weekly sessions). Outcomes assessed at baseline, 4 months (end of intervention), at 6 months and</p>	<ol style="list-style-type: none"> <li>1. Long-term HAES group continues to improve post intervention compared to SS and control.</li> <li>2. HAES group psychological variables still improving at one year.</li> <li>3. HAES group weight remained stable at one year compared to SS and control who regained.</li> </ol>

one year.				
Provencher et al. (2007)	Randomised control trial	To assess the effects of a HAES intervention on eating behaviours and appetite ratings.	Free-living premenopausal overweight/obese (BMI 25 – 35 kg m <sup>2</sup> ) women (HAES = 48, social support (SS) = 48 and control = 48)	<p>Randomly assigned to 4 month intervention period (HAES = 13 x 3 hour weekly sessions + one full day, SS = 14 x 2 hour weekly sessions). Outcomes assessed at baseline, 4 months (end of intervention)</p> <ol style="list-style-type: none"> <li>1. Decreases in susceptibility to hunger and external hunger were observed in the HAES group compared to the SS group.</li> <li>2. HAES group had a larger decrease in desire to eat and hunger when compared to control group.</li> <li>3. No significant difference in weight loss at end of intervention across the groups.</li> </ol>
Provencher et al. (2009)	Randomised control	To assess the long-term effects of HAES intervention on eating behaviours, appetite sensations, metabolic and anthropometric variables and physical activity.	Free-living premenopausal overweight/obese (BMI 25 – 35 kg m <sup>2</sup> ) women (HAES = 48, social support (SS) = 48 and control = 48)	<p>Randomly assigned to 4 month intervention period (HAES = 13 x 3 hour weekly sessions + one full day, SS = 14 x 2 hour weekly sessions). Outcomes assessed at baseline, 4 months (end of intervention) and 6 months and 1 year post intervention. Measured eating behaviours, appetite ratings, BMI, waist and hip circumferences, blood lipids and BP and exercise levels.</p> <ol style="list-style-type: none"> <li>1. HAES and SS groups showed a significant decrease in susceptibility to hunger over time (<math>p &lt; 0.0001</math> and <math>p &lt; 0.008</math>).</li> <li>2. No significant changes in a anthropometric measures for any group.</li> <li>3. 63% of HAES group maintained a lower weight at 1 year post intervention when compared to baseline.</li> </ol>
Rapoport et al. (2000)	Randomised control trial	To evaluate the efficacy of a non-dieting approach to weight management.	Overweight women with BMI $\geq 28$ kg m <sup>2</sup> , aged 18-65 years. Identified by GP as suitable for group weight management treatment. (M-BT = 37, S-CBT = 38)	<p>Assigned to either M-CBT (non-diet) group or S-CBT (standard CBT + diet) group (both 10 x 2 hour weekly sessions). Assessed weight, waist and hip circumferences and ratio, fasting lipids and glucose, body satisfaction, eating behaviours, nutrient intake and treatment acceptability</p> <ol style="list-style-type: none"> <li>1. Similar withdrawal numbers across both groups (6 M-CBT and 6 S-CBT)</li> <li>2. Modest changes in weight at one year (2.0 kg M-CBT and 3.6 kg S-CBT)</li> <li>3. Increased emotional wellbeing – reduced distress, increased activity and fitness and improved dietary intake</li> <li>4. Improvements maintained at one year.</li> </ol>

Tanco et al. (1998)	Controlled comparative treatment	To evaluate a cognitive (CT) group treatment program (including non-diet approach, exercise and alternative coping skills).	Obese (BMI > 30 kg m <sup>2</sup> ) women with previous unsuccessful weight loss attempts. (CT = 20, BT = 21, control = 19)	Assigned to CT program, standard behavioural weight (BT) program or wait-list control. Both intervention groups comprised of 8 x 2 hour weekly sessions. Depression, anxiety, eating behaviours, weight and height were measured at baseline, weeks 4 and 8 and 6 months following treatment.	<ol style="list-style-type: none"> <li>1. Depression, anxiety and eating-related psychopathology decreased significantly over time for the CT group.</li> <li>2. Women in both treatment groups lost significant amounts of weight whereas control group showed a small weight increase.</li> <li>3. At 6 month follow-up improvements were maintained.</li> </ol>
<b>Mindfulness Based Studies</b>					
Bush et al. (2014)	Skill based intervention	To examine efficacy of a workplace mindfulness-based intuitive eating intervention	Adult university women employees (Intervention = 53, waitlist control = 71)	Work-site based 10 x 1-1.5 hour weekly group intervention. Assessed at baseline and 10 weeks for intuitive eating, body appreciation, mindfulness and eating behaviours.	<ol style="list-style-type: none"> <li>1. Class attendance averaged 8.75 and ranged from 6 to 10.</li> <li>2. Intervention group had significantly higher mean scores for body appreciation, intuitive eating and mindfulness.</li> </ol>
Daubenmier (2016)	Randomised control	To determine whether adding mindfulness-based eating and stress management to a diet-exercise program improves weight loss	Obese (BMI 30 – 45.9 kg m <sup>2</sup> ) men and women (Mindfulness = 100, Control = 94)	Assigned to 5.5 month diet-exercise intervention with or without mindfulness components. both included 16 x 2 -2.5 hour sessions - 12 weekly, 3 biweekly and 1 monthly) Assessed at baseline, 3, 6, 12 and 18 months. Intention to treat analysis applied.	<ol style="list-style-type: none"> <li>1. Session attendance similar for both groups (74.7% and 71.2%).</li> <li>2. Estimated effects flavoured mindfulness arm compared to control for weight loss at 12 months</li> <li>4.</li> </ol>
<b>Other Studies</b>					
Ahern et al. (2012)	Randomised control	To identify the role of eating behaviour traits during weight loss.	Overweight/obese (n=772).	Weight, dietary intake and eating behaviours were assessed at baseline, 6 and 12 months. Adjusted for treatment, gender and baseline measures.	<ol style="list-style-type: none"> <li>1. Decreases in emotional eating were associated with greater weight loss (<math>p&lt;0.001</math>) and larger reductions in energy intake (both <math>p&lt;0.001</math>).</li> </ol>

		2. Decreases in uncontrolled eating were associated with larger weight loss and reduction in energy intake (both $p<0.001$ )	
Kieman et al. (2013)	Randomised trial	<p>To examine whether learning a set of stability skills before losing weight improved long-term weight management</p> <p>Overweight/obese women (27-40kg m<sup>2</sup>), ≥21 years, no chronic conditions and not dieting (n=267)</p>	<p>Intervention included 90-minute group sessions held weekly for 28 weeks.</p> <p>Participants randomised (1:1 allocation) to either Maintenance First (MF) included 8 week stability skills course first. Weight loss first (WLF) had an 8 week problem solving course afterwards.</p> <p>Both attended identical 20 week behavioural-weight loss program. 12 month follow-up post intervention.</p> <p>1. 93.3% retention rate (n=249) at 18 months</p> <p>2. MF group regained significant less weight in the 12 month follow-up period (half as much)</p> <p>3. Twice as many MF participants regained fewer than 2.5kg</p>

The majority of the intuitive and mindful eating research used a group session education structure plus or minus follow-up sessions (Bacon et al., 2002, Borkoles et al., 2016, Bush et al., 2014, Carroll et al., 2007, Cole and Horacek, 2010, Daubenmier, 2016, Kiernan et al., 2013, Leblanc et al., 2012, Provencher et al., 2009, Rapoport et al., 2000, Tanco et al., 1998), with session being between 1-3 hours long and intervention over 6–28 weeks. The studies were not highly reflective of general society, as the majority included only females (Bacon et al., 2002, Katzer et al., 2008, Leblanc et al., 2011, Provencher et al., 2007, Provencher et al., 2009, Rapoport et al., 2000, Tanco et al., 1998) and others used only university students (Anglin, 2012a, Humphrey et al., 2015, Keeler et al., 2013). Subject numbers were a limiting factor for a number of studies which tended to have less than 20 participants (Anglin, 2012b, Kausman et al., 2003, Keeler et al., 2013, Rapoport et al., 2000, Tanco et al., 1998) and participant numbers varied widely, from 16 to 772.

The main purpose of an intuitive eating approach is to promote improved general health and health behaviours. Results from multiple studies showed that intuitive eating does decrease emotional eating (Ahern et al., 2012, Keeler et al., 2013) and reduce dieting behaviours (Bacon et al., 2002, Cole and Horacek, 2010) and those focusing on hunger levels also showed decreases in hunger and desire to eat (Leblanc et al., 2012, Provencher et al., 2007, Provencher et al., 2009). While weight loss is not the main focus of this approach, research showed that decreases in emotional eating and uncontrolled eating can be associated with larger weight loss (Ahern et al., 2012) and completion of the programme alone was a influencing factor for significant improvements in weight for one study (Bradshaw et al., 2010).

Why a person completes or does not complete a programme was not investigated in the majority of the studies. Bradshaw et al (2010) identified that if a woman was more highly educated and had healthier nutrition behaviours at the beginning of a programme then they were more likely finish programme. Of the 119 participants, 69 (58%) completed at least eight or the ten sessions and at 12-month follow-up had lost on average 0.5kg compared to 2.6kg gained by non-completers. However Eckman et al. (2012) found no relationship between literacy levels and outcomes and the effectiveness of educational intervention for patients with chronic diseases. It was found that those with lower health literacy benefited as much as those with higher levels.

Results from two studies (Rapoport et al., 2000, Tanco et al., 1998) including a cognitive approach alongside the non-diet approach supported earlier research and the belief that CBT helps people to control their eating habits and improve food intake (Miller, 2002). Both studies reported

improvements in emotional wellbeing, reduced distress and Tanco et al. (1998) also reported significant weight reduction for the intervention groups. Previously Werrij et al. (2009) found that including cognitive therapy into dietetic practice was associated with decreasing eating concerns and less weight relapse in participants; only 6% compared to 38% when no cognitive therapy was included.

## 2.4 Assessing Change in Weight Management

### 2.4.1 Anthropometric Measurements

Aligned with a non-dieting approach the main objectives of this study were not to lose weight but to improve eating behaviours and relationship with food. While standard anthropometric measurements (weight, height, waist and hip) were taken during the study, observing changes in these were not required at the end of the study, but rather maintenance was a desirable outcome.

Weight and body mass index (BMI) are the most commonly used measurements to identify and monitor obesity. Weight and height are used to estimate body fat in the form of BMI. Weight and height tend to provide an accurate BMI calculation however BMI has the limitation that it doesn't distinguish body fat from lean mass or bone. BMI may also fail in the older population, since as people age lean body mass decreases which means what is remaining is fat mass (O'Neill, 2015). After reviewing literature (Stevens et al., 2006) suggested the following parameters to define weight changes in relation to initial weight:

- Weight maintenance  $\pm < 3\%$
- Small but insignificant change 3.0 – 4.9%
- Clinically relevant change  $> 5\%$

Waist and hip circumferences assess visceral fatness and are both cheap and effective measurements to take. Waist circumference has been shown to be most accurate at measuring obesity across ethnic groups compared to BMI and bioimpedence (O'Neill, 2015). It is thought that fat accumulation around the hip area may help limit the health impact of abdominal fat (James, 2004). A limitation of waist and hip measurements is that they may have larger error factor compared to weight, as measurements may be recorded differently from person to person. The ideal method for taking a waist measurement is to use a non-stretch tape at the midpoint between the last palpable rib and the top of the iliac crest. Men are classed as “high risk” of obesity when the waist circumference measures 102cm or greater and women when it is greater than 88cm (O'Neill, 2015).

#### 2.4.2 Quality of Life

Quality of Life (QOL) is defined as the general well-being of an individual. It is subjective and affected by both the positive and negative influences on an individual. QOL generally covers overall life satisfaction, but can also be broken down into other domains such as employment, finances, and family situation, social and physical health.

Weight gain and weight loss can affect a person's perceived QOL. The psychological effect of dieting is well documented and previous studies (Brinkworth et al., 2016, Brownell and Rodin, 1994, Venditti et al., 1996) have shown that following certain diets, overweight or obese individuals reported increased psychological mood. Brinkworth et al. (2016) went on to examine the long-term effect on mood of a low or high carbohydrate and found that both diets had significant weight loss and improved quality of life, mood and had an on-going positive affect on mood.

#### 2.4.3 Eating Behaviours

##### *Intuitive Eating Scale-2 (IES-2)*

The Intuitive Eating Scale (IES) was developed by Tylka (2006) to measure intuitive eating levels. The 21-item *Intuitive Eating Scale* covers the following three domains 1) unconditional permission to eat; 2) Eating for physical rather than emotional response; and 3) Reliance on hunger and satiety cues. Tylka and Van Diest (2013) further developed the scale in 2013. The *Intuitive Eating Scale-2 (IES-2)* is an improvement on the original IES, as it is validated for men as well as women and includes a fourth focus on honouring one's health via 'gentle nutrition'.

The IES and IES-2 has been used in research showing a linear relationship with BMI, that is the more intuitive the eater the lower the BMI. The original IES was used in a New Zealand study (Madden et al., 2012) that investigated responses to hunger and satiety signals and the association with BMI. Results showed that females with a higher BMI tended to eat in response to emotional and situational influences more than those with a lower BMI. They also concluded that those who binge-eat may benefit from intuitive eating training. Another study (Ahern et al., 2012) showed the importance of the role of eating behaviours in relation to weight loss. The findings showed that individuals increased cognitive restraint, experienced less uncontrolled eating and decreased emotional eating, which resulted in greater weight loss and decreased energy intake.

##### *Dutch Eating Behaviour Questionnaire (DEBQ)*

The Dutch Eating Behaviour Questionnaire was developed by van Strien et al. (1986) to measure eating behaviour. It has been used extensively in research and cited in over 800 published papers.

The questionnaire can identify dieters using the restrained eating subscale and also allows change over time to be monitored for dieting behaviours and also in relation to external trigger and emotional eating styles. Three psychological frameworks for the management of eating disorders are the basis for the DEBQ (van Strien et al., 1986).

1. Psychosomatic theory suggests that for some people anger, fear, anxiety or stress results in either loss of appetite, decreased eating and weight loss or an excessive intake of food. This behaviour is classed as emotional eating. Learning to recognise and build insight into emotions, feedings and needs instead of focusing solely on weight (Christopher, 2014).
2. Externality theory suggests that external environmental triggers are the main cause of changes in eating behaviour such as sight, smell and other food-related cues. Therapeutic recommendations focus on modifying eating behaviours, including learning to eat more slowly, adjusting eating style (eg. Taking smaller bites) and avoiding tempting cues (Christopher, 2014).
3. Restraint theory emphasises the need to preserve body-weight ratio to the extent of overriding the body's natural hunger and fullness cues if required. Treatment focus is on relearning hunger and satiety levels and becoming more comfortable with one's weight (Christopher, 2014).

When developing the questionnaire van Strien et al. (1986) showed that emotional eating was associated with weight gain when related to a negative life event. A later study (van Strien et al., 2012) provided similar conclusions, and while physical activity may minimise weight gain in people who are high emotional eaters, this effect isn't the same due to the overconsumption associated with their emotional eating. Koenders and van Strien (2011) in a study of the effect of lifestyle factors concluded that emotional eating is a predictor for weight gain and psychological strategies should be included in programmes to manage weight.

#### 2.4.4 Dietary Intake

Dietary intake can be assessed using a variety of measures including dietary recall, food frequency questionnaires (FFQ) and weighed diet record. England et al. (2015) found it difficult to recommend one tool after completing a systematic review on dietary assessment in the management of obesity, as there are a number of tools available and studies all had differing design and population parameters. A Canadian study reviewed the assessment tools used in Canada and found that the majority of studies used a FFQ (64%), and food records and 24-hour dietary recalls were used in 18% and 14% of the studies, respectively (Kirkpatrick et al., 2017).



Research has been conducted to determine which dietary assessment method is the best to use in studies. FFQ are able to provide more comprehensive data as they are longer but often the number of questions might be a barrier to people completing them correctly. Subar et al. (2001) compared two FFQ differing in length, to identify if a shorter FFQ is better completed and provides improved dietary data. Response rates were similar for both questionnaires (approximately 82%), even though the 16 page FFQ took 30 minutes less to complete than the 36 page FFQ. Another study looked at the advantages of the telephone interview 24-hour dietary recall versus four day food records (Buzzard et al., 1996). While they found that the 24-hour dietary recall under reported mean energy (8%) and mean fat intake (11%) when compared to the food records, they also concluded that the 24-hour may still be a favourable fat intake assessment tool compared to multiple days of food records from a compliance perspective, as the food records over estimated fat intake reduction by approximately 40% at six months and 25% at 12 months.

# Chapter Three: Methodology

## 3.1 Study Design

This study was a 28-week evaluation of a four-week intervention programme. Participants acted as their own control to ensure that there were no dietary or lifestyle changes made prior to the intervention, waiting a minimum of one month and a maximum of three months until the group intervention period began. Within the public health system it was also not ethical to make a separate control group from the patients referred and have them waiting over six months for intervention. Participants were followed up post group intervention at four weeks, eight weeks, twelve weeks and 24 weeks (see figure 3.1).

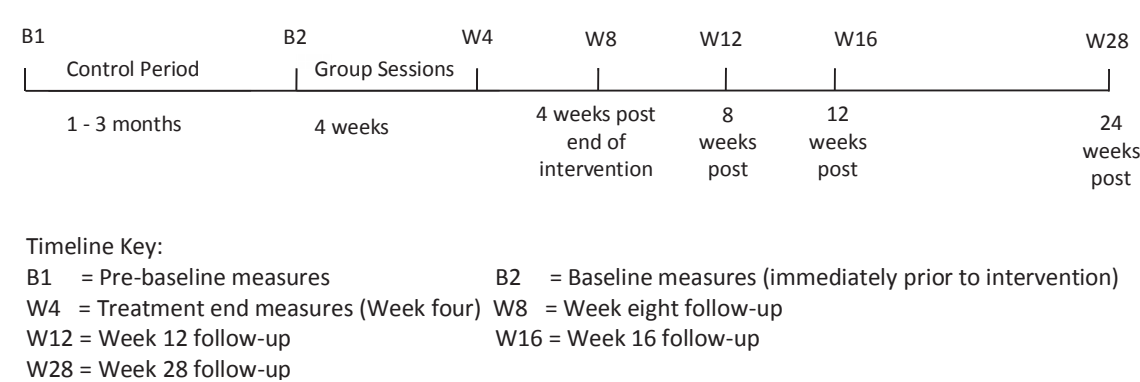


Figure 3.1: Study timeline

## 3.2 Ethical Approval

Ethics approval was obtained via HDEC-Expedited Review pathway from the Northern B Health and Disability Ethics Committee in July 2014. Written informed consent (see Appendix A) was also obtained from all participants prior to attending group education sessions.

## 3.3 Participants and Recruitment

A total of 49 participants were recruited in Auckland, New Zealand. The research was conducted within Waitemata District Health Board Nutrition and Dietetic Services' outpatient service. The Nutrition and Dietetics Service received weight management referrals for patients from specialists and Waitemata District Health Board staff. All patients referred to the Nutrition and Dietetic Services' outpatient service at North Shore and Waitakere Hospitals between July 2014 and August 2015 were screened for eligibility. Exclusion criteria included having a BMI <25, being under 18 years of age, having a learning difficulty or being on medication which affected weight and appetite (see Figure 3.2 for details of the recruitment process). Those eligible for the study were invited to participate in the evaluation programme. If any participants recruited choose not to participate or to withdraw from the study after giving consent, then they had the option to continue to receive

“treatment as usual”. “Treatment as usual” included attending the group sessions and been provided with the opportunity to attend up to three follow up individual sessions with the Dietitians within Nutrition and Dietetic Services.

