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Food, Eating and Weight

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A complete listing of his writings at <http://psychologywritings.synthasite.com/> and <http://kmbpsychology.jottit.com>.

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1. FOOD AND HEALTH

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1.1. HEALTHY DIETS

Studies of the health effects of diet often concentrate on a single ingredient ¹. But Honma et al (2013) produced powdered versions of the typical diet in Japan in 2005, 1990, 1975, and 1960 for mice. The 1975 version produced the least fat accumulation, and developing the research, Yamamoto et al (2016) found that life span was prolonged with it ².

For each diet, the equivalent of twenty-one meals to cover seven days were produced based on the National Nutrition Survey and the National Health and Nutrition Survey for the relevant years (table 1.1). The 1975 diet was high in grains, and fruit and vegetables with some dairy products.

DIET	CHARACTERISTICS
1960	Highest - grains Lowest - vegetables, fruit, meat, poultry, dairy products, fats, oils Protein and fat (lowest), carbohydrate (highest)
1975	Highest - sugar, fruit, seaweeds, eggs Lowest - seeds and nuts
1990	Highest - potatoes, seeds, nuts, dairy products, beverages Protein (highest)
2005	Highest - vegetables, mushrooms, meat, poultry, fat, oils Lowest - grains, potatoes, sugar Fat (highest), carbohydrate (lowest)

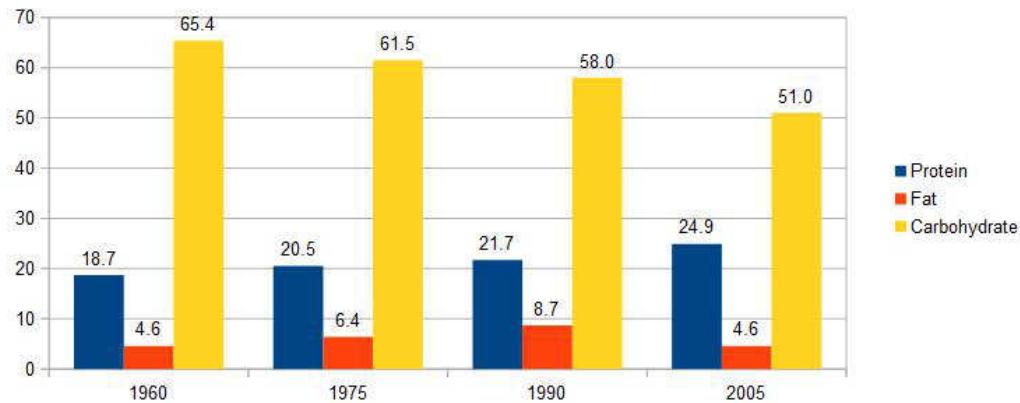
Table 1.1 - Differences between four Japanese diets.

¹ For example, recently, Beyaz et al (2016) showed that higher dietary fat in mice (kept on a 60% fat diet for around a year) affected intestinal stem cells, which could potentially develop into cancer. This fitted with the known association between human colorectal cancer and obesity (Luo and Puigserver 2016).

² Senescence is "a cellular state in which cells permanently stop dividing" (Gil and Withers 2016). The destruction of such cells in mice has been found to delay ageing (Baker et al 2016), but it had no effect on declines in motor performance, muscle strength, and memory (Gil and Withers 2016).

Gil and Withers (2016) pointed out: "It is worth noting that senescence is a protective response that limits tissue scarring (fibrosis) and cancer. Cells that express senescence markers are also involved in wound healing" (p165).

It may be the percentages of protein, fat and carbohydrates (PFC balance) contributing to total energy that is key rather than individual elements (Yamamoto et al 2016) (figure 1.1).



(Data from Yamamoto et al 2016 table 3 p126)

Figure 1.1 - Nutritional composition of diets (g/100 g).

Yamamoto et al (2016) summed up the findings and concerns: "Individuals described as having a long life today are those who consumed the Japanese diet around 1975 when they were between the ages of 40 and 60, when virile and middle-aged. In other words, they had likely been eating a proper diet in the period of life when lifestyle diseases and senescence progression usually develop, leading to increased life expectancy in Japan. On the other hand, because adolescents and children today eat the modern Japanese diet, we might not see today's life expectancy level maintained in the years to come. Indeed, the number of patients with lifestyle diseases such as diabetes and hyperlipidemia increases every year. If Japanese people continue to consume the modern diet, health problems might increase and life expectancy decrease. To prevent this, further detailed examination of the traditional Japanese diet and identification of a diet that is effective in maintaining good health and delaying senescence are necessary" (p127).