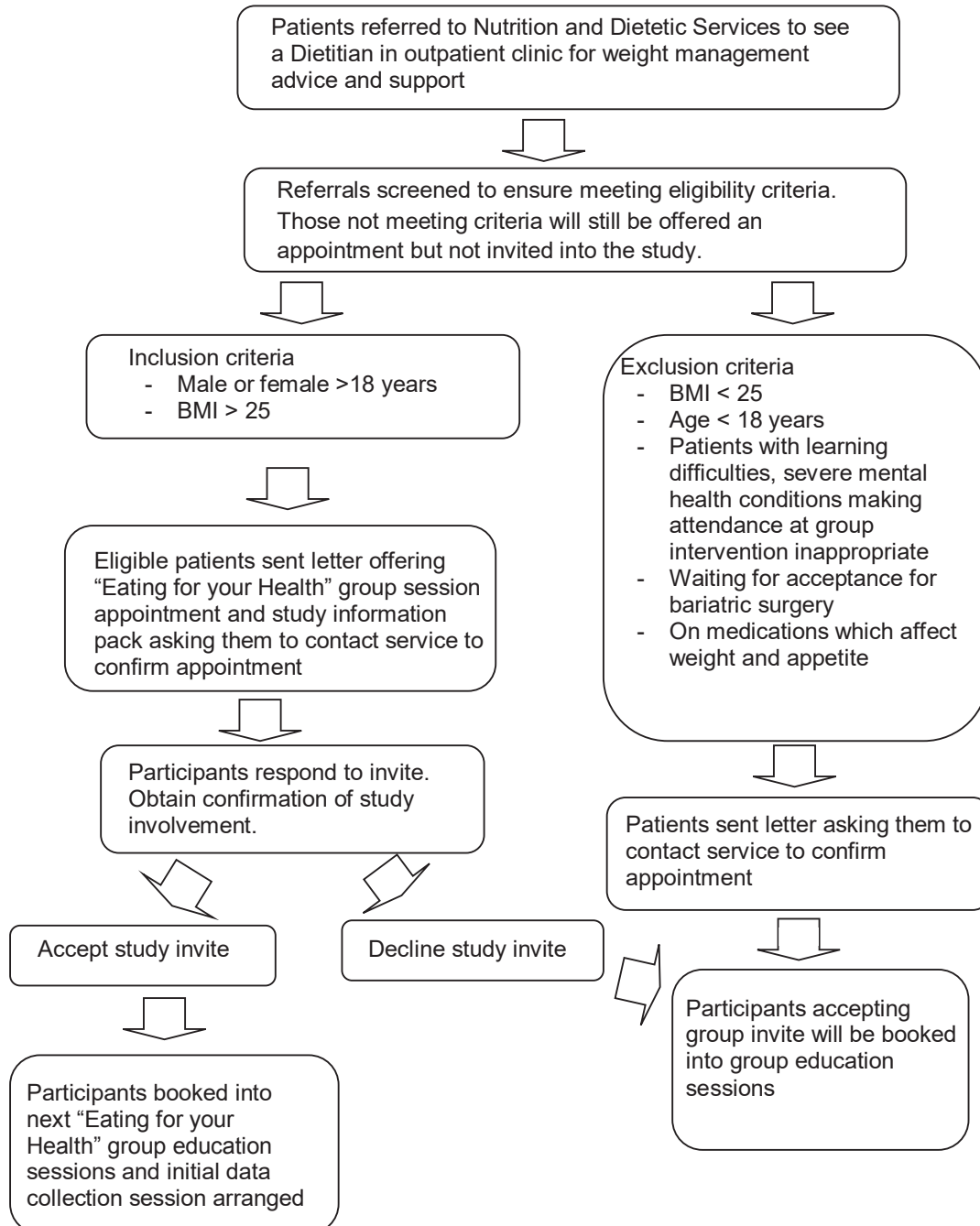


Figure 3.2: Recruitment of participants

### 3.4 Eating for your Health Intervention Programme

The “Eating for your Health” group education sessions used for this research had been previously trialled and participant acceptability evaluated by the researcher in 2012. A non-dieting approach was used across both the group and individual sessions and the programme emphasised eating awareness based on the “If not dieting” programme (Kausman, 1998). While information regarding food portions and reading labels was included in the nutrition session (see Table 3.1 session 3). The information was provided as a guide only and emphasised the nutritional qualities of the food and benefit to health and wellbeing. Within this section food was referred to in the context of ‘everyday’ and ‘sometimes’ food and hunger and eating awareness and mindful eating was regularly discussed alongside. Participants were reminded that “I can have it if I want it, but do I really feel like it?” and if they wanted it, then to eat mindfully.

Cognitive Behaviour Therapy (CBT) principles (Beck, 2008, Froggatt, 1993) had also been incorporated into the four week programme. Cognitive and behavioural tools and strategies were added to the programme to help support participants to change their thinking and behaviours around eating and food (see Table 3.1 for details). The cognitive focus is specifically helpful for emotional eaters and the behavioural components of the programme target those who have high levels of eating in response to external triggers (Christopher, 2014).

The aim of the “Eating for your Health” programme is to:

- Emphasise health gain not weight loss
- Focus on health behaviours not weight
- Support patients to make changes
- Specifically target: physical activity, the role of cognitions, eating awareness and non-hungry eating (eating when not physically hungry) and speed of eating

Participants were seen in a small group setting with approximately ten participants per group. Participants were able to bring along a support person to each session. The group education sessions consisted of 1.5 hours per week over a four week consecutive period. Sessions were held in the early evening on the hospital grounds. The group sessions were based on a standard session plan (see table 3.1) and used active learning principles. Homework activities were discussed and identified at the end of each session for the participant to complete during the upcoming week. A focus is on reflection and empowering the participant to make the changes that are relevant and appropriate for them.

The groups were facilitated by the researcher, a NZ Registered Dietitian trained in a non-diet approach and CBT and/or a second NZ Registered Dietitian trained in the non-diet approach and CBT by the researcher. All resources used within the group sessions were funded by Waitemata District Health Board. All attendees at the group sessions received a support pack at week one of group sessions (B2) which included the four week programme plan and also the worksheets and information sheets for the week one session. At following group sessions participants were given relevant worksheets to add to the pack.

Table 3.1: *Group Session Structure*

Week	Topic	Explanation
One	Non-diet approach	Discussion on why diets don't work. Emphasis on no foods being off limits and allowed to eat anything. "Pink elephants" activity – highlighting avoidance versus desirability Focus on identifying the "why and how" of eating how to make sustainable changes with a focus on health outcomes other than weight
	Motivation for making changes	Activity identifying own motivation for making changes Activity identifying importance and confidence levels and barriers to change (Sobell and Sobell, 2008) Cycle of Change and Relapsing
	Introduction to Thoughts (Froggatt, 1993)	Introducing the role of cognitions and unhelpful thoughts
	Eating awareness and non-hungry eating (Kausman, 1998)	Introduction to non-hungry eating and the reasons why we eat
	Homework discussion	Homework activity "Eating Awareness Diary"
Two	Reflection on previous week	Discussion regarding homework and what they observed/learnt Commend positive changes/learnings
	Role of our thoughts in weight management	ABC Model (Froggatt, 1993) and link between thoughts and behaviours
	When things don't go to plan	Behaviour Chain activity identifying tools and strategies for changing unhelpful behaviours
	Mindful eating (Albers, 2012)	Activity practising mindful eating using a raisin Second activity using chocolate which showing how to use satisfaction levels to manage eating
	Stopping overeating (Beck, 2008)	Group discussion about overeating and options for reducing eating / linked to mindful eating
	Homework	Participant identified at least one activity from either week two or one that they would work on during the week
Three	Reflection on previous week	Discussion regarding homework and what they observed/learnt during the week
	Every day and Sometimes foods (Kausman, 1998)	No "good" or "bad" foods Everyday foods = foods with benefits – nutrients for better health Sometimes foods = tasty food to be enjoyed rather than providing nutrients for health No foods off limits – "I can eat it if I want it, but

		do I really feel like it?"
	Foods for good health	Discussion and activity on four food groups and portion size guides in relation to 'everyday' and 'sometimes' foods Food's nutritional qualities and benefits to health discussed Portions given only as a guide to understand amounts of food. Related back to hunger awareness and mindful eating (Food groups from NZ Eating and Activity Guidelines and plate model introduced)
	Reading labels	Emphasis that reading labels is a tool to support person to identify more nutritious foods for health and wellbeing. Practical activity practising reading a variety of food packages and what to look for on the nutrition information labels. Discussed in relation to foods being "Everyday" or "Sometimes" and that there are no foods off limits.
	Homework	To practice reading labels at home and participant also identified at least one other activity from previous weeks that they will work on during the week
Four	Reflection on previous week	Discussion regarding homework and what they observed/learnt during the week
	Exercise (Ministry of Health, 2015b)	Why exercise is important/ Benefits of exercise Types of exercise Starting, maintaining or increasing exercise levels
	Being prepared	Importance of planning and being prepared and how to plan and prepare (Beck, 2008)
	Looking after oneself (Beck, 2008)	Holistic approach to health – importance of keeping all sides in balance. Activity regarding giving self-credit for changes made or when achieve what planned on doing
	Goal setting	Identifying non-weight based goals going forward and how will achieve. Goals were determined by the participant and what was relevant for them.
	Plan going forward	Summary of sessions Participant identifies what they will continue to do Follow-up sessions

Participants were all scheduled to see the Researcher/Dietitian in an individual appointment at weeks 8, 12, 16 and 28 post group interventions. The appointment lasted for up to 30 minute and was held in the Dietitian Outpatient Office on the hospital grounds. The individual sessions had the same non-dieting focus of the group sessions and during the individual session the participant reflected on the progress made in the preceding weeks relating to their behaviours, eating habits, and changes they have made. As required aspects of the group sessions were revisited and support and education was provided by the Dietitian; the focus of the individual session was placed on the needs of the participant. Each session varied depending on the changes that the participant had made or where additional information or support was needed. Anthropometric measures were taken and study forms collected as outlined in table 3.2. Attendance was recorded and if a participant was unable to make the appointment, a second appointment was organised for within the week where possible.

### 3.5 Data Collection

Data collection was carried out at multiple time points during the study, as outlined in table 3.2. While this research had a non-diet approach, traditional research outcome measures such as weight, waist and hip measurements and dietary intake were included to better monitor the impact of the intervention for the participants.



Table 3.2: *Study Procedure/Data Collection*

Time	Description	Data Collection	Measure Used
B1	Pre-baseline: Start of control period 1-3 months pre group intervention	Demographic information (obtained from hospital patient information system - iPMS)	Age Gender Ethnic group Smoking status Co-morbidities
		Intuitive Eating	IES-2
		Eating Behaviour	DEBQ
		Dietary Intake	Healthy guidelines questionnaire Plate Model 24-hour dietary recall
		Anthropometric	Weight (kg), Height (cm), circumferences (cm)
		Quality of Life	Q-LES-Q-SF
B2	Baseline: Immediately prior to Intervention period begins Week 1 group session	Changes made	Assessment Questionnaire
		Intuitive Eating	IES-2
		Eating Behaviour	DEBQ
		Dietary Intake	Healthy guidelines questionnaire Plate Model 24-hour dietary recall
		Anthropometrics	Weight (kg), Height (cm), circumferences (cm)
		Quality of Life	Q-LES-Q-SF
		Confidence Level	Confidence Scale
		Session Evaluation	Questionnaire
W2	Week 2 Group session	Session Evaluation	Questionnaire
W3	Week 3 Group session	Session Evaluation	Questionnaire
W4	Week 4 Group session (final session) End of intervention	Intuitive Eating	IES-2
		Eating Behaviour	DEBQ
		Dietary intake	Healthy guidelines questionnaire Plate Model 24-hour dietary recall
		Anthropometrics	Weight (kg), Height (cm), circumferences (cm)
		Quality of Life	Q-LES-Q-SF
		Confidence Level	Confidence Scale
		Session Evaluation	Questionnaire
W8	Four week post intervention follow-up First individual session Review of participant's progress over the preceding weeks based on	Intuitive Eating	IES-2
		Eating Behaviour	DEBQ
		Dietary intake	Healthy guidelines questionnaire Plate Model 24-hour dietary recall
		Anthropometrics	Weight (kg), Height (cm),

	their own experience.		circumferences (cm)
		Quality of Life	Q-LES-Q-SF
W12	8 week post intervention follow-up: Second individual session Review of participant's progress over the preceding weeks based on their own experience.	Intuitive eating	IES-2
		Eating Behaviour	DEBQ
		Dietary intake	Healthy guidelines questionnaire Plate Model 24-hour dietary recall
		Anthropometrics	Weight (kg), Height (cm), circumferences (cm)
		Quality of Life	Q-LES-Q-SF Questionnaire
W16	12 week post intervention follow-up: Third individual session Review of participant's progress over the preceding weeks based on their own experience.	Intuitive eating	IES-2
		Eating Behaviour	DEBQ
		Dietary intake	Healthy guidelines questionnaire Plate Model 24-hour dietary recall
		Anthropometrics	Weight (kg), Height (cm), circumferences (cm)
		Quality of Life	Q-LES-Q-SF
W28	24 week post intervention follow-up: Study follow-up session	Intuitive eating	IES-2 Intuitive eating scale
		Eating Behaviour	DEBQ
		Dietary intake	Healthy guidelines questionnaire Plate Model 24-hour dietary recall
		Anthropometrics	Weight (kg), Height (cm), circumferences (cm)
		Quality of Life	Q-LES-Q-SF
		Evaluation	Final Questionnaire
		Confidence Level	Confidence Scale
		Programme adherence	Number of sessions attended

IES-2 Intuitive Eating Scale – 2

DEBQ Dutch Eating Behaviour Questionnaire

Q-LES-Q-SF Quality of Life Enjoyment Satisfaction Questionnaire – Short Form

### 3.5.1 Demographic Information

Patient details were collected from the hospital Patient Information System (iPMs) including age at the start of the programme, gender, ethnicity, smoking status and medical co-morbidities. Ministry of Health ethnicity options were used as per hospital collection. Co-morbidities known to have associations with overweight and obesity were recorded from patient records and are shown in Table 3.3 (World Health Organisation, 2000).

Table 3.3 *Relevant co-morbidities*

Co-morbidity
Cardiac
Cancer
Diabetes
Depression
Endocrine
Gastrointestinal disease
Hypertension
Infertility
Liver disease
Osteoporosis
Renal disease
Respiratory disease
Sleep apnoea

### 3.5.2 Anthropometric Measurements

To ensure thorough monitoring of outcomes for the participants anthropometric data were used to identify changes to weight and body shape, this included weight, Body Mass Index (BMI), waist and hip circumferences and waist to hip ratio. Participants were clothed lightly without jackets or sweaters when the researcher or dietitian collected the weight, height and circumference measurements. Weight and height measurements were taken according to the protocol advised by the National Nutrition Survey of New Zealand (Quigley, 1997). Weight was collected on portable scales for home visits and group sessions and standing electronic scales in clinic sessions. All scales were checked for accuracy against each other and are calibrated yearly as per hospital procedure. Weight was accurate to 0.1kg. Height measurements were collected without shoes at the first clinic visit using a wall mounted stadiometer and recorded in centimetres (cm) to the nearest 0.1mm (Stewart et al., 2011). Body Mass Index (BMI) was used as an indicator of level of obesity. BMI was calculated the standard formula: weight (kg) divided by height<sup>2</sup> (m<sup>2</sup>) and recorded to the nearest 0.1unit. Waist and hip measurements were taken to the nearest millimetre over layer of clothing. Waist to Hip ratio was calculated and reported as a ratio to two decimal points (Stewart et al., 2011).

Weight change categories were created using clinically meaningful cut-offs points and applied to the continuous weight change measure (Stevens et al., 2006).

- Weight maintenance  $\pm < 3\%$
- Small but insignificant change 3.0 – 4.9%
- Clinically relevant change  $> 5\%$

### 3.5.3 Tools Used for Assessing Change

A number of questionnaires regarding eating behaviours, intuitive eating ability, quality of life and dietary intake were self-completed by the participant and estimated to take approximately 30 minutes. Table 3.2 details when each questionnaire was completed by the participant. Verbal instructions were given to each participant at the start of the study on completing the questionnaires and each questionnaire had brief written instructions

The initial data collection (B1) was completed during an individual appointment in either the participant's home or a visit to the Nutrition and Dietetic Services outpatient clinic, as preferred by the participant. This session took no more than 60 minutes as the participant had the opportunity to ask questions and the consent form was signed and collected. Aside from the initial data collection session all research forms were sent or given to participants prior to appointments and participants were asked to complete the forms the night before the appointment and to bring completed forms to the appointment with the Dietitian.

Although all participants had agreed to complete post group data and the importance to the study of completing questionnaires and attending appointments was repeatedly stressed. For final data collection participants were contacted via telephone to arrange an appointment and if this approach failed to elicit a response then questionnaires were sent to the home address and they were asked to complete and send back.

### 3.5.4 Quality of Life

The Quality of Life Enjoyment and Satisfaction Questionnaire (Q-LES-Q-SF) (Endicott et al., 1993) (see Appendix B) was used to measure participant's satisfaction using a 5-point likert scale from very poor (1) to very good (5) in relation to 16 different aspects of their life. The last two items in the questionnaire are not included in the scoring but are standalone responses. The scoring of the Q-LES-Q-SF was completed adding the first 14 items to provide the raw total score. The raw total score ranges from 14 to 70, this score was then converted to an overall percentage using Q-LES-Q-SF conversion table (Appendix C).

### 3.5.5 Eating Behaviours and Food Relationship

The primary outcome examined in the study is change in eating behaviours which includes the approach to eating, response to hunger cues and intuitive eating ability. The following two questionnaires were used to identify changes with eating behaviours.

#### *Intuitive Eating Scale (See appendix D)*

The 23-item *Intuitive Eating Scale (IES-2)* (Tylka and Van Diest, 2013) measure a person's intuitive eating ability. The higher the score the more of an intuitive eating style and increased trust in hunger and fullness cues the person has. The scoring used a 5-point likert scale from strongly disagree (1) to strongly agree (5). Reverse scoring was applied to the following items 1, 2, 3, 7, 8, 9, and 10. The following process was followed to score IES-2:

Table 3.4: *Intuitive Eating Scale scoring*

<b>Subscale</b>	<b>Total of Scores</b>	<b>Divide by</b>	<b>Final sub score</b>
<b>Unconditional permission to eat</b> (Items 1, 2, 3, 4, 5, and 6)		<b>6</b>	
<b>Eating for physical rather than emotional reasons</b> (Items 7, 8, 9, 10, 11, 12, 13, and 14)		<b>8</b>	
<b>Reliance on hunger and satiety cues</b> (Items 15, 16, 17, 18, 19, and 20)		<b>6</b>	
<b>Body-Food choice congruence</b> (Items 21, 22, and 23)		<b>3</b>	
<b>Total IES-2</b>		<b>23</b>	

#### *Dutch Eating Behaviour Questionnaire (see appendix E)*

Dutch Eating Behaviour Questionnaire (DEBQ) (Van Strien and Frijters, 1986) which consists of 31 questions was used to identify dominant eating behaviours and also changes to eating behaviours over the course of the study. Answers use a 5-point likert scale from never to very frequently and are scored 1 to 5 respectively, though a reserve score was applied to item 31. Totals for each domain; restrained, emotional and external were calculated using the following:

Table 3.5: *Dutch Eating Behaviour scoring*

Subscale	<b>Restrained</b> (items 1-10)	<b>Emotional</b> (items 11-23)	<b>External</b> (items 24-33)
Total of scores			(reverse score item 31)
Divide by	<b>10</b>	<b>13</b>	<b>10</b>
Final subscale score			

The dominant eating behaviours were identified as the domain with the highest score. Where two or more scores were similar, these were classified as joint dominant. Dominant eating behaviours were analysed for B2 and W28, where there was not a score for W28 then the last recorded score was used.

### 3.5.6 Dietary Intake

Participants completed several questionnaires to identify food group intake and frequency of healthy behaviours. The purpose was to identify changes in food group intake and healthy behaviours over the study period as a group focusing on Ministry of Health (Ministry of Health, 2015c) key messages rather than specific nutrients.

#### *Healthy Guidelines Questionnaire*

The Healthy Guidelines Questionnaire was developed by a previous Masters student and is based on the NZ Eating and Activity guidelines and recommendations (Xia, 2014) (see appendix F). The questionnaire asked how often the participant met each criterion from 1 “not at all” to 6 “always”. The following descriptors were given to numbers 2 through to 5 when analysing the data.

- 2 = rarely
- 3 = occasionally
- 4 = half the time
- 5 = most of the time

#### *Plate Model*

The Plate Model which is a standard teaching tool used by Dietitians to educate regarding healthy meal balance, was used to identify changes in food intake. Participants were required to indicate on a blank circle the proportion of an usual meal which was meat, chicken or alternatives (protein based), breads and cereals (starchy carbohydrate) and vegetables (see Appendix G). The proportion was then calculated as a percentage by the researcher; using a template split into 6.25% amounts (see Appendix H).

### 24 hour dietary recall

Participants were asked to recall all food and drink they ate the day before appointments. Standard cup and spoon measurements were provided to illustrate amounts. The 24-hour dietary recall questionnaire (see appendix I) data was reviewed by the researcher as a group in comparison to the New Zealand Eating and Activity Guidelines (Ministry of Health, 2015c) (see Appendix J) and exchanges were used to calculate number of servings (Table 3.6). Data was separated into the following groups; meat and alternatives, breads and cereals (including starchy vegetables), milk and milk products, fruits, vegetables, fats, sugars and non-water drinks. If an amount was not provided for meats then an assumption was made that the serving size was 120g (four exchanges). Discretionary foods, such as cakes, biscuits and chocolates were assessed using sugar contact as per the package food label.

Table 3.6: *Dietary exchanges for 24-hour food recall*

Food Group	One serving size
Meat and alternative	30g of lean meat 30g of high fat meat + 1 fat exchange 1 egg
Breads and cereals	½ cup cooked cereal, grains, starchy vegetables ½ cup cooked rice or pasta 1 slice bread
Milk and milk products	1 cup of reduced fat milk + 1 fat exchange 1 cup of whole milk + 2 fat exchanges 1 cup of yoghurt 30g of cheese
Fruits	½ cup canned or fresh fruit or unsweetened fruit juice 1 small fresh fruit 2 tablespoons dried fruit
Vegetables	½ cup of cooked vegetables or vegetable juice 1 cup raw vegetables
Fats	1 teaspoon of butter 1 tablespoon of cream/ cream cheese/ salad dressing ¼ small avocado 1 teaspoon of tahini
Sugars	1 teaspoon
Non-water drinks	250ml + sugar in label

Mahan and Raymond (2017)

### Confidence Levels (see Appendix K)

Confidence levels were measured using a standard motivational interviewing technique (Miller and Rollnick, 2014). For example, “What would need to change for you to go from \_\_\_\_ to (a higher

number)?” Confidence levels were recorded at week one (B1) and week four (W4) and at final session (W28). Participants scored on a line marked 1 to 10 where they felt their confidence level was. The researcher then read off the score and recorded for each participant. Participants also reported on evaluation questionnaire at W4 and W28 what had affected their confidence levels.

### 3.5.7 Participant Evaluation of the Programme

Qualitative feedback was gathered from questionnaires and evaluation forms completed focusing on obtaining the participant’s views, thoughts and experiences of the programme. Using a thematic analysis approach responses were then reviewed and themes obtained, these became the categories for analysis (Braun and Clarke, 2006).

### *Assessing Participant Changes Made*

A questionnaire ascertaining what changes were made between B1 and B2 period was completed by the participant prior to starting the group (see Appendix L). The purpose of this questionnaire was to identify if any changes to anthropometric measurements aligned with dietary and activity changes. At W28 participants completed a second questionnaire (see Appendix M) which looked at overall attendance at the program, their perceived changes to eating behaviours, dietary intake and activity levels, current confidence level and perceived intuitive eating levels.

### *Group session Evaluations*

Adherence to programme and activities was measured using a specifically developed session evaluation forms (see Appendices N – Q). Questions included participant’s satisfaction with the session content and activities; and identification of which homework activities the participant intended to complete and did complete.

## 3.6 Statistical Analysis

Statistical analysis was completed using SPSS package (version 22, IBM Corporation, New York, USA). Descriptive statistics were used to analyse the data. A sample size calculation showed that 67 participants were needed to detect significant results at 90% confidence.

Normality tests were completed on the variables using Kolmogorov-Smirnov and Shapiro-Wilk tests. Non-normal data was tested for homogeneity using the Levene’s test. Non-normally distributed data which had significant variance between groups using the Levene’s test was then log transformed and re-checked for normality. Normally distributed data was reported as mean  $\pm$  standard deviation (SD) and data non- normally distributed was reported as median [25<sup>th</sup>, 75<sup>th</sup> percentiles]. A *P* value less than 0.05 was considered significant. The paired-samples t-test results compare changes over time for all anthropometric measures and questionnaire results.



For variables which showed statistically significant differences between groups, effect size was calculated using the following formulas. Paired t-test  $r = \sqrt{t^2 / (t^2 + df)}$ , Wilcoxon Signed Rank test  $r = z / \sqrt{n}$ . An effect size value of 0.10 indicated a small effect, a value of 0.3 indicated a medium effect and a value of > or greater 0.5 indicated a large effect (Field, 2013). Two tailed tests were used for comparisons.

Independent t-tests were conducted between number of overall average score change for all participants and weight change range and number of group or individual sessions attended. Independent t-tests and One-way ANOVA tests were completed to identify any significant inter-group differences in change in eating behaviours in relation to number of group or individual sessions attended. For any significant differences identified Tukey's honestly significant difference test was conducted to identify where the difference between the three individual groups lies. The Wilcoxon test was used for non-parametric data to identify any significant differences.

## Chapter Four: Results

### 4.1 Study Participants

This study focused on examining the effectiveness of an intuitive eating programme to improve eating behaviours and well-being for participants completing the programme. A total of 433 women and men were assessed for eligibility for the study (see Figure 4.1). Of these, 87 failed to meet the inclusion criteria, and of the 346 invited to participate 260 failed to respond to the invitation to attend the group sessions and be involved in the study. Whilst 86 people accepted the invitation for to attend the group sessions, 31 of these declined being involved in the study and six responded too late to be included in the study. A total of 49 participants attended and completed initial data collection session. Of these eight failed to attend any of the group sessions.

Participants were counted as completers of the group sessions if they attended at least three of the four group sessions and one of the three individual sessions. Only 34 participants completed the group sessions as six participants attended only session one and one person failed to attend two of the four sessions. Of these 34 participants, 31 were considered completers at the end of the individual session period. Two participants had withdrawn during the course of the study; one withdrew due to lack of interest in the programme and the other due to having difficulties completing the questionnaires. The third participant was excluded based on failing to complete questionnaires at sufficient sessions (only B1 and B2), being impossible to compare change for this individual through the intervention. The final sample comprised of 28 participants completing the final session.

For data analysis, only complete data sets were included, resulting in differing total numbers at each time point during the study compared to attendance numbers reflected in figure 4.1. Two participants failed to attend the final appointment to have measurements taken but did return questionnaires by mail. Thus, weight-related data was completed for 26 people. One person attended the final appointment but failed to return completed questionnaires.

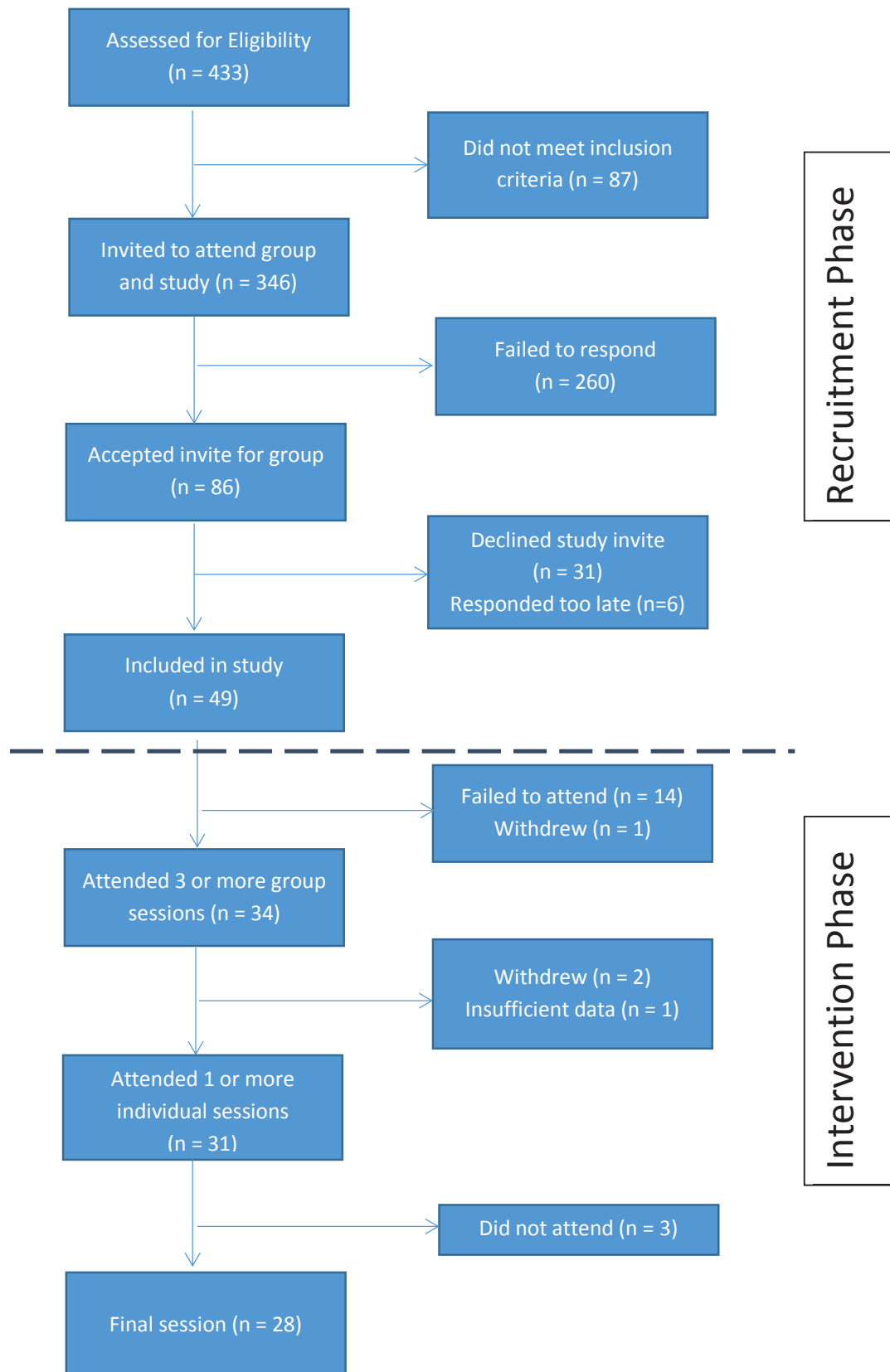


Figure 4.1: Participants involved in recruitment and intervention phases

## 4.2 Participant Demographics

The characteristics of the 49 participants who were recruited to the study are shown in table 4.1. Demographic data was analysed for participants who completed the group and individual sessions (completers) compared to those who did not (non-completers), using data collected at the enrolment/baseline session (B1).

Table 4.1: *Summary of study population characteristics*

<b>Parameters</b>	<b>Completer Participants (n=31)</b>	<b>Non-completer Participants (n=18)</b>
<b>Age, years</b>	51.1±15.24*	49±11.86*
<b>Gender</b>		
<b>Male</b>	3 (10%)	7 (39%)
<b>Female</b>	28 (90%)	11 (61%)
<b>Ethnicity</b>		
<b>Indian</b>	2 (6%)	0
<b>Latin American</b>	1 (3%)	0
<b>Middle Eastern</b>	0	2 (11%)
<b>NZ European</b>	24 (77%)	8 (44%)
<b>NZ Maori</b>	2 (6%)	4 (22%)
<b>Other European</b>	1 (3%)	2 (11%)
<b>Pacific Islander</b>	1(3%)	2 (11%)
<b>Smoking Status</b>		
<b>Non-smoker</b>	15 (48%)	8 (44%)
<b>Smoker</b>	4 (13%)	3 (17%)
<b>Ex-smoker</b>	12 (39%)	7 (39%)

All data reported as frequency unless indicated

\* Mean±SD

Only one participant had none of the identified co-morbidities associated with carrying extra body weight. Nearly 50% of the participants had diagnosed respiratory disease, 35.5% had some form of gastrointestinal disease and approximately 23% of the participants had high blood pressure and osteoporosis respectively. Table 4.2 contains details of the number of positive responses for identified co-morbidities and the proportion of the participants diagnosed with each co-morbidity.

Table 4.2: *Frequency and proportion of co-morbidities amongst participants (n=31)*

<b>Co-morbidity</b>	<b>Number of Responses</b>	<b>Percent of Responses (%)</b>	<b>Proportion of Participants (%)</b>
<b>Cardiac</b>	5	5.4	16.1
<b>Cancer</b>	4	4.3	12.9
<b>Diabetes</b>	10	10.8	32.3
<b>Depression</b>	8	8.6	25.8
<b>Dyslipidaemia</b>	9	9.7	29.0
<b>Endocrine</b>	3	3.2	9.7
<b>Gastrointestinal disease</b>	11	11.8	35.5
<b>Hypertension</b>	7	7.5	22.6
<b>Infertility</b>	5	5.4	16.1
<b>Liver disease</b>	1	1.1	3.2
<b>Osteoporosis</b>	7	7.6	23.3
<b>Renal disease</b>	3	3.2	9.7
<b>Respiratory disease</b>	15	16.1	48.4
<b>Sleep Apnoea</b>	4	4.3	12.9
<b>No co-morbidity</b>	0	1.1	3.2

### 4.3 Anthropometry

The focus of this intervention was on eating behaviours and food relationships rather than weight loss. Therefore the aim of the study was to achieve weight maintenance at least across the intervention period. Anthropometric data was collected at each time point and results are shown in table 4.3. There was no significant change for the pre-intervention control period (B1 to B2) indicating no additional weight loss strategies have been implemented. For on-going analysis B2 parameters were therefore used as baseline. There was no significant change in any anthropometric measurements compared to baseline during the intervention and weight, BMI, waist and hip measurements remained relatively stable overall from baseline to the other time points.

Table 4.3: Anthropometric results

Parameters	B1	B2	P-value	W4	P-value	W8	W12	W16	P-value	W28	P-value	P-value	P-value	P-value
												W16:W28	B2:W16	B2:W28
	n=31	n=31	B1:B2	n=28	B2:W4	n=26	n=22	n=21	W4:W16	n=26				
Weight (kg)	113±26.7	113±26.2	0.37	113±28.1	0.60	112±28.8	115±28.3	106±27.9	0.08	112.04±28.52	0.32	0.13	0.62	
Height (cm)		163±8.4												
BMI, kg/m <sup>2</sup>	42.2±9.3	42.0±9.1	0.37	42.0±9.7	0.65	41.1±9.6	43.4±9.7	39.6±9.0	0.07	41.4±9.6	0.37	0.11	0.52	
Waist	125±20.6	124±21.6	0.31	121±21.3	0.76	120±20.9	120±19.8	118±17.9	0.01*	120.3±19.9	1.00	0.14	0.82	
Circumference (cm)														
Hip	135.6±17.69	134.0±18.3	0.17	135±18.3	0.34	133±18.2	135±18.3	129±16.7	0.01	132.7±8.2	0.78	0.12	0.64	
Circumference (cm)														
Waist – Hip Ratio	0.92±0.07	0.92±0.08	0.33	0.90±0.07	0.33	0.90±0.08	0.88±0.06	0.91±0.04	0.32	0.91±0.06	0.33	0.33	0.33	

All data reported as mean ± SD

\* P-value &lt; 0.05

B1 = Pre-baseline

B2 = Baseline – beginning of group sessions

W4 = End of group sessions

W8 = First individual follow-up

W12 = Second individual follow-up

W16 = Third individual follow-up

W28 = Final data collection session

kg = kilogram, cm = centimetre, m = metre

Non-completer anthropometry was analysed and compared to participant data and results are shown in Table 4.4. At baseline there were no significant differences in anthropometry data between the participants and the non-completers.

Table 4.4: *Anthropometry for non-completers*

<b>Parameters</b>	<b>Completers (n=31)</b>	<b>Non-Completers (n=18)</b>	<b>P-value</b>
<b>Weight (kg)</b>	113±26.2	110±23.4	0.99
<b>Height (cm)</b>	163±8.4	159±14.1	
<b>BMI, kg/m<sup>2</sup></b>	42.0±9.1	41.5±8.3	0.88
<b>Waist Circumference (cm)</b>	124±21.6	126±16.3	0.56
<b>Hip Circumference (cm)</b>	134.0±18.3	136±16.7	0.38
<b>Waist – Hip Ratio</b>	0.92±.08	0.93±.10	0.41

All data reported as mean ± SD

Kg = kilogram, cm = centimetre, m = metre

P<0.05 = significant

An assumption was made with missing BMI values that there was no change and last recorded BMI was used in the analysis of BMI change. Overall, there was a small reduction in mean BMI,  $-0.40\text{kg/m}^2 \pm 1.87$  from baseline to W28, and the median change was  $-0.47\text{ kg/m}^2$ . Body Mass Index (BMI) levels across the study period were grouped according to the WHO BMI classifications (World Health Organisation, 2000). Figure 4.2 represents the number of participants in each category at baseline and final session. At baseline the majority (58%) of the participants were classified with obesity class 3 which equates to having a BMI greater than 40. This number decreased to 52% after six months and there were a greater number of participants with a BMI between 35.0 and 39.9. Of note one person at the final week was now classified in the normal weight range ( $\text{BMI} < 25\text{ kg/m}^2$ ).

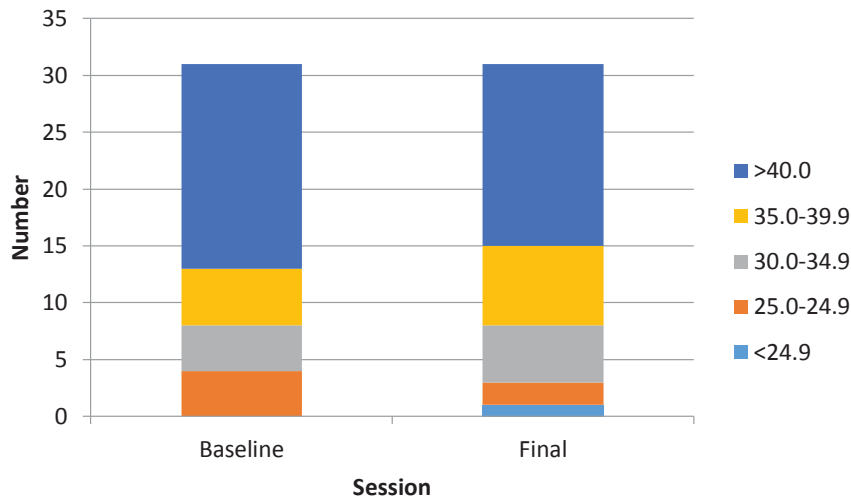


Figure 4.2: Proportion of participants in Body Mass Index classifications at Baseline and Final (n=31)

Weight change was calculated from baseline to last weight collected. Maximum weight loss was -15.2kg and largest weight gain was 6.8kg. The average weight change was  $-0.92\text{kg} \pm 4.93$  and the average percentage weight lost was  $1.1\% \pm 4.85$ . Weight change was analysed further to identify the number of participants who lost a clinically relevant amount of weight, gained weight or maintained weight (see table 4.6).

Table 4.6: Classification of weight change

Weight Group	Weight Change Range	Number of Participants (n=31)	Percent of Participants (%)	Range of co-morbidities	Average number of co-morbidities
Clinically relevant weight loss	>-5%	4	13	1-4	2.5
Small weight loss	-4.9 – -3%	6	19	1-6	2.8
Weight maintenance	-2.9 – 2.9 %	13	42	1-7	3.46
Small weight gain	3 – 4.9%	7	23	0-3	2.14
Clinically relevant weigh gain	>5%	1	3	5	5

For the purpose of identifying an association between co-morbidities and weight change, co-morbidities were grouped into those which make weight loss more difficult (diabetes, depression, endocrine, osteoporosis, respiratory and cardiac) and those co-morbidities which don't impact on weight.



Participants who loss more than 5% of their initial weight are highlighted orange in table 4.7 and participants who loss 3-4.9% are highlighted blue. Those who gained >3% weight are coloured grey. There appears to be no obvious trend between the number of co-morbidities and amount of weight change. The participant who had greatest negative weight change had three co-morbidities including depression and the person with greatest weight gain had 6 co-morbidities, three of which were classified as non-weight influencing. During the intervention, 32% of the participant's loss more than 3% of their initial body weight and 74% of the participants either lost or maintained weight.

Table 4.7: Co-morbidity and weight change by Participant

Weight Influencing Co-Morbidities (WI C-M)										Non-Weight Influencing (NWI C-M)								Total		Weight Change	
Participant	Cardiac	Diabetes	Depression	Endo- crine	Osteo- porosis	Respir- atory	# WI C-M	Cancer	Dys- lipidemia	Gastro	Hyper- tension	Infer- tility	Liver	Renal	Sleep Apnoea	# NWI C-M	# C-M	kg	%		
1			✓				3	✓		✓						2	3	-10.4	-15.2		
2						✓	1			✓						1	2	-15.7	-13.3		
3	✓				✓	✓	3							✓		1	4	-6.4	-6.2		
4			✓				1									0	1	-4.0	-5.7		
5	✓			✓			2				✓					1	3	-4.2	-4.6		
6							0			✓	✓				✓	3	3	-3.2	-4.6		
7							0		✓	✓		✓				3	3	-4.0	-3.3		
8							0			✓						1	1	-3.3	-3.2		
9		✓			✓	✓	3			✓	✓			✓		3	6	-3.7	-3.1		
10					✓		1									0	1	-4.1	-3		
11		✓		✓		✓	3				✓					1	4	-3.1	-2.7		
12		✓	✓			✓	3		✓			✓				2	5	-3.2	-2.7		
13			✓			✓	2									0	2	-2.4	-1.7		
14	✓	✓					2	✓	✓		✓					3	5	-1.1	-1.5		
15					✓		1			✓						1	2	-1.8	-1.5		
16		✓					1		✓						✓	2	3	-1.5	-1.4		
17							0					✓				1	1	-0.8	-0.7		
18	✓	✓				✓	3		✓	✓	✓			✓		4	7	0.0	0		
19			✓				1									0	1	0.0	0		
20			✓			✓	2									0	2	0.2	0.1		
21				✓	✓	✓	3			✓					✓	1	4	0.5	0.3		
22		✓			✓	✓	3									0	3	0.9	0.7		
23		✓			✓	✓	3		✓	✓			✓			3	6	1.6	1.3		
24			✓				1	✓		✓						2	3	3.2	4.1		
25							0									0	0	4.7	4.2		
26			✓				1		✓							1	2	5.2	4.2		
27		✓				✓	2	✓								1	3	5.8	4.4		
28						✓	1					✓				1	2	4.8	4.5		
29		✓					1		✓			✓				2	3	6.8	4.8		
30						✓	1			✓						1	2	5.6	4.9		
31	✓					✓	2		✓		✓				✓	3	5	5.3	6.8		

#### 4.4 Quality of Life

An increase in satisfaction level (rating out of five) and overall percentage across the study period was expected to be seen (see Table 4.8). Participants reported satisfaction levels improved over the study period from a median [25<sup>th</sup>, 75<sup>th</sup> percentile] baseline score of 3 [3, 4] to a W16 score of 4 [3.75, 5] ( $Z=-2.39$ ,  $P=0.17$  (2-tailed), moderate effect size  $r=0.42$ ). Overall the percentage improvement one month after group sessions finishing was significant ( $P=0.04$ ), increasing from baseline percentage of 52.7% to 58.7% at W8. The improvement of perceived QOL remained high at final data collection (60.2%), though not significant. Overall there was an increase in participant's perceived quality of life during the study period.

Table 4.8: Reported Quality of Life across sessions

Parameters	B1	B2	P-value B1:B2	W4	P-value B2:W4	W8	W12	W16	P-value W4:W16	W28	P-value W16:W28	P-value B2:W16	P-value B2:W28
Quality of Life	n=31	n=27		n=24		n=28	n=23	n=19		n=26			
Satisfaction level	4 [3, 4]	3 [3, 4]	0.43	4 [3, 5]*	0.01	4 [3, 4.75]*	4 [3, 4]*	4 [3.75, 5]	1.00	4 [3, 5]	1.0	0.02*	0.15
Overall Percentage (%)	51.7±18.8	52.7±15.6	0.21	60.2±15.3	0.08	58.7±16.2*	58.4±19.5*	63.9±16.3	0.75	60.2±20.7*	0.37	0.26	0.10

All results reported as mean, SD unless indicated

Satisfaction levels reported as median (25<sup>th</sup>, 75<sup>th</sup>)

\*  $P < 0.05$  compared to B2

B1 = Pre-baseline

B2 = Baseline – beginning of group sessions

W4 = End of group sessions

W8 = First individual follow-up

W12 = Second individual follow-up

W16 = Third individual follow-up

W28 = Final data collection session

All sessions compared to B2

## 4.5 Eating Behaviours and Food Relationships

A comparison of psychological factors and eating behaviours changes over time relating to the IES-2 and DEBQ are displayed in table 4.8. Total responses differ at each time point depending on participant response rates. A number of participants also failed to complete the second page of DEBQ at different sessions, affecting scores for emotional and external trigger eating. Information for these sections was removed from data analysis. To identify dominant eating behaviours and change over the study period all calculations used week one of group sessions (B2) as baseline level.