A recent human study is the PREvencion con DIeta Mediterranen (PREDIMED) study, which is a five-year randomised trial of over 7000 mostly overweight older adults (55-80 years old) on the Mediterranean diet ³.

³ Diet and mental health is seen as increasingly important with the development of "nutritional psychiatry". For example, the Mediterranean diet has been found to be associated with a lower risk of depression in the PREDIMED study (Sanchez-Villegas et al 2013).

While Jacka et al (2015) have found an association between the stereotypical diet (eg: high

Participants were divided into three groups - Mediterranean diet with extra virgin olive oil, Mediterranean diet with extra nuts, or control diet (reduced dietary fat).

The Mediterranean diet groups showed body weight reductions from baseline at five years ⁴.

Estruch et al (2016) concluded that their findings "lend support to advice not restricting intake of healthy fats for body weight maintenance" (ie: "plant-based, unrestricted-calorie, high-fat diets, such as the traditional Mediterranean diet, do not promote weight gain". This is important because sometimes nutritional advice to obese individuals is to avoid all dietary fat and replace with carbohydrate and protein.

Adherence to diets and health promoting behaviours depends on various factors, including self-efficacy (appendix A), outcome expectation, social support, and acceptability of diet/behaviour (Moore et al 2015).

This last factor is important when individuals are randomised to different dietary regimens. Moore et al (2015) explored the acceptability of the diet in the New DIETs ⁵ study in Columbia, South Carolina, USA, where over sixty overweight and obese participants were randomly assigned to one of five different diets - vegan (no animal products), vegetarian, pesco-vegetarian (seafood, but not meat), semi-vegetarian (limited meat, and seafood), and omnivore (unrestricted meat) - for two months. Adherence was measured by two unexpected requests via mobile phone for 24-hour dietary recall ⁶.

Adherence did not vary between the different groups, but non-adhering (ie: absence of prescribed foods in 24-hour recall) vegan and vegetarian participants had lost significantly more weight at six months (ie: four-month follow-up) than non-adhering omnivorous participants, and non-significantly more than non-adhering pesco- and semi-vegetarian participants. Overall, 54% of participants were assigned to a preferred diet and 40% to a least preferred option.

sugar and fat) and depression and anxiety. In brain scans the left hippocampus was also significantly smaller with this diet. One explanation is that high-sugar diets trigger inflammation and other metabolic changes, which destroy healthy brain tissue (Stetke 2016).

⁴ The authors admitted that "in any feeding trial in free-living people, there can be difficulties in ensuring compliance with dietary instructions" (Estruch et al 2016 p9). Energy restriction or physical activity were not advised.

⁵ New Dietary Interventions to Enhance the Treatments for weight loss (DIETs) (Turner-McGrievy et al 2014).

⁶ Studies of food intake are less common outside the West, but there are exceptions. For example, Bidi et al (2015) collected data on the 24-hour dietary intake of 387 healthy mothers in the province of Errachidia, Morocco. Women from urban areas had higher food consumption than women from rural areas, particularly in daily vegetables, cereals, red and white meat intake. Daily intake was also correlated with family size (eg: more vegetables in larger families), occupation, and level of education (eg: higher white meat intake and lower educational level).

The researchers drew the following conclusion: "counselling overweight individuals to follow plant-based approaches, such as vegan and vegetarian diets, may allow for greater weight loss and decreases in animal product intake as compared to approaches that include meat, even in the absence of 100% adherence to the diets [...] Despite the low adherence rates among participants, non-adherent vegan and vegetarian participants still had diets that contained fewer animal products than non-adherent pesco-vegetarian or semi-vegetarian participants and omnivorous participants" (Moore et al 2015 p35).

1.2. FOOD PREFERENCES AND CHOICES

The first two years of life are seen as crucial in the development of food preferences and eating behaviours, and this is also linked to the development of overweight and obesity in later life. This is particularly the case with fruit and vegetables (F/V) as compared to non-core foods (ie: nutrient poor and high in saturated fats, added sugars and/or salt). For example, one study found that one-third of 0-3 year-olds did not eat F/V, but almost all consumed non-core foods every day (Mallan et al 2016).

Vegetables, in particular, are rejected by young children as part of food neophobia (fear of new foods)⁷, whereas this is not a problem with non-core foods. High food neophobic toddlers ate less F/V than low food neophobic children, but the two groups did not vary on preference and intake of non-core foods (Howard et al 2012).