### 4.5.1 Intuitive Eating Scale-2

The expected outcome for the IES-2 was for participant's scores to increase over time as this reflects an increase in intuitive eating practices and a reduction in dieting practices.

There was no difference seen in the "Unconditional permission to eat" score of the IES-2 which reflects the level of dieting practice (Table 4.9). However, a significant positive change was seen in both "Eating for physical rather than emotional reasons" and "Reliance on hunger/satiety cues" which reflects a move towards more intuitive eating practices. These improvements were maintained over the six month period. Emotional eating levels decreased as eating for physical reasons increased from  $2.87 \pm 0.80$  to  $3.30 \pm 0.73$  at W4 ( $t = -3.01$ , 22 df,  $P = 0.01$ ),  $3.30 \pm 0.69$  (W12) ( $t = -3.076$ , 22 df,  $P = .006$ ),  $3.36 \pm 0.90$  (W16) ( $t = -3.52$ , 18 df,  $P = 0.00$ ) and again to  $3.44 \pm 0.72$  ( $t = -3.37$ , 25 df,  $P = 0.00$ ) after six months. This result was also supported by the increase in reliance on hunger/satiety cues which was  $2.80 \pm 0.95$  at baseline and increased to  $3.29 \pm 0.72$  at W4 ( $t = -3.54$ , 22 df,  $P = 0.00$ ) and increased further to  $3.38 \pm 0.83$  at six months ( $t = -3.17$ , 25 df,  $P = 0.00$ ). A change was also seen in "Body-food choice congruence" over the study period, although the only significant improvement compared to baseline was seen four weeks after group finished; increasing from 3.34 to 3.61 ( $t = -2.22$ , 22 df,  $P = 0.04$ ).

Table 4.9: Changes to eating behaviours results across sessions

Parameters	B1	B2	P-value B1:B2	W4	P-value B2:W4	W8	W12	W16	P-value W4:W16	W28	P-value W16:W28	P-value B2:W16	P-value B2:W28
<b>Intuitive Eating Scale-2</b>													
	n=31	n=28		n=23		n=27	n=23	n=19		n=26			
<b>Unconditional permission to eat</b>	3.22±0.81	2.93±0.55	0.11	2.90±0.51	0.93	2.77±0.46	2.85±0.60	2.80±.63	0.70	3.01±0.53	0.31	0.62	0.94
<b>Eating for physical rather than emotional reasons</b>	2.71±0.82	2.87±0.80	0.31	3.30±0.73*	0.01	3.30±0.74	3.30±0.69*	3.36±.90*	0.55	3.44±0.72*	0.86	0.00	0.00
<b>Reliance on hunger/satiety cues</b>	2.70±0.86	2.80±0.95	0.52	3.29±0.72*	0.00	2.98±.79*	3.14±0.80	2.82±1.00*	0.33	3.38±0.83†	0.23	0.01	0.00
<b>Body-food choice congruence</b>	3.17±0.93	3.34±0.86	0.14	3.62±0.68†	0.04	3.61±0.84	3.46±0.73	3.70±0.93	0.93	3.60±0.71	0.38	0.13	0.15
<b>Total Score</b>	2.88±0.48	2.93±0.54	0.47	3.25±0.41*	0.00	3.20±0.40*	3.16±0.43†	3.26±0.57*	0.37	3.31±0.41*	0.81	0.00	0.00
<b>DEBQ</b>	n=31	n=27		n=22		n=26	n=22	n=17		n=25			
<b>Restrained</b>	2.55±0.95	2.69±0.68*	0.15	2.90±0.64	0.74	2.97±0.61	3.07±0.81	2.71±0.68	0.32	2.70±0.76	0.68	0.67	0.78
<b>Emotional</b>	2.71±1.13	2.67±1.04*	0.81	2.23±1.03†	0.01	2.17±0.95	2.03±0.93†	2.01±0.90†	0.02	1.98±0.86	0.71	0.01	0.00
<b>External</b>	3.06±0.67	3.05±0.84*	0.74	2.61±0.56†	0.01	2.55±0.70†	2.55±0.69†	2.64±0.70†	0.43	2.56±0.63†	0.18	0.02	0.00

All results reported as mean, SD unless indicated

†  $P < 0.05$  compared to B2

\*  $P < 0.025$  compared to B2

B1 = Pre-baseline

B2 = Baseline – beginning of group sessions

W4 = End of group sessions

W8 = First individual follow-up

W12 = Second individual follow-up

W16 = Third individual follow-up

W28 = Final data collection session

Figure 4.3 illustrates the changes in IES-2 sub-scores and the overall trend in change. Eating for physical rather than emotional reasons was the only score which continued to increase across the study period. Reliance on hunger and Total score fluctuated across the intervention but still improved overall.

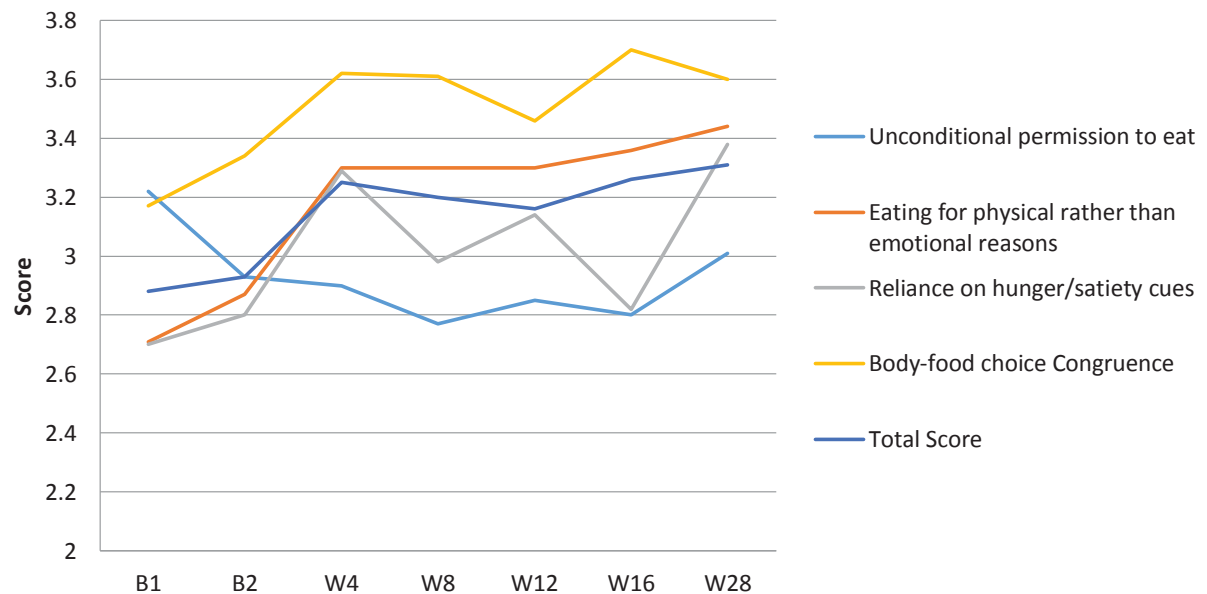


Figure 4.3: Change in IES-2 mean sub-score results over study period

#### 4.5.2 Dutch Eating Behaviour Questionnaire

The DEBQ ‘restrained’ sub-score reflects the level of dieting practice, the ‘emotional’ sub-score reflects eating in response to emotions and the ‘external’ sub-score relates to effect of external triggers on eating practices. It was expected that the participants would have a combination of dominant eating behaviours and an expected outcome of the intervention is to have a reduction in all the eating behaviour scores as the participant moved towards more intuitive eating practices.

At the beginning of the study period, both ‘restrained’ and ‘external’ were dominant eating behaviours for nearly 60% (n=18) of the participants (see table 4.10). At W28, the ‘restrained’ dominance had increased to 68% of the participants, while ‘external’ decreased to 42%. The frequency of ‘emotional’ being a dominant eating behaviour was around 50% at the beginning but this decreased considerably to only 19% (n=6) at the end of the study period.

Table 4.10: Participant dominant eating behaviours at B2 and W28 (n=31)

Session	DEBQ dominant eating behaviour		
	Restrained	Emotional	External
<b>B2</b>	18 (58%)	15 (48%)	18 (58%)
<b>W28</b>	21 (68%)	6 (19%)	13 (42%)

In relation to the change in DEBQ results (Table 4.9), there was no significant difference seen in the average (mean, SD) restrained eating score (which represents dieting practices) across the study period (Figure 4.4). There were also no inter-session significant changes in scores for any of the three domains. However, there were significant decreases in average emotional eating and external trigger scores after group sessions (W4) when compared to baseline ( $2.67 \pm 1.04$  and  $3.06 \pm .67$  respectively). The improvements were maintained six months after group finished, decreasing to  $1.98 \pm .86$  ( $t=3.481$ , 20 df,  $P<0.00$ ) for the emotional score and  $2.56 \pm .63$  ( $t=3.715$ , 20 df,  $P<0.00$ ) for the external trigger score.

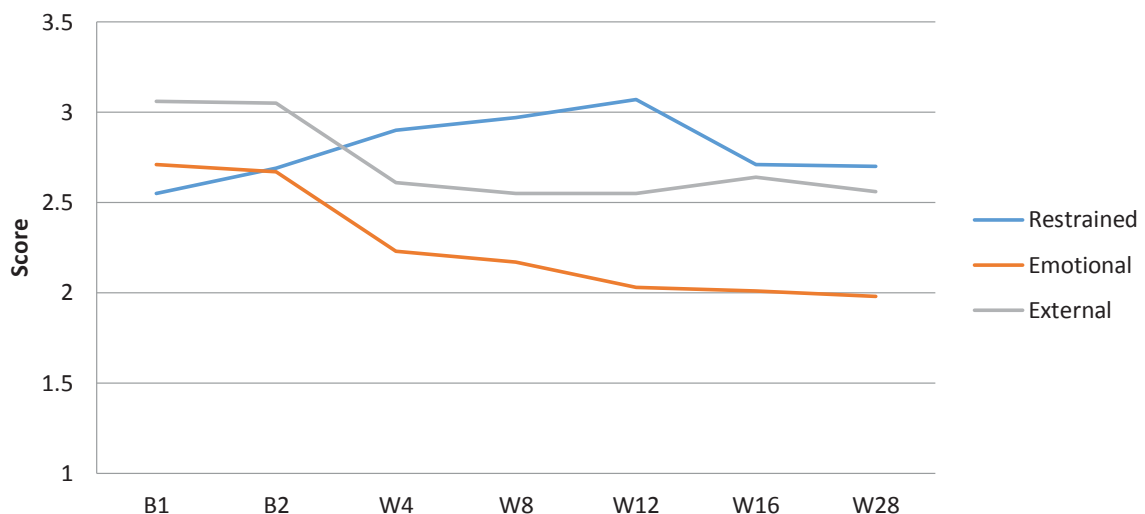


Figure 4.4: Change in DEBQ scores results over study period

## 4.6 Dietary Intake

Over the course of the study it was expected to see an improvement in food intake choices as it is expected that their knowledge would improve and participants would strive to adopt healthier eating behaviours.

### 4.6.1 Healthy Guidelines

The Healthy Guidelines questionnaire asked nine questions based on the NZ Food and Nutrition



Guidelines. The percentage of participants choosing each response was calculated using W28 score of the score recorded at the last session attended (see figure 4.5).

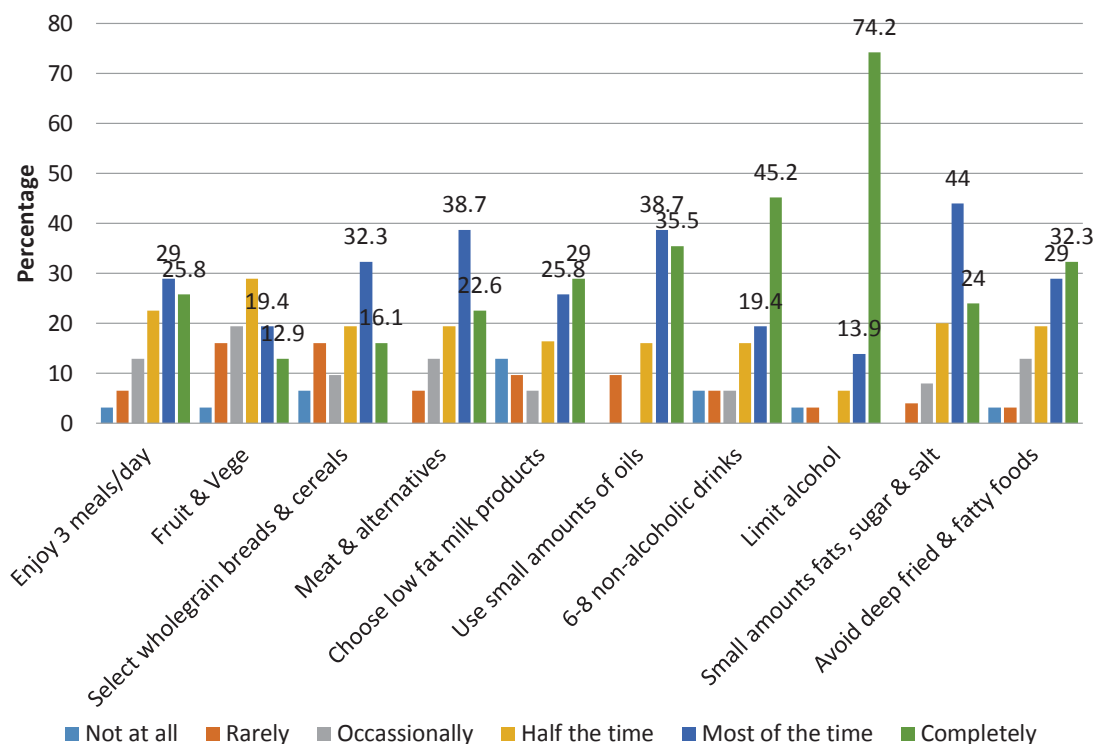


Figure 4.5: Frequency of responses to Healthy Guidelines questionnaire (n=31)  
See Appendix R for full results

In response to the question about eating 5+ fruit and vegetables only a third of the participants chose “most of the time” or “completely”, indicated low fruit and vegetable intake. Otherwise, for all the other questions at least 50% of the participants chose the top two options. A high number of participants (74%) are keeping their alcohol intake to less than three drinks per day.

There were several significant changes in reported eating practices by the participants as reflected in the Healthy Guidelines Questionnaire mean score change over the study period (see table 4.11). Compared to baseline participants moved towards scoring “completely” (score = 6) in several of the areas, including enjoying 3 meals a day, eating 5+ fruit and vegetables, choosing lean meat and choosing low fat dairy. At W12 there was a significant difference for enjoying 3 meals a day with the median score being 5 [3, 6] compared to 4 [2, 5] ( $P=0.01$ ). For eating 5+ fruit and vegetables at baseline the median was 3 [2, 4.75] which increased significantly at one month post group to 4 [3, 5] ( $P=0.04$ ) and at two months post group was stable at 4 [3, 5] ( $P=0.02$ ). More sustained change was seen with choosing lean meat and choosing low fat dairy which were both significantly improved

over the study period. Participant's chosen response to choosing lean meat increased from a score of 3.5 [2, 5] at baseline to 5 [4, 5] at the end of group sessions ( $P=0.01$ ) and maintained at the third individual session at 5 [4, 6] ( $P=0.01$ ) and at final session 5 [4, 5] ( $P=0.05$ ). For choosing low fat dairy responses the median at baseline was 4 [2, 5] and this increased to 5 [3, 6] at the final session ( $P=0.03$ ) which represents participants moving closer always choosing low fat dairy options.

Table 4.11: Changes in food choices based on healthy guidelines across sessions

Parameters	B1	B2	P-value B1:B2	W4	P-value B2:W4	W8	W12	W16	P-value W4:W16	W28	P-value W16:W28	P-value B2:W16	P-value B2:W28
	n=31	n=28	n=23	n=23	n=23	n=23	n=23	n=19	n=25				
Enjoy 3 meals a day	5 [2, 6]	4 [2, 5]	0.56	4 [3, 5]	0.21	4 [3, 5]	5 [3, 6]*	4 [3, 5]	0.40	5 [3.5, 5.5]	0.45	0.13	0.36
Have 5+ fruit and vegetables a day	3 [2, 4]	3 [2, 4.75]	0.48	4 [3, 5]	0.07	4 [3, 5]*	4 [3, 5]*	4 [3, 5]	0.65	4 [2.5, 5]	0.75	0.12	0.35
Use wholegrain cereals	3 [2, 5]	4 [2, 5]	0.79	4 [3, 5]	0.34	4 [3, 5]	4 [2, 5]	4 [3, 5]	0.32	4 [2.5, 5]	0.25	0.40	0.50
Choose lean Meat	5 [3, 6]	3.5 [2, 5]	0.07	5 [4, 5]*	0.01	4.5 [4, 5]*	4 [3, 5]*	5 [4, 6]*	0.60	5 [4, 5]*	0.41	0.01	0.05
Choose low fat dairy	5 [2, 6]	4 [2, 5]	0.23	4 [2, 6]	0.40	5 [3, 6]	5 [2, 5]	5 [4, 6]	0.25	5 [3, 6]*	0.55	0.13	0.03
Use small amounts of oils	5 [3, 6]	4 [3, 5]	0.27	5 [4, 6]*	0.00	5 [4, 5.75]*	5 [4, 6]*	5 [4, 6]	0.27	5 [4, 6]	0.14	0.16	0.11
Non-alcoholic drinks	6 [4, 6]	5 [2.25, 6]	0.11	5 [4, 6]	0.25	5 [2, 6]	5 [5, 6]	6 [4, 6]*	0.43	5 [4, 6]	0.89	0.01	0.31
Limit Alcoholic drinks	6 [6, 6]	6 [6, 6]	1.0	6 [4, 6]*	0.18	6 [6, 6]	6 [6, 6]	6 [6, 6]	0.38	6 [5, 6]	0.32	0.68	0.34
Minimal fat & sugar intake	5 [3, 6]	4.5 [3, 6]	0.39	5 [4, 6]	0.22	4 [3, 5.75]	5 [4, 6]	5 [4, 6]	0.38	5 [4, 5.5]	0.53	0.88	0.43
Avoid fatty foods	5 [3, 6]	4 [3, 5.75]	0.59	5 [3, 6]	0.24	4.5 [3.25, 5.75]	4 [3, 6]	5 [4, 5]	0.10	5 [4, 6]	0.24	0.90	0.36

All results reported as median [25<sup>th</sup>, 75<sup>th</sup> percentile]

\* P<0.05 compared to B2

B1 = Pre-baseline

W4 = End of group sessions

W12 = Second individual follow-up

W28 = Final data collection session

B2 = Baseline – beginning of group sessions

W8 = First individual follow-up

W16 = Third individual follow-up

#### 4.6.2 Plate Model

Table 4.12 represents both the plate model proportions and the 24-hour food recall results. The plate model percentages reflect the participant's reported usual intake of the food groups; meat and alternatives, breads and cereals and vegetables. Over time would expect to see plate proportions of these food groups moving towards that of the ideal plate of 25% meat and alternatives, 25% breads and cereals and 50% vegetables. There were no significant changes to the participant's perceived plate model proportions during the study period. However, there was trend in change towards the ideal plate model (Figure 4.6). There was a small decrease in perceived proportion of the plate which contained meat or starchy carbohydrate foods, from 33.2% to 30.7% and 33.6% to 28.4% respectively. The mean proportion of vegetables on the plate did increase from 35.2% to 40.9% but again this was not a significant change.

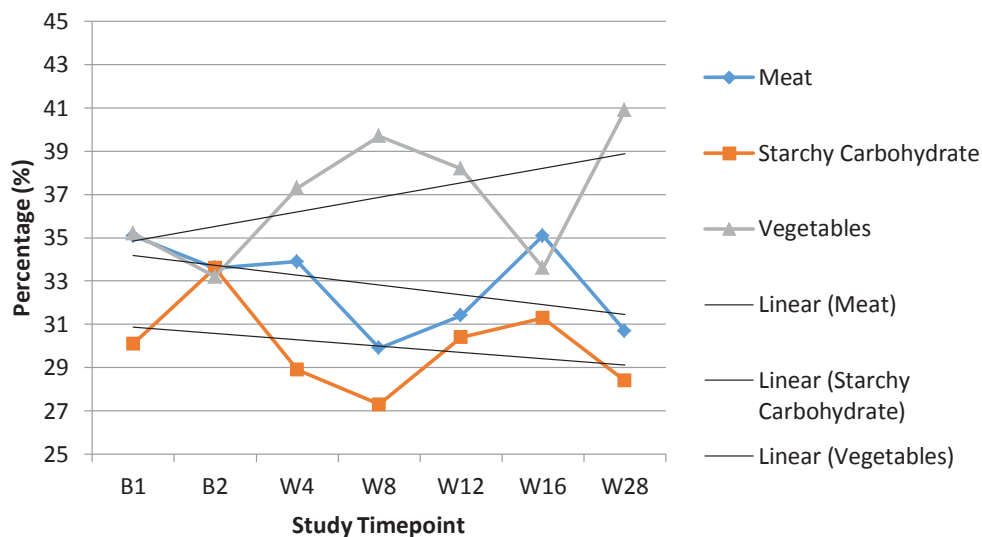


Figure 4.6. Change in perceived Plate Model proportions over study period

The change in median percentage for each food group further supports the trend towards the ideal plate model (Figure 4.6). At baseline, median percentages were for meat and alternatives 37.3%, for breads and cereals 30.0% and for vegetables 35.7%. At the final session this had improved to 25% for meat and alternatives, 25% for breads and cereals and 43.8% for vegetables.