Food neophobia is influenced by early feeding experiences (as much as genetic taste preference), and repeated exposure to new foods reduces it, as shown by consumption of more and varied F/V in the first two years of life and the association with increased intake of F/V at school age (Mallan et al 2016). But often studies of this relationship are based on maternal recall (retrospective studies).

Mallan et al (2016) used data from a longitudinal study in Australia. Six hundred and ninety-eight first-time mothers in Brisbane and Adelaide, recruited in 2008-9, receiving training on protective feeding practices (ie: healthy eating guidance) or not in their child's first year of life. Data were collected up to 3-4 years old. The aim was to establish the relationship between number of F/V and non-core foods tried at age fourteen months and then liked at 3.7 years old.

Mothers scored nineteen fruits, 25 vegetables, and

⁷ Food neophobia may become an eating disorder (appendix E).

eighteen non-core food items as tried at the data collection point of 14 months old, and then as liked (on a six-point scale) at 3.7 years old ⁸.

Overall, there was a significant relationship between food tried at fourteen months old and later liking:

- More F/V tried associated with liking of a greater number of fruits at 3.7 years old.
- More vegetables tried associated with greater number of vegetables liked.
- Non-core foods tried and liked.

There was no difference between mothers who had receiving protective feeding training or not.

This was a prospective study, which means the data were collected at fourteen months old before the later data and not influenced by maternal recall bias as in retrospective studies.

The researchers concluded that "early taste and texture experiences influence subsequent food preferences and acceptance. These findings indicate introduction to a variety of fruits and vegetables and limited non-core food exposure from an early age are important strategies to improve later diet quality" (Mallan et al 2016 p630).

Attempts to encourage greater F/V consumption at school include simply providing F/V ⁹ to multi-component interventions, like the "Food Dudes" programme. This programme includes role models (eating F/V), repeated tasting of different F/V, and rewards for eating certain amounts of them. It lasts for 3-4 months.

During the period of the programme, fruit consumption increases (up to 160% from baseline in the best study) and vegetable consumption increases but by less (50% at the best) (Morrill et al 2016).

Two longer studies (follow-up at 12 months) have found contradictory results. Wengreen et al (2013) reported a combined increase of F/V and juice of over 70% from the pre-intervention baseline, while Upton et al (2013) found that F/V consumption fell below the baseline. The nature of the implementation of the programme at different schools probably explains the contradictory findings (known as implementation fidelity) (Morrill et al 2016).

Consequently, Morrill et al's (2016) evaluation of

⁸ The measure used did not distinguish between "whether the child had never been offered the food or had been offered the food but refused to taste it" (Mallan et al 2016).

⁹ Simply providing F/V has no lasting benefits for 5-12 year-olds (Evans et al 2012).

the Food Dudes programme took this into account. Six public primary schools in northern Utah, USA (with over 2000 pupils in total), were recruited to the study in 2011-12. Two schools each were allocated to three study conditions - Food Dudes programme with tangible rewards (eg: small toys) (prize group), Food Dudes programme with teacher praise ¹⁰, or control group (non-intervention). Each day the children were given certain amounts of different F/V at school. F/V consumption at home was not measured.

Implementation fidelity was assessed by researchers randomly checking that rewards were appropriately given, and automatically when the teachers accessed the programme website. There was no way of checking the praise, and this relied on teacher self-reports.

Initially, F/V consumption was significantly higher in the prize group than the other two conditions, and this continued throughout the programme and also at six-month follow-up ¹¹. F/V consumption was significantly higher in the praise group than the control condition by the end of the programme.

Morrill et al (2016) summed up: "When the Food Dudes programme was implemented as designed, with tangible rewards delivered for F/V consumption, children consumed a mean of 92% more F/V during the intensive first 3 weeks (phase I) than did children attending control schools..." (p625).

The researchers noted one relevant point about the timing of rewards - ie: the food was eaten in the cafeteria and the rewards were given later in the classroom.

The Food Dudes programme is quite expensive in terms of materials, and the teachers' time. Hoffman et al (2011) reported increased F/V consumption over two years using inexpensive reward stickers, but it did require teachers to monitor the children closely (Morrill et al 2016).

As a generalisation, individuals from lower socio-economic status (SES) groups are more likely to consume diets with high fat and low micro-nutrients and less F/V than higher SES individuals, and also for mothers and their children's diets (Hardcastle and Blake 2016).