Table 4.12: Changes in reported dietary intake results across sessions

Parameters	B1	B2	P- value B1:B2	W4	P- value B2:W4	W8	W12	W16	P- value W4:W16	W28	P-value W16: W28	P- value B2:W16	P- value B2:W28
Plate Model	n=31	n=26	n=24	n=28	n=23	n=19	n=26						
Meat and alternatives (%)	35.1±9.8	33.2±12.0	0.52	33.9±11.7	0.97	29.9±10.8	31.4±8.0	35.1±13.7	0.74	30.7±10.0	0.17	0.75	0.45
Carbohydrate (%)	30.1±11.8	33.6±15.2	0.61	28.9±15.7	0.24	27.3±16.2	30.4±14.0	31.3±11.9	0.97	28.4±12.5	0.40	0.60	0.32
Vegetables (%)	35.2±15.6	33.2±17.4	0.97	37.3±17.5	0.15	39.7±19.0	38.2±17.7	33.6±16.0	0.72	40.9±13.8	0.07	0.57	0.16
24 hour food recall	n=31	n=27	n=23	n=28	n=23	n=19	n=24						
Meats and alternatives	1.5 [1, 2]	1.25 [1, 2]	0.18	1.38 [1, 2]	0.94	1.25 [1, 1.75]	1.25 [0.75, 1.75]	1.25 [1, 1.75]	0.73	1 [1, 2]	0.81	0.68	0.96
Breads and cereals	6 [5, 10]	6 [5, 8]	0.63	5.5 [4, 8]	0.15	6 [4, 8]	7 [3, 10]	7 [4, 10]	0.75	5.75 [4.25, 11]	0.40	0.98	0.28
Milk and milk products	1 [0, 1]	1 [0, 1]	0.50	1 [0, 1.12]	0.82	0 [0, 1]*	01 [0, 1]	1 [1, 2]	0.86	1 [0, 1]	0.85	0.38	0.78
Fruit	1 [0, 2]	1 [0, 2]	0.94	1 [0, 3]	0.43	2 [0, 3]*	1 [0, 2]	1 [0, 3]	0.30	2 [0, 3]	0.34	0.70	0.11
Vegetables	2 [0, 3]	1 [0, 3]	0.96	3 [1, 3]	0.01*	2 [2, 3]*	3 [1, 4]*	3 [2, 4]	0.75	3 [2, 3]	0.76	0.13	0.01*
Fat	7 [3, 12]	6 [4, 9]	0.45	5 [1, 7.5]	0.27	5 [2, 9.75]	5 [3, 9]	3 [2, 8]	0.75	4 [1.25, 7]	0.55	0.09*	0.05
Sugar	3 [0, 7]	6 [0, 8]	0.77	4.5 [0, 9]	0.92	1.5 [0, 9]	3 [0, 6]	1 [0, 4]	0.78	3 [0, 6]	0.06*	0.02*	0.16
Non Water drinks	2 [1, 4]	3 [0, 4]	0.66	2.5 [0, 5.25]	0.97	2 [0, 4]	2 [0, 3]	2 [0, 5]	0.61	2.5 [0, 3.75]	0.07*	0.54	0.77

Plate model results reported as mean, SD

24 hour food recall reported as median [25<sup>th</sup>, 75<sup>th</sup> percentile]

All sessions compared to B2

\* P<0.05 compared to B2

B1 = Pre-baseline  
B2 = Baseline – beginning of group sessions  
W4 = End of group sessions  
W8 = First individual follow-up  
W12 = Second individual follow-up  
W16 = Third individual follow-up  
W28 = Final data collection session

#### 4.6.3 24-hour dietary recall

Participants completed a 24 hour dietary recall at each time point. Over the study period an improvement in the number of serves from each food group and fat and sugar intake was expected, as participants moved towards healthier eating choices based on what was taught during the 'Eating for your Health' programme. Serves of legumes and nuts and seeds were calculated, however intake of these foods was minimum across the study period equating to median of 0 [0, 0] so are not included in Table 4.12.

There were a few significant changes in food intake over time and generally the change was seen at four weeks post group finishing. At this time the intake of milk and milk products decreased significantly with median [25<sup>th</sup>, 75<sup>th</sup> percentile] serves of 0 [0, 1] from initially being 1 serve [0, 1] and the intake of fruit serves increased significantly to 2 serves [0, 3] in comparison to before group sessions only having on average one serve [0, 2] ( $p < 0.05$ ).

There appeared to be a move to improve overall quality of food with decreased fat and sugar intake shown by decrease in the number of fat and sugar exchanges over the course of the study. At baseline the median number of fat exchanges were 6 [4, 9] and this decreased non-significantly to 3 [2, 8] ( $P = 0.09$ ) at the third individual session and to final 4 [1.25, 7] ( $P = 0.05$ ) at the final session. There was a significant decrease in sugar exchanges from 6 [0, 8] at baseline to 1 [0, 4] at final individual session ( $P = 0.02$ ) and a small increase back to 3 [0, 6] at final session ( $P = 0.06$ ).

#### 4.7 Confidence and Intuitive Eating levels

The programme utilised tools and strategies focusing on increasing intuitive eating levels and supporting the participant to achieve and maintain change. An increase in confidence level around making changes is a desired outcome as it indicates that the participants feel they are in an environment where they can make change. Also an increase in perceived intuitive eating levels is ideal as it aligns with the purpose of the programme to improve intuitive eating ability. Participant's perceived level of confidence to make changes and intuitive eating levels are shown in Table 4.13.

Table 4.13: Participant perceived Confidence levels and Intuitive Eating Levels

<i>Parameter</i>	<i>B2</i>	<i>W4</i>	<i>p-value</i>	<i>W28</i>	<i>p-value</i>	<i>p-value</i>
	<i>n=31</i>	<i>n=31</i>	<i>B2:W4</i>	<i>n=19</i>	<i>W4:W28</i>	<i>B2:W28</i>
<b>Confidence Levels</b>	6 [5, 7.5]	8 [7, 9] <sup>†</sup>	0.00	7.5 [5, 8]*	0.88	0.02
<b>Intuitive Eating level (%)</b>	36 ± 22	60 ± 24	0.00	68 ± 26	0.12	0.00

Confidence levels reported as median [25<sup>th</sup>, 75<sup>th</sup> percentiles]

Intuitive eating levels reported as mean ± SD

<sup>†</sup>  $P < 0.00$  compared to B2

\*  $P < 0.025$  compared to B2

Confidence levels increased significantly after completing the group sessions, from a median [25, 75 percentile] of 6.0 [5, 7.5] up to 8.0 [7, 9] ( $Z = -4.46$ ,  $P < 0.00$  (2-tailed),  $r = 0.8$ ) and confidence levels remained higher six months after groups finished compared to before group sessions, at 7.5 [5, 8] ( $Z = -2.24$ ,  $P < 0.05$  (2-tailed),  $r = 0.51$ ). There was no significant confidence level change between finishing group sessions and six months later. The mean ± SD participant intuitive eating level reported as a percent of time increased significantly from 35.9±22.0 to 60.0±23.5 at the completion of the group sessions ( $t = -4.22$ , 21 df,  $P < 0.01$  (2-tailed), large sized effect  $r = 0.68$ ). Six months post the completion of the group sessions participants still reported a significantly higher (67.5±26.36) occurrence of intuitive eating than before attending group sessions ( $t = -3.95$ , 21 df,  $P < 0.01$  (2-tailed), large sized effect  $r = 0.65$ ).

#### 4.8 Relationship between Eating Behaviours, Weight and Attendance

Correlation co-efficient were calculated to look for significant associations between factors measured in this study. No significant associations were found between weight at baseline and age or the number of co-morbidities.

Weight change according to number of sessions attended was initially analysed and compared to average weight change of -0.92kg. Two outlier values greater than -10kg were removed as these skewed the data. The outlier values were removed and the data re-analysed and results are shown in Table 4.14.



Table 4.14: *Relationship between weight change and attendance*

<b>Sessions Attended</b>	<b>Average Weight (n=29)</b>	<b>Group sessions</b>		<b>p- value</b>	<b>Individual sessions</b>		
		<b>3 (n=10)</b>	<b>4 (n=19)</b>		<b>1 (n=6)</b>	<b>2 (n=12)</b>	<b>3 (n=11)</b>
<b>Weight change (kg)</b>	0.92±4.93	-1.4±3.45	0.62±3.84	0.17	1.19±4.94	-0.92±3.16	0.14±4.18
<b>Weight change (%)</b>	1.1±	-1.5±3.44	0.47±3.6	0.17	1.53±4.17	-0.89±3.18	-0.39±3.77

All results reported as mean, SD

P<0.05 = significant

There was no significant difference in weight change or percentage weight change depending on the number of group (3 or 4) or individual sessions attended. While participants who attended only one follow-up on average gained 1.19±4.94kg and those that attended two individual follow-up sessions lost a greater amount, though not significant, than those who attended three follow-ups.

The change in participants in eating behaviours based on IES-2 and DEBQ was also compared in relation to weight change. Total average scores for changes in eating behaviours were calculated comparing the W28 score or the last recorded score to baseline (B2). The expectation was that those participants with a greater negative weight change would have a greater positive change in eating behaviour scores. Table 4.15 shows the results. Differences between the weight ranges and overall average score change was calculated and any significant differences identified.

Table 4.15: Relationship between change in eating behaviour scores and weight change

<b>Weight % Change Range</b>	<b>Average Score change (n=31)</b>	<b>&gt;5 lost (n=4)</b>	<b>3-4.9 lost (n=6)</b>	<b>Weight maintenance (n=13)</b>	<b>&gt;3 gained (n=8)</b>
<b>IES-2</b>					
<b>Unconditional permission to eat</b>	-0.03±0.78	0.13±0.64	-0.31±0.53	-0.20±0.66	0.37±1.6
<b>Eating for physical rather than emotional reasons</b>	0.56±0.83	0.47±0.41	0.77±0.75	0.56±1.09	0.46±0.60
<b>Reliance on hunger/satiety cues</b>	0.61±0.92	1.0±0.76	0.94±1.37	0.15±0.66 <sup>Δ</sup>	0.92±0.80 <sup>Δ</sup>
<b>Body-food choice congruence</b>	0.20±0.94	-0.34±0.72	0.22±1.11	0.16±0.82	0.20±1.24
<b>Total Score</b>	0.37±0.46	0.50±0.19	0.39±0.55	0.24±0.48	0.54±0.45
<b>DEBQ</b>					
<b>Restraint</b>	0.03±0.92	0.25±0.87	0.32±0.62	-0.02±0.73	-0.23±1.38
<b>Emotional</b>	-0.71±0.83	-1.04±1.28	-0.28±0.57	-0.76±0.80	-0.79±0.81
<b>External</b>	-0.56±0.76	-0.83±0.74	-0.02±0.52	-0.68±0.85	-0.66±0.72

All results reported as mean, SD

P&lt;0.05 = significant

<sup>Δ</sup> P<0.05 between weight maintenance and >3 gained groups

There was only one significant difference in the IES-2 results in relation to weight change. The reliance on hunger cues/satiety mean score for those in the weight maintenance group was significantly lower (0.15±0.66) than those who gained weight ( $P=0.03$ ). There were no significance differences between the weight change groups in relation to the DEBQ scores. However, the group that loss >5% weight had a much larger reduction in the external trigger score (-0.83 compared to -0.06) compared to the 3-4.9% loss group ( $P=0.8$ ). An unexpected result is the difference between the 3-4.9% lost group and 3-4.9 gain group, though not a significant difference ( $p=0.8$ ) the gain group had a greater negative score change than the lost group.

Results for changes to IES-2 and DEBQ scores in relation to the number of group or individual sessions attended are shown in Table 4.16. There was no significant difference in the change in IES-2 between participants who attended three or four of the group sessions or the different number of individual sessions.

Table 4.16: Relationship between change in eating behaviour scores and attendance

Sessions Attended	Group sessions		p-value	Individual sessions		
	3 (n=11)	4 (n=20)		1 (n=8)	2 (n=10)	3 (n=13)
IES-2						
Unconditional permission to eat	-0.76±0.62	-0.01±0.87	0.82	-0.08±0.66	-0.11±0.52	-0.06±1.02
Eating for physical rather than emotional reasons	0.55±0.92	0.58±0.80	0.92	0.18±0.96	0.80±.97	0.62±0.55
Reliance on hunger/satiety cues	0.65±0.63	0.59±1.06	0.86	0.35±0.72	0.73±.61	0.67±1.21
Body-food choice congruence	0.12±0.95	0.25±0.96	0.70	0.04±1.03	0.13±0.90	0.36±0.97
Total Score	0.37±0.50	0.38±0.45	0.94	0.15±0.56	0.45±0.44	0.46±0.39
DEBQ						
Restraint	0.05±0.34	0.01±1.10	0.87	0.12±0.58	-0.24±0.66	0.17±1.23
Emotional	-0.35±0.56	-0.91±0.89	0.07	-0.11±0.46	-0.89±0.75*	-0.95±0.91 <sup>Δ</sup>
External	-0.65±0.81	-0.52±0.76	0.64	-0.54±0.53	-0.56±-0.99	-0.58±-0.75

All results reported as mean, SD

P<0.05 = significant

\*P<0.05 between Individual session 1 and 2

<sup>Δ</sup> P<0.05 between individual session 1 and 3

Participants who attended four group sessions had a greater, though non-significant ( $P=0.07$ ), reduction in the DEBQ emotional eating score than those that attended three sessions. There were significant improvements in emotional eating score depending on the number of individual sessions attended. The mean  $\pm$  SD change in emotional eating score for those that attended one follow-up was  $-0.11\pm0.46$  whereas the score for those that attended two sessions was  $-0.89\pm0.57$  ( $P=0.02$ ) and  $-0.95\pm0.91$  for those that attended three sessions ( $P=0.03$ ).

There were no obvious trends in relation to dominant eating behaviour and weight change for the individual participants (see Table 4.17). Out of the 10 participants who lost greater than 3% body weight, seven of these had a dominant 'restraint' score at the beginning of the study and increasing to nine at the end. However, of these ten individuals five increased their restraint score and five decreased, which indicated that while more individuals had dominant restraint scores, for some of them the dieting practices had lessened a little. All of the eight participants who gained weight had two or more dominant domains at the beginning of the study. With this group of participants, 'emotional' and 'external' were the dominant eating behaviours (87.5%) and 'restrained' was dominant for only 37.5% (n=3). At the end of the study, only two of the eight who gained weight had multiple dominant eating behaviours and emotional eating had reduced from being dominant initially for seven individuals to only three.

Table 4.17: Dutch Eating Behaviour Classification and Change over study period

Participant	Restrained		Emotional				External		Dominant Behaviour			Weight Change %
	B2	W28		B2	W28		B2	W28		B2	W28	
1	2.7	2.3	↓	1.31	1.23	↓	2.4	2.5	↑	R	R/Ex	-15.2
2	2.3	3.8	↑	3.93	1	↓	3	1.3	↓	Em	R	-13.3
3	2.8	3	↑	3.62	3	↓	3.8	3	↓	Em/Ex	Em/Ex	-6.2
4	3.1	2.8	↓	2.69	2.15	↓	3.3	2.4	↓	R/Ex	R	-5.7
5	2.2	1.9	↓	0.85	1	↑	1.4	1.6	↑	R	R/Ex	-4.6
6	2.7	2.8	↑	0.92	1.08	↑	2.4	2.8	↑	R/Ex	R/Ex	-4.6
7	2.5	3.8	↑	4	2.77	↓	3.8	2.8	↓	Em/Ex	R	-3.3
8	4.8	4	↓	3.07	2.54	↓	2.9	3.2	↑	R	R	-3.2
9	3.5	3.7	↓	3.46	3	↓	2.8	2.6	↓	R/Em	R	-3.1
10	3.2	3.4	↑	2	2.23	↑	2.5	2.7	↑	R	R	-3
11	4.1	4.1	-	1.39	1	↓	2.5	1.8	↓	R	R	-2.7
12	1.7	1.8	↑	3.38	1.92	↓	3.5	2.7	↓	Em/Ex	Ex	-2.7
13	2.5	3	↑	2.23	1	↓	4.4	1.9	↓	Ex	R	-1.7
14	2.2	1.5	↓	1	1	-	2.4	2.2	↓	R/Ex	Ex	-1.5
15	2.9	2.9	-	1.5	1.69	↑	2.9	2.9	-	R/Ex	R/Ex	-1.5
16	1.7	2.6	↑	3.62	2.85	↓	2.8	2.1	↓	Em	R/Em	-1.4
17	2	2.4	↑	2.69	2.46	↑	3.8	2.8	↓	Ex	Ex	-0.7
18	3.2	1.9	↓	3.69	1.38	↓	1.8	1.5	↓	R/Em	R	0
19	2.2	3.5	↑	2.08	1.15	↓	2.3	2.6	↑	R/Em/Ex	R	0
20	2.9	2.9	-	2.62	1.23	↓	4.4	2.3	↓	Ex	R	0.1
21	3.1	3.2	↑	2.08	2.77	↑	2.4	2.3	↓	R	R/Em	0.3
22	1.6	2.2	↑	2.62	1.62	↓	3.6	2.6	↓	Ex	Ex	0.7
23	3.8	2.8	↓	2.23	1.15	↓	2.1	2.4	↑	R	R	1.3
24	3.9	3.4	↓	4.23	2.46	↓	4.4	2.5	↓	R/Em/Ex	R	4.1
25	1.7	2.8	↓	3.54	2.69	↓	3.3	2.2	↓	Em/Ex	R/Em	4.2
26	2.5	2.4	↓	3.54	2.77	↓	4	3.8	↓	Em/Ex	Ex	4.2
27	3.1	4	↑	3	2.7	↓	2.1	2.4	↑	R/Em	R	4.4
28	1.8	2.3	↑	3.69	3.39	↓	3.9	2.7	↓	Em/Ex	Em	4.5
29	4.5	1.2	↓	3.46	1.23	↓	4.6	3.8	↓	R/Em/Ex	Ex	4.8
30	2.8	3	↑	3.54	3.46	↓	3.7	3.5	↓	Em/Ex	Em/Ex	4.9
31	2.4	1.8	↓	1	1	-	2.6	2.4	↓	R/Ex	Ex	6.8

R = Restrained, Em = Emotional, Ex = External, B2 = baseline, W28 = week 28, ↓ = decreasing, ↑ = increasing, - = same

Scores highlighted blue are above the mean score for that domain;

Orange shading indicates clinically significant weight loss, blue shading for those that lost weight, grey shading for weight gain and no shading equals weight stability

#### 4.9 Participant Evaluation of Programme

The participant reasons for changes to reported confidence level were analysed and categorised into themes and the number of participant responses and examples under each theme is shown in table 4.18. The themes identified were aligned with the main aspects and aims of the 'Eating for your Health' programme, which are:

1. Motivation
2. Knowledge gain
3. Tools for change
4. Thoughts related to way think about food, self and behaviours
5. Behaviour change
6. Health related

The programme focused on supporting the person to make changes using motivational interviewing techniques, CBT tools and strategies and an intuitive eating approach. The comments relate well to the purpose of the programme and the content of the sessions. With participants making comments about improved motivation, feeling more positive, having the information and tools to make change, and being mindful and increased awareness of what they were eating.

Table 4.18: *Identified themes for reported confident level changes*

<b>Theme</b>	<b>Number of responses</b>	<b>Example of Participants Comments</b>
<b>1. Motivation / Expectation of self</b>	7	"Motivation" "Keeping self-motivated when don't see automatic progress from changes made" "Setting smart goals" "Moving from contemplation to action" "Feeling more positive" "Feeling not so hopeless"
<b>2. Knowledge gain (knowing what to do)</b>	8	"Learnt a lot about food, know that not all good foods are actually good for you" "Better understanding of portions and what should eat" "I know what to do" "Have more information"
<b>3. Tools for change</b>	10	"More tools available to make change" "Having the tools and strategies" "More tools to handle food and my life" "Been given more tools to make change" "Feel like have better tools to succeed"
<b>4. Thoughts related to way think about food, self and/or behaviours</b>	9	"Not seeing everything I eat as bad" "Not giving self a hard time" "Realise don't have to beat self-up when fail, accept that can try again" "Giving myself credit when achieve goals"
<b>5. Behaviour change related to how respond to situations and changes made</b>	12	"Mindful of what eating more than at the beginning" "Mindful eating – taking the time to enjoy food" "Reduced meal size, eating more vegetables" "Thinking before doing" "Exercise more" "More mindful" "Eating smaller portions" "Making good choices when selecting food" "More aware of focusing on hunger cues" "Now check what eat, drink more water"
<b>6. Health Related</b>	4	"Feel better because mobility has increased" "Feeling healthy"

See Appendix R for additional comments

#### 4.9.1 Participant Perceived Changes Made

Participants perceived changes in relation to the key components of the programme, such as attitude to food, overall eating behaviours, how often they comfort eat using responses improved, stayed the same and worsened are presented in Table 4.19. All areas of focus had more responses indicating an improvement. The majority of respondents (n=16, 69.6%) reported an improvement in attitude towards food and eating behaviours since completing the programme, which supports the main aims of the programme. Again improvements in frequency of non-hungry eating and intuitive eating was reported, 57% and 61% respectively.

Table 4.19: *Participant perceived change related to key components of the programme*

	<i>Improved</i>	<i>Stayed the same</i>	<i>Worsened</i>	<i>No response</i>
<b>Attitude to food</b>	16 (69.6%)	6 (26.1%)	-	0
<b>Eating behaviours</b>	16 (69.6%)	6 (26.1%)	-	0
<b>Relationship with food</b>	14 (60.9%)	5 (21.7%)	1 (4.3%)	3 (13.0%)
<b>Frequency of comfort eating</b>	11 (47.8%)	7 (30.4%)	1 (4.3%)	4 (17.4%)
<b>Frequency of non-hungry eating</b>	13 (56.5%)	7 (30.4%)	1 (4.3%)	2 (8.7%)
<b>Ability to intuitively eat</b>	14 (60.9%)	7 (30.4%)	1 (4.3%)	1 (4.3%)
<b>Overall food intake</b>	11 (47.8%)	9 (39.1%)	1 (4.3%)	2 (8.7%)
<b>Planned exercise</b>	14 (60.9%)	5 (21.7%)	3 (13.0%)	1 (4.3%)
<b>Incidental activity</b>	14 (60.9%)	6 (26.1%)	0	3 (13.0%)

#### 4.9.2 Participant Evaluation of the “Eating for your Health” Programme

Twenty-three participants completed the final questionnaire and were asked to rate how useful they found the programme on a scale of one to five (One being not useful, and five very useful). Fifty-two percent of the participants felt the programme was very useful, 22% rated it a four and 26% were undecided, rating it a three. None of the respondents felt the programme wasn’t useful.

Participants were also asked to comment on how the programme was useful and what could be improved about the programme. When assessing the comments regarding usefulness of the programme the comments were collated using the themes reported in Chapter 4.9 (Table 4.20). The majority of comments related to knowledge gain (31%), food, self and/or behaviour related thoughts (25%) and motivation related (22%). No participants gave a health related response in relation to the usefulness of the programme.



Table 4.20: *Participant comments regarding usefulness of the programme*

<b>Theme</b>	<b>Number of responses (n=23)</b>	<b>Example of Comments</b>
<b>1. Motivation / Expectation of self</b>	7 (22%)	<p>"Gave me back some confidence in both myself and my ability to continue on my weight loss journey"</p> <p>"From the first group everything seemed to click"</p>
<b>2. Knowledge gain (knowing what to do)</b>	10 (31%)	<p>"Liked approach"</p> <p>"More strategies and information for health"</p> <p>"Understanding portion sizes was very useful"</p> <p>"Taught me how to read labels"</p> <p>"It make me more aware of what is good food"</p>
<b>3. Tools for change</b>	2 (6%)	
<b>4. Food, self and/or behaviours related thoughts</b>	8 (25%)	<p>"Making me aware of eating habits especially after sessions"</p> <p>"Psychology of why you eat was very interesting"</p> <p>"Helped me re-think my attitude towards eating and food"</p> <p>"I learned to think twice before eating anything"</p> <p>"There is more to eating than just putting food in your mouth"</p>
<b>5. Behaviour change related to how respond to situations and changes made</b>	3 (9%)	<p>"Tried to do more exercise"</p> <p>"Made healthier choices"</p>
<b>6. Other</b>	2 (6%)	"Follow-ups kept me accountable"

See Appendix R for additional comments

The word cloud in figure 4.7, was designed using the comments provided by the participants on the confidence levels form and the session evaluation form (table 4.18 and 4.20). Comments are shown in table 4.16 and it represents the participants' comments visually by presenting words in relation to frequency as shown by the size of the word; larger words were more frequently mentioned. Tools, mindful and learning are all words used in high number by the participants to describe what they gained from the programme. The words positive, re-think, goals and aware also appeared frequently in the comments, these words align with the goals and approach of the programme.

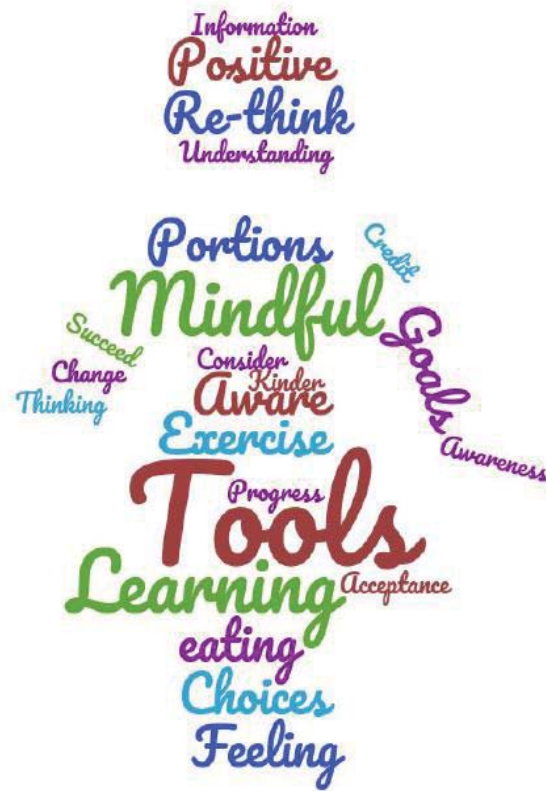


Figure 4.7 Word Cloud representing participants evaluation comments

Overall recommendations on what could be improved with the programme are presented in Table 4.21. Thirty-six percent of the comments related to the number of sessions with participants wanting more sessions. One participant commented on wanting post group sessions where the other participants would also be present. Ten respondents had no comments on what could be improved. While a few participants felt the facilitator could make some improvements, others felt the facilitator was “awesome”, “very friendly and patient” and that they had “a lot of useful knowledge”.

Table 4.21: *Participant comments regarding improving the programme*

Theme	Number of Responses (n=14)	Examples of comments
<b>Number of sessions</b>	5 (36%)	<p>"More sessions over the year"</p> <p>"Not a lot of post group contact and no follow-up group sessions"</p> <p>"To continue the group sessions, so that we could support each other"</p> <p>"I felt it could go on a bit longer. The groups and individual sessions. I felt there could have been a few more and maybe another individual session a year later to catch up"</p> <p>"I think more sessions would be good (even if we had to pay for it)"</p>
<b>Specific medical advice</b>	1 (7%)	"I was expecting more assistance with thyroid/gall bladder medical issues"
<b>Facilitators</b>	3 (21%)	<p>"Identify those participants that like to do all the talking and be the centre of attention – and then ignore them"</p> <p>"I found sitting there listening to someone boring, not much interaction between the group and speaker, not good speakers"</p> <p>"Getting side tracked with conversations, hard to focus or emphasise"</p>
<b>Time of sessions</b>	1 (7%)	"Would be better if the appointments could be after work"
<b>Location</b>	1 (7%)	"It was good but sometimes a bit of a mission to attend from Warkworth"
<b>Content</b>	1 (7%)	"Too many repeating questions"
<b>Activities</b>	1 (7%)	"I did not like having to do the questionnaire about the days course at the end of each session – does not give you time to take the session in"

Unfortunately, only a small number (n=6) of participants who responded to the question regarding reasons for not attending either group or individual sessions. Mostly work and health related issues kept the participants from attending sessions (Table 4.22).

Table 4.22: *Reasons for not attending sessions*

Reason	Session		Total Responses
	Group	Individual	
<b>Family commitments</b>	2	-	2
<b>Work commitments</b>	1	2	3
<b>Other commitments</b>	-	1	1
<b>Health</b>	2	4	6
<b>Transport issues</b>	1	-	1
<b>Self/motivation</b>	-	2	2

## Chapter Five: Discussion

The purpose of this pilot study was to identify whether the “Eating for your Health”, a non-dieting based programme is an effective intervention for people who are classified as overweight or obese and are already within the hospital system due to their co-morbidities.

In recent years there has been a move towards a weight neutral approach which does not focus on weight loss as a primary objective but instead improving health (Bacon et al., 2005, Kausman, 1998, King, 2007, Napolitano and Foster, 2012, Willer, 2013). In the workplace we continue to strive to maximise what services are provided to an ever growing number of patients without a matched increase in resources. It is important that Dietitians are able to show that services offered are effective and beneficial to patients. The aim of this pilot study was to ascertain the effectiveness of, and adherence to, a four week “Eating for your Health” programme which supports patients who have been referred for weight loss to improve their eating behaviours and health. The objectives of this study was to firstly evaluate the effectiveness of an intuitive eating programme focusing on eating behaviours, well-being and reported dietary intake and secondly to evaluate the participant’s adherence to the programme and follow-up sessions.

### 5.1 Study Participants

Recruitment occurred over an 18-month period in an attempt to meet the target participant number. The “Eating for your Health” group education sessions were only held approximately every six weeks as per the normal DHB schedule, and while a large number of participants (n=346) were invited to participate in the study, a high number (75%) failed to respond to the invitation. This study did not explore the reasons for people not responding to the invitation, but it would be an area to explore further in future research.

Of those 49 participants who agreed to participate in this study, 16% failed to attend even one group session and another 14% dropped out after one or two sessions. However, once engaged fully in the programme the drop out was much lower and of those who completed the group sessions (n=33) only five (15%) went on to drop out or fail to complete, giving a 43% attrition rate at six months. In general there tends to be high attrition rates with weight management programmes, however there tends to be poor consistency in defining and reporting attrition rates as reported by Miller and Brennan (2015) who reviewed the literature on weight management programmes attrition rates.. The attrition rates in this study align with other non-dieting research which ranges from around 30-55%. Cole and Horacek (2010) reported a 39% drop out rate during intervention,

with an increase to 50% at the 6 month follow-up. During the intervention period Keeler et al. (2013) recorded a similar dropout rate of 39% which increased to 52% at six months for the intervention group. (Bradshaw et al., 2010) reported a 42% attrition rate and Daubenmier (2016) achieved approximately 70% attendance.

Potentially the length of this programme's intervention period contributed to a lower dropout rate, as the majority of previous research had intervention periods of 10-12 weeks (Carroll et al., 2007, Cole and Horacek, 2010, Daubenmier, 2016, Katzer et al., 2008, Kiernan et al., 2013, Leblanc et al., 2012, Provencher et al., 2009, Rapoport et al., 2000). A four week programme meant there was less opportunity for sessions to be missed due to health, work or family commitments. A number of weight management programmes have explored differences between completers and non-completers. Bradshaw et al. (2010) found possible predictors of non-completing to be lower baseline nutrition knowledge and current smoking status, and Kolotkin and Moore (1983) reported that the completer group in their study comprised of more stay at home mothers. They hypothesised that participants prioritised attending sessions for human contact but that they also had greater flexibility to attend sessions. While this research was conducted in 1983, the reasoning may still be valid as 'work commitments' was one of the top reasons reported by the participants for not attending either group or individual sessions. The top reasons for not attending sessions in this study were similar to that of Cole and Horacek (2010) who reported work or family commitments or health as the main reasons for not attending sessions and Toth-Capelli et al. (2013) identified from focus groups that physical limitations or health and family issues were the main reasons for the dropout rate.

## 5.2 Participant demographics

While there was no difference in mean age between the completer and the non-completer groups in this study, there were a number of other differences. The proportion of men and women varied between the two groups, with the majority of completers being women (n=28, 90%), while non-completers were similar in number, men (n=7) or women (n=11).

The majority of participants in this study were NZ European (77%) though only 44% of the non-completers were NZ European. The number of Māori and Pacific people involved in the study was well below the expected number based on the proportion of the Waitemata community who identify as Māori and Pacific, which is 9.7% and 7.3% of the population respectively (Waitemata DHB, 2015). Within this study Māori and Pacific peoples were under represented respectively, with only 6% Māori (n=2) and 3% Pacifica (n=1) being classified as completers. However, twice the

number of Māori (n=4) and Pacifica (n=2) people accepted the invitation for the study but failed to complete. What are unknown, are the reasons why these participants failed to complete.

Furthermore, also the number of Māori or Pacific people who failed to respond to the invitation to attend group education and participate in the study, and their reasons for lack of engagement. In a survey of Māori people, 73% reported having a 'wait and see' attitude, leaving seeing the doctor to the last minute (Jansen et al., 2008). This approach to health may impact on their response to the weight management invitations, as may not see weight management as a high need or priority at the time. Generally, Māori and Pacific participants responded well to the programme but further information is needed to understand their failure to attend the programme.

This study is unique in that, as far as we are aware, it is the first to use a non-diet approach with patients with co-morbidities within an outpatient setting. Previous research tended to use healthy overweight/obese people and exclude participants with co-morbidities. Only Borkoles et al. (2016) and Bradshaw et al. (2010) included participants with co-morbidities. The most common health issues experienced by participants within this study, was respiratory disease, diabetes, dyslipidaemia and gastrointestinal disease. Potentially the complexities of having associated diseases may have impacted on the participant's abilities to engage in the programme. While this was not investigated in this research, Gucciardi et al. (2007) reported that attrition rates can be as high as 57% for diabetes self-management programmes and in the Verevkina et al. (2014) study 23% did not complete a chronic disease self-management programme and those with lower baseline self-efficacy were more likely to drop out. Potentially the additional requirements of this study were too great for people with chronic diseases on top of already managing their condition.

This study did not provide additional incentives, apart from the intervention outcome to participants, as the study was designed to replicate the standard hospital outpatient service. This meant participants attended sessions at usual clinic times offered during normal practice and generally were required to pay for parking on the hospital sites. While this may have made recruitment more difficult, it reflects a true clinical setting which is typical for dietitians working in an outpatient environment. However, the above issues associated with participants having diagnosed chronic diseases may have played a greater role in minimising outcomes, as these patients were already within the hospital system under specialist doctors and likely had multiple appointments that may have been prioritised above dietitian sessions.

### 5.3 Anthropometry

As this research study used a non-diet approach, the main focus was on improving well-being and eating behaviours and not on weight loss. While some participants achieved large weight loss (greater than 5% of initial weight), overall there was no significant change to weight status. This corresponds with other research using an intuitive eating approach which generally reported no significant weight change (Bacon et al., 2002, Borkoles et al., 2016, Carroll et al., 2007, Kausman et al., 2003, Provencher et al., 2009, Rapoport et al., 2000). Two studies using a non-dieting approach did report significant weight loss; these differed to the current study as they had longer intervention periods and included a focus on coping and stress management skills (Bradshaw et al., 2010, Tanco et al., 1998). The greater emphasis on coping skills may have helped the people involved to manage difficult situations better and to continue with helpful behaviours such as exercise and not return to previous unhelpful (World Health Organisation, 2000) coping strategies, such as comfort eating.

Waist and hip measurements were also taken at each time point for participants, and as with the mean weight these were also stable. Over the study period, the mean waist and hip measurements did fluctuate, but the end measurements were below baseline, although not significantly different. Mean waist circumference at W16 was significantly lower than W4 ( $P=0.01$ ) by 3cm, though this measurement does appear to be random compared to the others and could have been due to measurement errors.

In this research study, nearly 75% of participants either lost or maintained weight, which is a similar result to Kausman et al. (2003), who found the 71% of the respondents who had completed the “If not dieting” programme, reported stable weight. A third of the participants in the current study lost greater than 3% of their initial body weight and four people achieved clinically significant weight loss (>5%). This was an additional benefit to the participants considering the approach used. Also nearly half of the participants had respiratory disease and one-fifth have osteoarthritis, which likely impacted on their ability to engage in regular activity which could have supported the changes they had made to improve their well-being. Considering research has shown as little as 4.5kg weight loss is required to see improvement in blood pressure and diabetes control then it can be assumed that the three participants who lost more than 4.5kg would have achieved health improvements (Diabetes Prevention Program, 2002, Fayh et al., 2013, Stevens, 2001). As biomarker data were not collected in this study, these improvements could not be assessed.

To improve evaluation measures, including biomarkers would have been beneficial to show the health benefits of the non-dieting approach. Heart rate and blood pressure measures, lipid profiles and glucose have been shown to improve with weight change (Goldstein, 1992, World Health Organisation, 2000) and potentially including these in the study may have given measurable outcomes to reflect improvement in health status.

#### 5.4 Quality of Life

Overall there was an increase (52% to 62%) in the participant's perceived quality of life. This aligns with other non-dieting studies which have also seen an improvement in general psychological well-being (Carroll et al., 2007, Rapoport et al., 2000, Tanco et al., 1998). In the current study, mood, stress and other psychological factors; such as body image, were not investigated. However, it may have been beneficial to explore further as perceived stress levels has been associated with weight regain (Brantley et al., 2014). Also considering the non-diet approach has a focus on improving well-being exploring these factors may have shown additional beneficial outcomes for the participants.

#### 5.5 Eating Behaviours

As the "Eating for your Health" programme is based on a non-diet approach, the main components of the programme emphasise improving well-being and improving relationships with food. Participants are taught tools and strategies to learn to eat more intuitively and also to help develop new ways of managing situations and eating occasions. The content of the programme closely links to the eating behaviours identified using the DEBQ. The focus on increasing awareness of hunger levels and to eating in response to hunger is the recommended treatment for 'restrained' eaters (Christopher, 2014). Exploring and gaining knowledge and understanding of the link between emotions, thoughts and feelings is required when working with 'emotional eaters'. For those that eat in response to 'external triggers', the behavioural tools are especially helpful to make progress (see Chapter 3.4, table 3.1 for session topic details). Other non-dieting studies have examined eating behaviour change over time, but have not investigated the proportion of participants that identified with each of the eating behaviours. As emotional eating is a predictor for weight gain (Koenders and van Strien, 2011, van Strien et al., 2012) then it could have been expected that the majority of the participants in this study would be dominant emotional eaters. However, the split across the three eating behaviours at the beginning of the study was relatively even, with emotional eating being the lowest number of participants (15 out of 31). We could hypothesise that the programme did appropriately target the 'emotional' and 'external' eating behaviours, as the dominance of these reduced over the study period, indicating that participants ate less due to these reasons by W28.



### 5.5.1 Changes in Eating Behaviours

Over the course of the study it was expected to see an increase in IES-2 scores as participants increased their trust in their own hunger and fullness cues and improved their intuitive eating ability (Tylka, 2006, Tylka and Van Diest, 2013). In two of the domains; 'eating for physical rather than emotional response' and 'reliance on hunger and satiety cues' there were significant improvements across the study period. These results are likely due to the emphasis in all of the group sessions on improving eating awareness and reducing non-hunger eating. The improvements in the 'eating for physical rather than emotional reasons' score aligns with the findings from Keeler et al. (2013) which also achieved significant improvements in this domain. The DEBQ 'emotional eating' and 'external trigger' scores also decreased significantly over the study period, indicating that participants were eating less for emotional reasons or in response to triggers at the end of the study.

In contrast, the IES-2 'Body-food choice congruence' score improvement was only significant at the end of the group sessions. This domain relates to making food choices that support both health and taste buds while still making you feel well, and throughout the programme this is covered less than eating awareness and non-hungry eating. Due to this reason, it is potentially the more difficult area for participants to affect after completion of the programme, as it would be easier to go back to usual way of thinking with the focus mostly on health and not also on food.

The results for the 'unconditional permission to eat' domain show that participants over the course of the study did not give themselves greater permission to eat the food they desired. Even though the content and approach of the programme did not promote dieting or strict monitoring of food intake, previous ingrained habits and behaviours held for a number of years may have been difficult to break over the intervention period. This result differs to Humphrey et al. (2015) who found an improvement in 'unconditional permission to eat', although this study was with students completing a nutrition course rather than individuals with weight issues. In this current study, the DEBQ 'restrained eating score' also increased which reinforces that participants changed their eating practices to be more restrictive during the study. This result was in contrast to other non-dieting research by Bacon et al. (2002) and Cole and Horacek (2010), both studies reporting decreased 'restrained' eating scores. The four week intervention period of this research was much shorter than both Bacon et al. (2002) (six months) and Cole and Horacek (2010) (10 weeks) which may be why restraining habits weren't fully broken in this study. However, considering the high number of referrals, the demand for the service and the number of patients who fail to attend all sessions; from

a sustainability angle it is not possible for Nutrition and Dietetic Services' to offer a group intervention that is considerably longer.

In support of the IES-2 and DEBQ questionnaire results, participant's self-perceived changes in their eating practices also showed a positive change. Nearly 50% of the participants reported that the frequency of comfort eating had reduced and over half of the respondents saw an increase in how often they non-hungry ate and intuitively ate.

## 5.6 Dietary Intake

The majority of the non-dieting/intuitive eating research has not focused on food intake. However, intuitive eating is based on improving well-being and one way to improve health and well-being is through choosing nutritious food. Exploring whether participants improve their food intake could provide evidence that a non-diet approach can support patients to make beneficial changes which could have a positive effect on health status. Only a few non-dieting studies to date have looked at dietary changes. Two studies which used three day diet records found no significant dietary changes (Cole and Horacek, 2010, Leblanc et al., 2012). Rapoport (1998) reported a decrease in percentage fat intake and an increase in percentage protein intake, and Miller and Brennan (2015) reported a decrease in energy and an increase in protein intake.

The 24-hour dietary recall was used in this pilot study due to the ease of use, while it does not provide detailed dietary information like food records, from which specific nutrient intakes can be assessed. The dietary recall was used to examine participants' food group intake and fat and sugar exchanges collectively and changes over time. Over the course of this study the participants reported an improved intake across a number of dietary intake areas based on the NZ eating and activity guidelines (Ministry of Health, 2015b); increasing the frequency of eating three meals a day, choosing 5+ fruit and vegetables, choosing lean meats and low fat dairy products and increasing the frequency of using small amounts of oils. The food group analysis revealed a number of significant improvements. From baseline to W8 the mean fruit intake had increased significantly from on average one serve to two serves daily and over the course of the study daily vegetable intake had increased from an average intake of one serving up to three servings. Though only a third of the participants indicated that at least 'most of the time' they eat three vegetables and two fruit servings a day. This is well below the 72% of females and 59% of males who reported eating three or more servings of vegetables, and 66% of females and 55% of males eating at least two serves of fruit daily in the 2008/09 NZ Nutrition survey (University of Otago and Ministry of Health, 2011).

Nearly 50% of the participants reported eating at least six servings of wholegrain or high fibre breads and cereals, the majority of the time, which could imply that at least 50% of the participants were choosing whole grain breads and cereals. This number is much less than the 68% who indicated they chose whole-grain (heavy or light grain) in the NZ Nutrition survey (University of Otago and Ministry of Health, 2011). The NZ Nutrition survey did not go on to ask the amount of these foods eaten, so it is difficult to identify whether or not the response rate from this study aligns with typical NZ consumption of wholegrain breads and cereals.

To make direct comparisons between the 2008/09 NZ Nutrition Survey and this study in relation to fat intake is difficult as the questions asked in both are different. However, an attempt has been made to identify any similarities in results. Fat intake related responses for this study's questions (use small amounts of oil, margarine, nuts or seeds (74.2%), use small amounts of fat, oil, sugar & salt (68%) and mostly avoid deep-fried & fatty foods or sweet bakery products (61.3%), compared favourably to the 2008/09 NZ Nutrition Survey (University of Otago and Ministry of Health, 2011) where responses varying between 25 – 72% depending on whether referred to frequency of eating takeaways, hot chips or choosing low fat varieties.

### 5.7 Relationship between Eating Behaviours, Weight and Attendance

Not many research studies have reported relationships between eating behaviours, weight and attendance. Ahern et al. (2013) reported a link between improvements in eating behaviours and weight loss and Leblanc et al. (2012) found a decrease in total energy expenditure associated with a decrease in hunger and external hunger. This research found no associations between the factors explored however low participant numbers and the chronic disease aspect may have impacted on these results.

Interestingly there appeared to be no advantage in attending four over three group sessions or three over two or one individual sessions, in relation to achieving improvements in eating behaviours, as shown in IES-2 and DEBQ results. It would have been expected that the more sessions a person attended the better the results. Especially with the individual sessions, as these were an opportunity to further support, encourage and empower the individual with the changes they were achieving. However, again participant numbers may have affected the results and also the inconsistent number of questionnaires completed at the different time points.

Potentially no associations were found due to the participant's readiness to change level. While not explored in this study, identifying where a person initially sat on the stages of change scale (Miller

and Rollnick, 2014) would have highlighted those who were at the right stage to make change. Potentially, a person's readiness to change may have been a factor for those who failed to complete, as they may have had higher priorities to manage at the time rather than their weight. Having information on readiness to change may have shown differences in outcomes based on where a person sat on the scale and also if they progressed along the scale.

Considering that a higher emotional eating score leads to weight gain (Koenders and van Strien, 2011, van Strien et al., 2012), then it could have been expected that the majority of participants who gained weight in this study were dominant emotional eaters. This was the case at the beginning of the study, with seven of the eight who gained weight having 'emotional' as the dominant or joint dominant eating behaviour. At the end of the study 'emotional' dominance was only seen in three of the eight participants. In fact, the split between the three domains was even; restrained (n=3), emotional (n=3) and external (n=4), indicating that this group of participants decreased their eating in response to emotions and external triggers. In this small subgroup of participants, 'restrained' eating behaviour did not increase whereas it had in the group who lost weight. At the end of the study, nine of the ten participants who lost greater than 3% body weight scored highest in the 'restrained' eating domain, an increase from seven at baseline. Additionally, initially five weight loss participants had a 'restrained' score above the mean for B2 yet eight had a score higher than the mean score at W28 (this compared to 50% for the weight stable group and the weight gain group). So, not only were there a larger number of participants with 'restrained' as their dominant eating behaviour in the weight loss group, they also had higher scores compared to that other weight change groups. This result may help explain the weight loss which occurred in this this group of participants, as it is known that restricting food intake can aid short term weight loss (Johns et al., 2014).

### 5.8 Participant Evaluation of the Programme

The "Eating for your Health" programme used in this study, utilised a non-diet approach based on the "If not dieting" programme (Kausman, 1998). The key focus of the programme are eating and health behaviours and not weight, with an emphasis on health gain not weight lost, and on empowering participants to feel positive about themselves. Specific components of the programme address the non-diet focus by teaching tools and strategies for participants to use outside of the group sessions; including awareness of non-hungry eating, mindful eating, being active/increasing movement and learning how to give oneself permission to eat ("I can have it if I want it"). CBT tools and strategies were also included in the sessions to teach participants ways to adjust eating behaviours to support their health and wellbeing; these included the role cognitions play in

behaviours, challenging negative thoughts and giving credit to oneself. The evaluation comments from the participants give clear indications that the programme achieved the goal of supporting participants to develop in these areas.

Overall the programme seemed to have a perceived positive impact on participants in relation to the key points of the programme. The majority of the participants reported improved attitude to food and eating behaviours (69.6% each) and relationship with food (60.9%) and improved frequency of planned exercise and incidental activity (each 60.9%). While different questions were asked, these results align with those found by Keeler et al. (2013) where participants reported improved dietary patterns/thoughts (82.4%) and exercise patterns/thoughts (76.5%).

Participant evaluation comments tended to be supportive of the programme and what they learnt. Similar comments were made to those in an audit completed by Kausman et al. (2003) which found that the majority of participants rated the programme as beneficial. In this study, a number of participants asked for additional sessions over the year or post group sessions. At the time it wasn't explored how these sessions would look from the participant's perspective and what they felt would be beneficial to be included if additional sessions were to be held. However, within the public health system demand frequently outweighs resource available and the "Eating for your Health" programme was designed to allow maximum access to the programme by those referred to the service for weight management. Previous non-dieting research has used longer programmes, mostly over 10 weeks (Carroll et al., 2007, Cole and Horacek, 2010, Daubenmier, 2016, Katzer et al., 2008, Kiernan et al., 2013, Leblanc et al., 2012, Provencher et al., 2009, Rapoport et al., 2000), so there is the research to support this programme being longer. However, previous studies were conducted in a different setting using generally healthy but overweight or obese individuals. However, only one third of the completers attended all the group and individual sessions in this study. Knowing that work, family and health were all reasons why the participants failed to attend this programme and others (Cole and Horacek, 2010, Grave et al., 2006, Toth-Capelli et al., 2013, Verevkina et al., 2014), there is the potential that the participants may not have regularly attended a longer programme. To understand further the reasons why these participants either attended or not attended sessions, it was decided to do a follow up study with the same participants to examine their adherence and ideas regarding the programme.

## Chapter 6 Conclusion

### 6.1 Study research problem and aims

Obesity is a growing problem internationally and NZ is currently third in the global obesity rankings (OECD, 2015), with over one million (approximately 31%) adult New Zealanders classified as obese and a further 24% overweight (Ministry of Health, 2016). There are well known negative health associations with being overweight or obese, including diabetes, heart disease, infertility and osteoarthritis among others (James, 2004, Willet, 1999). In 2006, it was estimated that costs associated with overweight and obesity were approximately 4% of the total NZ health care expenditure (Lal et al., 2012). Alongside the health costs, there are also additional costs to companies related to absenteeism, recruitment and training.

A wide ranging review of the literature related to weight, diets and the effects of diets was conducted. Alongside this, the existing non-dieting research was also reviewed. It is well established that while dieting can assist a person to lose weight, the majority of people regain lost weight within years of losing it, proving that weight reducing diets may not be an effective treatment for all people (Korkeila et al., 1999, National Institute Health, 1992, Sarlio-La Hteenkorka et al., 2000, Weiss et al., 2007, Wadden et al., 2007). It is also –established that dieting can have a psychological impact on people resulting in yo-yo dieting, feelings of deprivation and associated negative feelings (Brownell and Rodin, 1994, Kuehnel and Wadden, 1994, Venditti et al., 1996). Within the literature there was a lack of research based in public hospital settings and specifically targeting people with additional health issues aside from weight.

This pilot study was a 28-week intervention implementing a four-week non-dieting weight management programme. Participants were recruited to the study via referrals to the Nutrition and Dietetic Service at Waitemata District Health Board. Patients older than 18 years, with a BMI > 25, who did not have learning difficulties and were not awaiting bariatric surgery or on medications affecting weight and appetite, were invited to participate in the study. Participants attended four consecutive weeks of 1.5-hour group education sessions, which were facilitated by the researcher or another NZ Registered Dietitian. Participants then attended three 30-minute monthly individual follow up sessions with the dietitian and a final session six months after group sessions finished. Anthropometric, eating behaviour, QOL, dietary intake data, and participant perceptions were collected at each time point during the study.

## 6.2 Main findings of the study

Objective one was: *“To evaluate the effectiveness of a non-dieting programme for hospital-referred overweight or obese patients to improve eating behaviours, dietary intake and quality of life”.*

An individual's dominant eating behaviour was identified using the DEBQ. At the beginning of this study the majority of participants had 'restrained' dieting practices and/or ate in response to external triggers (58% each) and 48% were classified as emotional eaters. Over the study period more participants increased their dieting practices, which was an undesirable outcome, with 'restrained' eating as a dominant behaviour increasing to 68% of the participants. However, the non-diet approach programme successfully supported participants to decrease the amount of emotional eating and eating in response to external triggers. At the end of the intervention period, 19% of the participants were classified as emotional eaters and 42% of the participants ate in response to external triggers as their dominant eating behaviour. Over the study period, as a group there was a significant increase in the level of intuitive eating and reliance on hunger levels, and a decrease in frequency of emotional eating and eating in response to external triggers. Participants also reported an increase in intuitive eating levels from 36% of the time to 68% at the end of the follow-up period at W28. Alongside the improvements in eating behaviours, 75% of the participants achieved weight stability or weight loss, which was a desirable outcome as the non-diet approach does not focus on weight loss, but rather on improving well-being and weight management.

Improvements were seen in several areas of dietary intake using the three dietary assessment tools (healthy guidelines questionnaire, plate model and 24-hour dietary recall). Participants reported increasing the frequency of having three meals a day, having 5+ fruit and vegetables daily, and choosing lean meats and low fat dairy across the study period. There were significant increases in the “choose lean meats” and “choose low fat dairy” responses at the final session ( $P=0.01$  and  $P=0.03$  respectively). Median fruit intake also increased from 1 [0, 2] at baseline to 2 [0, 3] ( $P=0.05$ ) at first follow-up after the group sessions finished (W8). Participants significantly decreased their sugar intake from 6 [0, 8] exchanges at baseline to 1 [0, 4] at third individual session ( $P=0.02$ ), however with a small increase up to 3 [0, 6] at final session, W28 ( $P=0.06$ ).

Overall, participants reported a perceived increase in QOL, with a non-significant increase in QOL satisfaction level from 3 out of 5 [3, 4] at baseline to 4 [3.75, 5] at W16 (3 months after group sessions finished). The overall percentage also increased from baseline to one month after group sessions (W8), from 52.7% to 58.7% ( $P=0.04$ ).

Objective two was: *“To evaluate the hospital-referred overweight or obese patient’s adherence to the programme and follow-up sessions”*

The rate of compliance with this study programme (a 43% attrition rate) was similar to previous non-dieting research. However, this study did have a shorter group programme intervention and also the participants had multiple diagnosed chronic diseases; whereas, previous research was completed with healthier subjects and over a longer period. Hence, it is possible that if the programme and follow up sessions were to run over a longer period then the adherence rate may worsen, as one of the main reasons participants missed sessions was due to health issues. Participants suggested that additional sessions would be beneficial, so future studies could explore the option of additional group sessions, or follow up sessions and investigate the adherence to these within this population group.

The aim of this study which was to ascertain the effectiveness, and adherence to, the “Eating for your Health” programme to support patients classified as overweight or obesity using a non-dieting approach, was met. This study has shown that a non-diet approach can support hospital outpatients to improve their eating behaviours, improve their dietary intake and improve reported quality of life measures.

### 6.3 Strengths

This study did not have a separate control group, and participants were their own control. The rationale for this decision was due to the constraints of working within the public health system and having patients referred to the service. It did not meet the Nutrition and Dietetics service specifications to have patients wait an extended period of time to see the dietitian, when intervention opportunities could have been provided. As there were no significant differences seen during the control period, this was an effective method to ensure balance between service requirements and research protocol.

The primary strength of this study is that it reflects what occurs in the secondary care setting and the challenges encountered when working with people with multiple health issues and potentially conflicting priorities to the clinician. To our knowledge; this is the first study in New Zealand to include hospital outpatients as participants in a non-dieting study. It is also the first non-dieting study known to include participants with multiple co-morbidities. Additionally, patients were not



incentivised to be involved. This meant that the results are a true reflection of the effectiveness of the programme, rather than the effectiveness of an incentive.

#### 6.4 Limitations of Study

The small numbers recruited to this study resulted in a reduction in statistical power and this potentially contributed to the lack of significant association between variables. Difficulties in recruitment and high attrition rates meant that we achieved less than half the expected number of participants in this study. Recruitment occurred over an 18 month period and due to length of intervention and the number of interventions held it was not possible to extend the recruitment period further. Low attendance numbers at some sessions also contributed to the lack of follow-up data, which meant variable participant numbers throughout the study period further affected the researcher's ability to analyse and interpret the data fully, as only one third completed the entire study; that is attending all group and follow up sessions and completing all the requirements. Due to low numbers of Māori and Pacific participants recruited it was not possible to evaluate the cultural acceptability of the programme and make conclusions on the suitability of the programme for different ethnicities.

At each time point participants were required to complete six assessment tools. This may have impacted on the participant's ability to complete all the questionnaires and contributed to the difficulties in obtaining completed questionnaires from participants. Every effort was made to remind participants to complete and return questionnaires, however if not returned at the session it was difficult to engage with the participant to ensure the return of completed study documents. For example, at group sessions, with up to 12 other people present it was possible for participants to leave whilst the researcher was busy with other participants, without the researcher discussing the questionnaires with them.

There are difficulties associated in taking waist and hip measurements of very overweight participants. For this study, and due to the real-life situation of attending the sessions in a hospital setting and as a group, all measurements were done over clothes. This may have impacted on the accuracy of the actual measurements in comparison to the reference ranges. However, processes were standardised as much as possible for the participants, to allow for identifying a change in measurements. An effort was made to minimise these effects as the same researcher conducted the majority of the measurements, but some measurements were completed by other clinicians, and the inter-rater differences in measurement may have resulted in slightly varied results.

## 6.5 Future Applications and Research Recommendations

Within the NZ health system there is a large focus on the reduction of obesity numbers, however the focus is still on main-stream diet options focusing on weight loss. This research goes a small way to showing that a non-diet approach can be effectively utilised in the hospital outpatient setting to support people with weight related issues.

Either or both of the IES-2 or DEBQ can be used to identify an individual's level of intuitive eating or main type of eating behaviour respectfully, and could be used in everyday dietetic practice with weight management patients. Having patients complete the IES-2 questionnaire prior to seeing the dietitian would allow the dietitian to identify how intuitively the person eats initially and this could be repeated at the completion of sessions to evaluate change in intuitive eating levels. Similarly by completing the DEBQ eating behaviours which are dominant for that person can be identified and then the Dietitian tailor individual follow-up interventions towards those unhelpful eating behaviours to better support the patient. For example, if the person is an emotional eater, then focus on the role of cognitions and ABC model. If the person eats in response to external triggers, then teach appropriate behavioural tools and strategies to support the person to change how they manage a 'trigger' situation. Having follow-up sessions tailored towards eating behaviours may also help adherence to programmes and support the patient to maintain motivation. Incorporating the DEBQ into practice would also provide the opportunity to evaluate change and show outcomes of treatment. This would be done by having the patient complete the questionnaire again when intervention is completed and comparing to the initial scores.

The following recommendations can be made for future non-dieting research:

- To establish the clinical benefit of a non-diet approach for hospital outpatients with co-morbidities research should include health markers as outcomes, such as glycaemic control, lipid levels and blood pressure and psychological outcomes, such as mood and perception of body image.
- Readiness to change information should be collected at the beginning of programmes to identify how a participant's readiness to change level affects their involvement in a non-dieting weight management programme and also allow programmes be targeted specifically at individuals.
- To further explore the reasons why people either accept or decline invitations to attend group weight management sessions. Understanding patient's reasons for declining may help guide the way group education is promoted and provided to individuals, such as weight

management introductory sessions, an introductory phone call or information packs to better engage patients.

- Ensure that Māori and Pacific people are over sampled, as engagement with these groups was very low.
- Provide standardised process and instructions for collecting measurements, including appropriate training of all data collectors and instructions for participants on keeping clothing consistent at data collection times.
- To ensure appropriate data capturing, it is imperative to factor into sessions support and additional time to allow the participants to complete all the required documents at the time of the intervention.
- Conduct a feasibility study exploring the possibility of additional group or individual sessions being provided, and to examine the sustainability of running longer intervention period within the public health system.

## Chapter Seven: References

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## Chapter Eight: Appendices

### Appendix A: Participant Information Sheet

## Participant Information Sheet

Study title:	Evaluation of an “Intuitive Eating” weight management intervention programme		
Locality:	Waitemata DHB	Ethics committee ref.:	14/NTB/90
Lead investigator:	Franica Yovich	Contact phone number:	0212297058

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Dear

You are on the waiting list to attend a group intuitive eating in weight management programme. This group has been provided for patients wanting support with weight management. We do not however have research that tells us whether the group is effective. I am therefore asking you to take part in a study that assesses the usefulness of the group. Whether or not you take part in the research is your choice. If you don't want to take part, you don't have to give a reason, and you can still attend the group. If you do want to take part now, but change your mind later, you can pull out of the study at any time.

This Participant Information Sheet will help you decide if you'd like to take part. It sets out why we are doing the study, what your participation would involve, what the benefits and risks to you might be, and what would happen after the study ends. We will go through this information with you and answer any questions you may have. You do not have to decide today whether or not you will participate in this study. Before you decide you may want to talk about the study with other people, such as family, whānau, friends, or healthcare providers. Feel free to do this.

If you agree to take part in this study, you will be asked to sign the Consent Form on the last page of this document. You will be given a copy of both the Participant Information Sheet and the Consent Form to keep.

This document is six pages long, including the Consent Form. Please make sure you have read and understood all the pages.

### WHAT IS THE PURPOSE OF THE STUDY?

*The purpose of this study to see how effective an intuitive approach is at supporting people to improve their eating behaviours and health. An intuitive eating approach focuses on identifying hunger cues and helping a person to eat in response to these. The focus is also not solely on weight loss but on improving overall health, such as breathing, wellbeing,*



*fitness and relationship with food. During the study you will have the opportunity to develop skills to better manage your unhelpful thoughts and behaviours which affect your food intake and weight.*

#### **WHAT WILL MY PARTICIPATION IN THE STUDY INVOLVE?**

*You have been invited to be part of this study as you have been referred to Nutrition and Dietetic Service for weight management support. As part of the study you would also need to attend an initial appointment (1-3 months before group session starts) and a final session (six months after group finishes) where information regarding your weight, lifestyle, food intake and eating behaviours will be collected. These sessions will take between 30 – 60 minutes each time. During your group and individual sessions you will be required to keep three day food diaries at home and at the session complete questionnaires evaluating the group sessions and your eating behaviors' and quality of life. You would need to complete these forms at your initial meeting, at start and finish of group sessions and at your individual appointments, this will take up to 30 minutes. Your weight and body measurements will also be completed and kept for study purposes.*

#### **WHAT ARE THE POSSIBLE BENEFITS AND RISKS OF THIS STUDY?**

*There are no foreseeable risks or side-effects to yourself or your family from being involved in the study. As part of the study you will obtain additional information regarding changes to your relationship with food and changes to your food intake during the study period.*

#### **WHO PAYS FOR THE STUDY?**

*You will not incur additional costs by being involved in the study compared to someone who is not. Any parking costs and travel will be reimbursed for attending the initial and final data collection session.*

*Involvement in the four group education sessions and individual follow-up sessions will not be reimbursed as this is standard treatment we offer.*

#### **WHAT IF SOMETHING GOES WRONG?**

*If you were injured in this study, which is unlikely, you would be eligible for compensation from ACC just as you would be if you were injured in an accident at work or at home. You will have to lodge a claim with ACC, which may take some time to assess. If your claim is accepted, you will receive funding to assist in your recovery.*

*If you have private health or life insurance, you may wish to check with your insurer that taking part in this study won't affect your cover.*

## WHAT ARE MY RIGHTS?

*It is your choice to be involved with this study. You have the right to decline to participate and it won't affect your right to see the dietitian in the group sessions. If you choose to be involved but later down the track change your mind. You can withdraw from the research and still continue to see the dietitian in the groups followed by three individual sessions.*

*If any new information about adverse or beneficial effects related to the study becomes available during the study that may have an impact on their health then you will be informed about it.*

## WHAT HAPPENS AFTER THE STUDY OR IF I CHANGE MY MIND?

*Any information collected from you for study purposes will be stored electronically for a maximum of 10 years in secure Waitemata DHB premises. There is the potential that the data could be used at a later date by the researcher or a colleague to complete follow-up research on how you are going 1-2 years later.*

*The information collected from you will be available to you and you will receive a summary report of the findings at the end of the study. This could be up to one year after you stop seeing the dietitian.*

## WHO DO I CONTACT FOR MORE INFORMATION OR IF I HAVE CONCERNS?

If you have any questions, concerns or complaints about the study at any stage, you can contact:

*Franica Yovich  
Nutrition and Dietetic Service  
Waitemata District Health Board  
Ph: 486 8920 extn 3718      Mob: 0212297058  
Email: [Franica.yovich@waitematadhb.govt.nz](mailto:Franica.yovich@waitematadhb.govt.nz)*

If you want to talk to someone who isn't involved with the study, you can contact an independent health and disability advocate on:

Phone:            0800 555 050  
Fax:                0800 2 SUPPORT (0800 2787 7678)  
Email:             [advocacy@hdc.org.nz](mailto:advocacy@hdc.org.nz)

For Maori Health support please contact :

If you require Māori cultural support, talk to your whānau in the first instance. Alternatively you may contact the administrator for He Kamaka Waiora (Māori Health Team) by telephoning 09 486 8324 ext 2324

Unfortunately we are unable to provide an interpreter during the group sessions. If you require an interpreter you will not be able to be involved in the study but you will still be able to see the dietitian, please contact us to make an appointment.

If you have any questions or complaints about the study you may contact the Waitematā District Health Boards Maori Research Committee or Maori Research Advisor by telephoning 09 4868920 ext 3204

You can also contact the health and disability ethics committee (HDEC) that approved this study on:

Phone: 0800 4 ETHICS

Email: [hdec@moh.govt.nz](mailto:hdec@moh.govt.nz)

Appendix B: *Quality of Life Questionnaire*

**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 C: Quality of Life Questionnaire Conversion Chart

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

The scoring of the Q-LES-Q-SF involves summing only the first 14 items to yield a raw total score. The last two items are not included in the total score but are stand-alone items. The raw total score ranges from 14 to 70. The raw total score is transformed into a percentage maximum possible score using the following formula:

$$\frac{(\text{raw total score} - \text{minimum score})}{(\text{Maximum possible raw score} - \text{minimum score})}$$

The minimum raw score on the Q-LES-Q-SF is 14, and the maximum score is 70. Thus the formula for % maximum can also be written as (raw score – 14)/56. The table below converts total raw scores into % maximum scores.

Raw Score	% Maximum	Raw Score	% Maximum	Raw Score	% Maximum	Raw Score	% Maximum
14	0	28	25	42	50	56	75
15	2	29	27	43	52	57	77
16	4	30	29	44	54	58	79
17	5	31	30	45	55	59	80
18	7	32	32	46	57	60	82
19	9	33	34	47	59	61	84
20	11	34	36	48	61	62	86
21	13	35	38	49	63	63	88
22	14	36	39	50	64	64	89
23	16	37	41	51	66	65	91
24	18	38	43	52	68	66	93
25	20	39	45	53	70	67	95
26	21	40	46	54	71	68	96
27	23	41	48	55	73	69	98
						70	100

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Citation: Endicott J, Nee J, Harrison W, Blumenthal R. Quality of Life Enjoyment and Satisfaction Questionnaire: A new measure. *Psychopharmacology Bulletin*. 1993;29:321-326.

Appendix D: *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

## Appendix E: 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.

## Healthy Guidelines Questionnaire

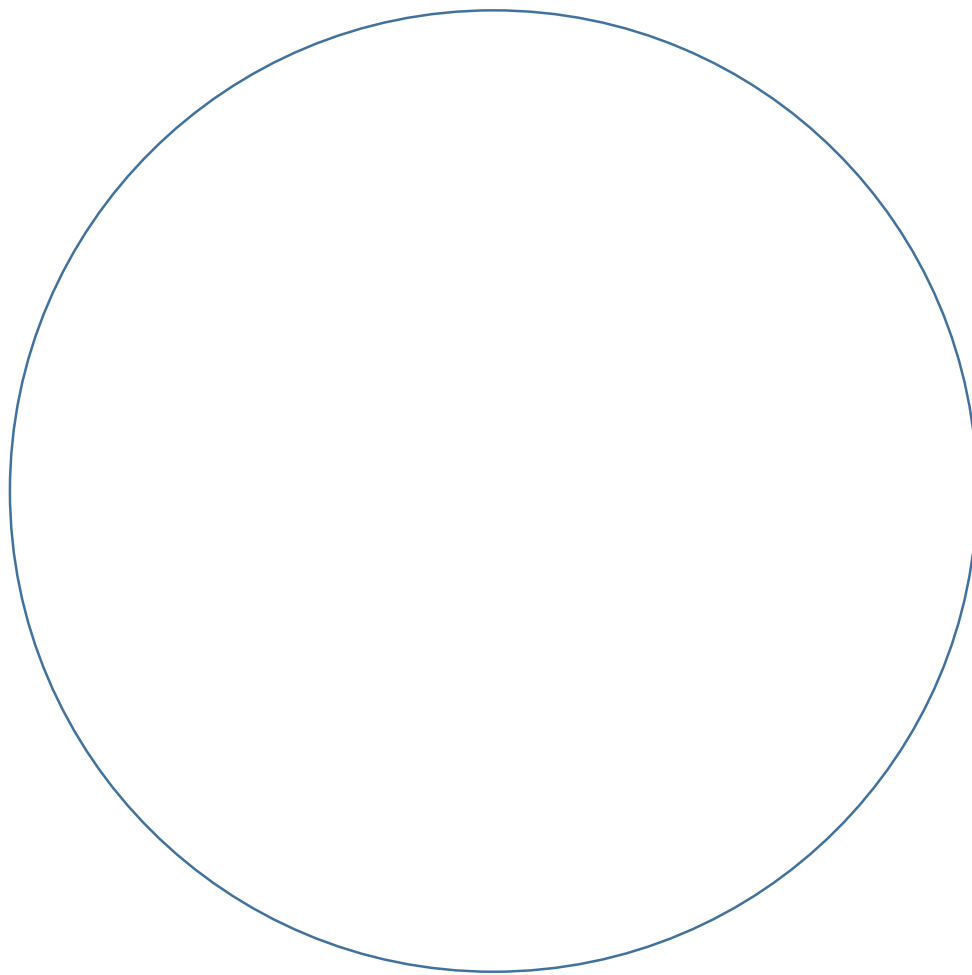
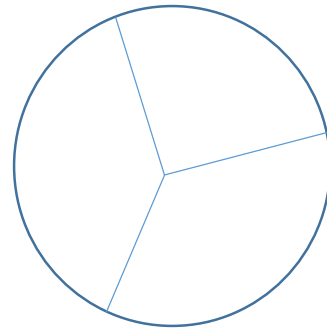
For the healthy eating component of the study, please rate how well you achieved each guideline in the table: (✓)

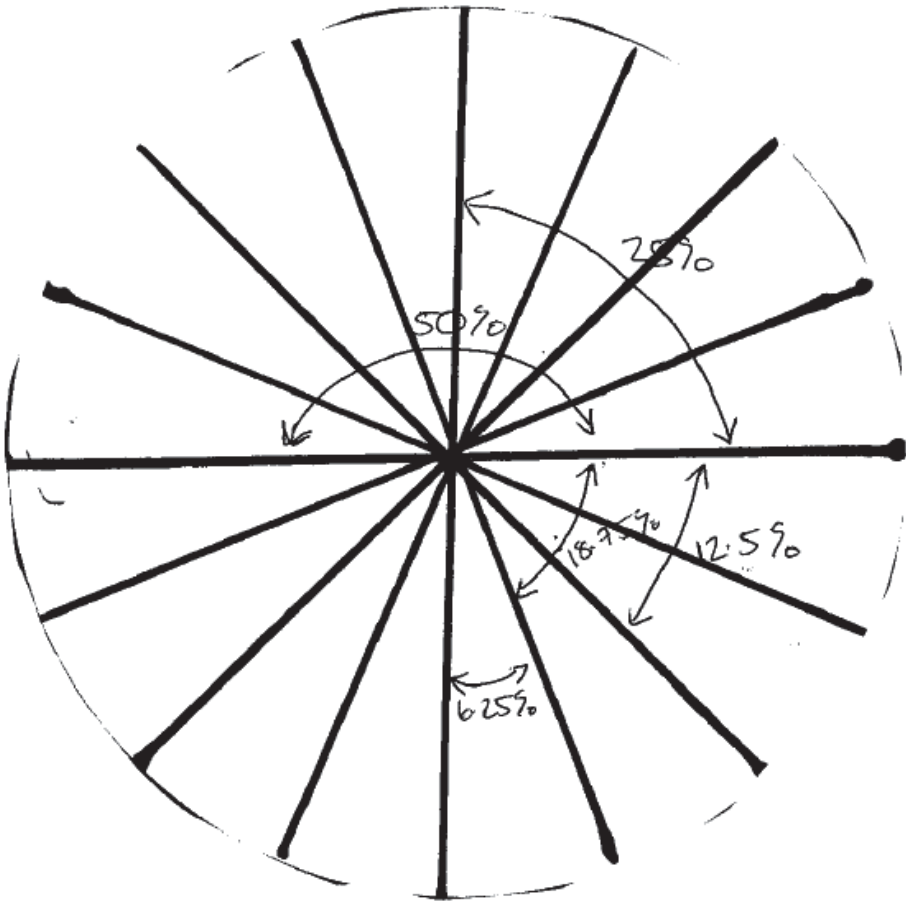
Healthy Heart Eating Guidelines:	Not at all <span style="float: right;">Completely</span>					
	←—————→					
	1	2	3	4	5	6
1. Enjoy three meals each day						
2. Choose fruits/vegetables at every meal & most snacks (3 servings vegetables & 2 servings of fruit)						
3. Select whole grains/high fibre breakfast cereals & breads at most meals & snacks (at least 6 servings per day)						
4. Include a small serving of low fat meat, poultry, fish, or legumes at 1 or 2 meals each day						
5. Choose low fat milk or products, or replace with soy products (at least 2 servings per day)						
6. Use small amounts of oil, margarine, nuts or seeds (no more than 3-5 servings per day)						
7. a) Drink 6 to 8 non-alcoholic drinks per day						
b) Limit alcohol to less than 3 drinks per day						
8. Use small amounts of fat, oil, sugar & salt in food preparation & choose ready-prepared foods low in these ingredients						
9. Mostly avoid deep-fried & fatty foods, or sweet bakery products						

## 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)





24-Hour Diet Recall

Today’s date: \_\_\_\_\_

Which day of the week does this record? *Please tick one*

Sun ☐ Mon ☐ Tues ☐ Wed ☐ Thurs ☐ Fri ☐ Sat ☐

Is this a typical day? *Please tick one* Yes ☐ No ☐



Please be as specific as possible. Include all beverages, condiments, and portion sizes.


Time	Details of Food and Drink	Amount Eaten

## Appendix J: NZ Eating and Activity Guidelines for NZ Adults

### Food groups and the nutrients they provide

The Food and Nutrition Guidelines Statements refer to the four food groups. The information below describes each food group, states the recommended number of servings and serving sizes and lists the main nutrients supplied.


 <b>Vegetables and fruit</b> (includes fresh, frozen and canned)	 <b>Grain foods, mostly whole grain and those naturally high in fibre</b> (includes some breakfast cereals, breads, rice and pasta)
<b>Advice</b> Eat at least 5 servings a day: at least 3 servings of vegetables and at least 2 servings of fruit	<b>Advice</b> Eat at least 6 servings a day
<b>Serving size examples</b>	<b>Serving size examples</b>
<b>Vegetables</b> 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)	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
<b>Fruit</b> 1 medium apple, pear, banana or orange 2 small apricots or plums ½ cup fresh fruit salad ½ cup stewed or canned (in juice)	
<b>Nutrients provided</b> 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	<b>Nutrients provided</b> 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 (2015c)

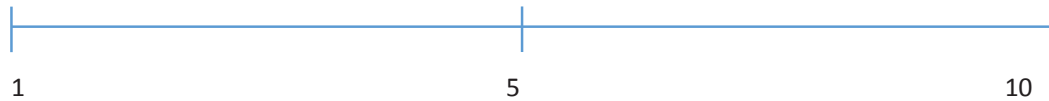
## Confidence Levels

Week 1 - How confident today are you that you can make changes to improve your health?

On the scale below mark with a cross where your confidence level is

1 = not very confident

10 = very confident



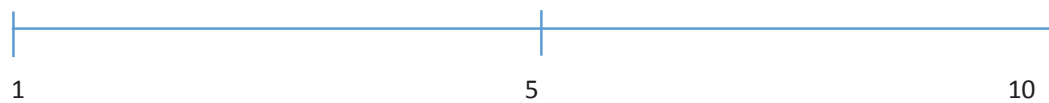
Week 4 – Consider what you have learnt/done over the past four sessions and weeks.

How confident are you right now that you can continue with the changes you have made and/or make further changes?

On the scale below mark with a cross where your confidence level is

1 = not very confident

10 = very confident



Compared to week one do you now feel more, less or about the same level of confidence about making changes? Please circle one option

More

Less

About the same

What has changed for you? Please describe?

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Appendix L: *Changes Questionnaire*

**Participant Questionnaire**

Since signing up to be involved in this study - has the following:  
Please indicate which applies to you.

	Stayed the same	Increased	Decreased	Not relevant
Food intake				
Fruit intake				
Vegetable intake				
Meat, chicken or fish intake				
Starchy carbohydrate (bread, rice, potato, pasta)				
Cakes, biscuits, chocolate, sweets				
Takeaways				
Fried and fatty foods				
Fruit juice and fizzy drinks (not zero or diet)				
Low calorie fizzy drinks				
Water intake				
Alcohol intake				
Planned exercise undertaken (eg. Gym, walks)				
Incidental activity (taking stairs, parking further away)				

Please turn over....

What specific changes, if any have you made to the following over recent weeks:

Diet \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Drinks \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Exercise \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Alcohol \_\_\_\_\_  
\_\_\_\_\_  
\_\_\_\_\_

Thank you for completing this questionnaire

## Appendix M: Participant Final Questionnaire

## Participant Final Questionnaire

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

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?  
If yes, how? \_\_\_\_\_
- | (not useful) | 1 | 2 | 3 | 4 | 5 (very useful) |
|--------------|---|---|---|---|-----------------|
|              |   |   |   |   |                 |

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 currently is.

Confidence Level

1 5 10

Please turn over →

Please comment on the following areas relating to food and your relationship with food as it applies to you over the past six months:

	Improved	Stayed the same	Worsened	Comments on what has changed
Attitude to food				
Eating behaviours				
Relationship with food				
How often you comfort or emotionally eat				
How often you eat when not hungry				
Your ability to intuitively eat (eating in response to your hunger)				
Your overall food intake				
Your planned exercise/activity levels (eg. Gym, walks)				
Your incidental activity (taking stairs, parking further away)				

Would you like to add anything else about how your relationship with food may or may not have changed over the past 6 months?

Please rate, on a scale of 0% to 100%, your ability to intuitively eat on the three scales below. The first scale measures your intuitive eating before the course and the second scale rates your intuitive eating after the course had finished. “**Intuitive eating**” refers to how often you respond to your hunger cues.

Before starting the course      0% (never)      50% (half the time)      100% (all the time)

When group sessions had finished      |      |      |

Over the past week      |      |      |

## ***Eating For Your Health***

### ***Session 1 Evaluation Form***

**How useful did you find today's session?** Please tick the appropriate box.

	Very useful	Useful	Not useful	Comments
<i>Introduction – non dieting</i>				
<i>Advantages Card</i>				
<i>Importance and Confidence levels</i>				
<i>Non hungry eating</i>				
<i>Thoughts - ABC</i>				
<i>Eating Awareness</i>				

**Do you plan to use any of the tools discussed in today's session for homework?**  
If yes, which ones?

**Did you find the handouts in the pack useful?**

Yes ☐ Some of it ☐ No ☐

Please explain your answer:

**Are there any areas/topics that you would like to know more about that were not included, or not covered sufficiently?**

**Was there anything that could be changed to improve today's session?**  
(Please try to list 1-2 items)

**Any other comments or suggestions are appreciated:**

## ***Eating For Your Health***

### ***Session Two Evaluation Form***

**Did you complete homework activities last week?** Please tick the appropriate boxes

	Yes I did it	Very useful	Useful	Not useful	Comments
<i>Eating awareness</i>					
<i>Intuitive Eating Scale</i>					
<i>Thought Diary</i>					

**How useful did you find today's session?** Please tick the appropriate box.

	Very useful	Useful	Not useful	Comments
<i>Homework discussion</i>				
<i>Challenging negative thinking</i>				
<i>When things don't go to plan - Behaviour Chain</i>				
<i>Mindful eating</i>				
<i>Satisfaction Chart</i>				

**Do you plan to use any of the tools discussed in today's session for homework?**

If yes, which ones?

**Did you find the handouts useful?**

Yes ☐

Some of it ☐

No ☐

☐

Please explain your answer:

**Was there anything that could be changed to improve today's session?**

(Please try to list 1-2 items)

**Any other comments or suggestions are appreciated:**

## ***Eating For Your Health***

### ***Session Three Evaluation Form***

**Did you complete homework activities last week?** Please tick the appropriate boxes

	Yes I did it	Very useful	Useful	Not useful	Comments
<i>Intuitive Eating Scale</i>					
<i>Behaviour Chain</i>					
<i>Mindful Eating</i>					
<i>Satisfaction levels/chart</i>					

Did you do homework not listed above? \_\_\_\_\_

**How useful did you find today's session?** Please tick the appropriate box.

	Very useful	Useful	Not useful	Comments
<i>Homework discussion</i>				
<i>Everyday &amp; sometimes foods</i>				
<i>Reading labels</i>				

**What homework do you plan on doing prior to the next session?**

\_\_\_\_\_

**How did you find the number of handouts?**

Too many ☐ Right number ☐ Not enough ☐

**How did you find the length of tonight's session?**

Too long ☐ Just right ☐ Too short ☐

**Was there anything that could be changed to improve the session?** \_\_\_\_\_

**Eating For Your Health**  
**Session Four Evaluation Form**

**Did you complete homework activities last week?** Please tick the appropriate boxes

	Yes I did it	Very useful	Useful	Not useful	Comments
<i>Reading labels</i>					
<i>Practising plate model</i>					

Did you do homework not listed above?  
If yes, which

**How useful did you find today's session?** Please tick the appropriate box.

	Very useful	Useful	Not useful	Comments
<i>Homework discussion</i>				
<i>Exercise</i>				
<i>Being Prepared</i>				
<i>Looking after Yourself</i>				
<i>Goal Setting</i>				

**Did you find the handouts useful?**

Yes ☐      Some of it ☐      No ☐  
Please explain your answer:

**Was there anything that could be changed to improve this session?**



**What were the advantages of the group session?**  
(Please try to list 1-2 items)

**What were the disadvantages of the group session?**  
(Please try to list 1-2 items)

**Will you continue to use any of the tools discussed in the sessions or done for homework?**  
If yes, which ones?

**Are there any areas/topics that you would like to know more about that were not included, or not covered sufficiently?**

**Any other comments or suggestions to improve the session are appreciated:**

Appendix R: Participant responses to Healthy Guidelines Questionnaire

Table 8.1: Frequency of participant responses to Healthy Guidelines questionnaire (n=31)

Response	Enjoy 3 meals	Fruit & Veg	Chose cereal	Chose WG	Chose lean meat	Chose low fat milk	Chose small amounts oils	6-8 glasses non-alcoholic	Limit alcohol	Minimal fats, sugar & salt	Avoid deep-fried & fatty foods
Not at all	1 (3.2%)	1 (3.2%)	2 (6.5%)	0 (0%)	4 (12.9%)	0 (0%)	0 (0%)	2 (6.5%)	1 (3.2%)	0 (0%)	1 (3.2%)
Rarely	2 (6.5%)	5 (16.1%)	5 (16.1%)	2 (6.5%)	3 (9.7%)	3 (9.7%)	3 (9.7%)	2 (6.5%)	1 (3.2%)	1 (3.2%)	1 (3.2%)
		(16.1%)									
Occasionally	4 (12.9%)	6 (19.4%)	3 (9.7%)	4 (12.9%)	2 (6.5%)	0 (0%)	0 (0%)	2 (6.5%)	0 (0%)	2 (6.5%)	4 (12.9%)
		(19.4%)									
Half the time	7 (22.6%)	9 (29.0%)	6 (19.4%)	6 (19.4%)	5 (16.1%)	5 (16.1%)	5 (16.1%)	5 (16.1%)	5 (16.1%)	5 (16.1%)	6 (19.4%)
		(29.0%)									
Most of the time	9 (29.0%)	6 (19.4%)	10 (32.3%)	12 (38.7%)	8 (25.8%)	12 (38.7%)	12 (38.7%)	6 (19.4%)	4 (12.9%)	11 (35.5%)	9 (29.0%)
Completely	8 (25.8%)	4 (12.9%)	5 (16.1%)	7 (22.6%)	9 (29.0%)	11 (35.5%)	11 (35.5%)	14 (45.2%)	23 (74.2%)	6 (19.4%)	10 (32.3%)
WG = whole grain											

Table 8.2: *Additional participant responses from evaluation questionnaires*

Participant Responses
"It is alright to turn down food when someone offers you some"
"No food is naughty food and not to be so hard on myself if I have a bad day"
"Very conscious of what eat and type of food"
"My mind set towards food has changed"
"Changes have stuck with me, it's always at the back of my mind to remind me to think carefully about my food choices"
"I think I have less splurges that I did"
"I'm generally happier with myself than I have been"
"I feel like only now am I starting to make some changes and that I have to change lifelong habits so it is normal for that to be a long process"
"After the classes I think more before inhaling my food"
"I should refer to the hand outs regularly to keep me on track!"