Hardcastle and Blake (2016) explored the food choices of sixteen mothers from a socially-deprived community in southern England in semi-structured interviews. Four main themes emerged from analysis of the

¹⁰ "Teachers were instructed to praise the behaviour of individual students and given autonomy to do so in a way that felt natural and genuine" (Morrill et al 2016).

¹¹ There are concerns that individuals given tangible rewards for a behaviour will discontinue the behaviour when the rewards stop. This is sometimes called the "over-justification effect", and it was not found in the study (Morrill et al 2016).

transcripts:

i) Cost and budget influencing food choices - This was mentioned by almost all mothers; eg: "Wherever's the cheapest and what offers are on at the time... we don't eat vegetables every day, we don't eat fruit every day. It's mainly frozen foods we do eat coz it's just the cheaper option really" (p3).

ii) Diversity in household rules controlling food - These included food that the children wanted "coz they're the ones eating it", or rules about snacks (eg: "one of them might come and say can I have a packet of crisps mum and I'll say no your dinner will be ready in twenty minutes" (p4)).

Healthy eating was often perceived as associated with restriction and control.

The mother was usually the food "gatekeeper" (Reid et al 2009), because, as one woman said: "I do the shopping. If I don't buy it they can't have it can they?" (p6).

iii) Role of socialisation on diet - The importance of habit usually based on the parents' childhood experiences. For example, one mother told the story of her husband, who "will have his dinner and then he will go and make himself some bread and butter afterwards because that's what his mother always told him to do and even now he still does it and it's not necessary... my middle son is kinda following along the same route" (p4).

iv) Improved cooking skills and confidence to make homemade meals ¹² - Many of the young teenage children were learning cooking skills at school, and this encouraged the mothers to improve their skills. One woman said: "I've changed the cooking, the method of cooking... one thing I have changed recently I must admit is that I do much more in the oven; I've found alternative ways of cooking food... that's more healthy and I've been using cooking spray rather than oil you know just little changes" (p5).

Hardcastle and Blake (2016) summed up: "Cost was reported as an important influence on parental food shopping choices, limiting the variety and availability of healthier food items within the home. However, when healthier snack options were available, the role of taste, availability and socialisation influenced at home eating behaviour" (p6).

¹² About one in seven mothers in the UK cook from scratch every day (ie: use no convenience foods) (Warner 2016). It is often assumed that such home-cooked meals are healthier than convenience products and "ready meals". This is not necessarily the case (table 1.3).

1.2.1. Parental Control Rules

Generally, parental rules that restrict food between meals leads to positive dietary intake by children. But which food rules are most effective?

Gevers et al (2015) attempted to answer this question with 359 mothers of 4-12 year-olds in Holland. Nine rules were presented in a questionnaire with yes/no options. The rules came from indepth interviews with four mothers, and discussions with health promotion experts (table 1.2).

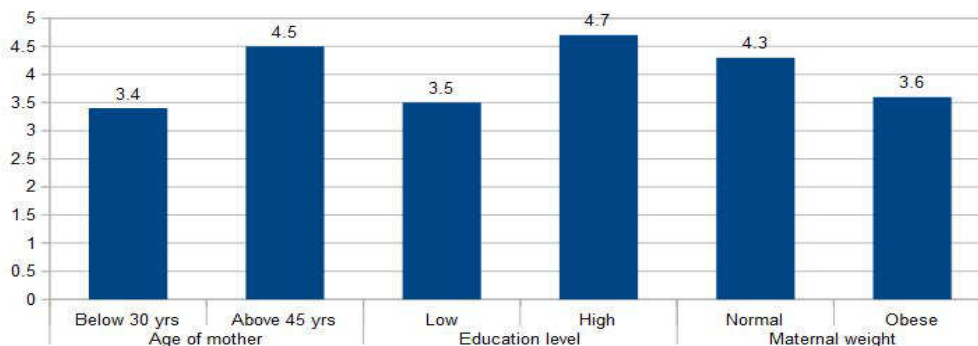
- Foods never allowed to consume
- Not allowed to consume very often
- Not allowed to consume too much
- Not shortly before a main meal
- Only allowed on certain days of week
- Only allowed on certain times of day
- Only allowed certain types of foods
- Only on special occasions
- Only in certain places

Table 1.2 - Nine rules about food between meals.

Only 5% of mothers used none of the rules, with the average being four rules. The most common rules in order were not allowed shortly before meal (88% of mothers), not allowed certain foods too often (70%), and not too much of certain foods (69%).

Older mothers (45 years and above) used more rules, as did higher educated ones, while obese mothers and those with older children (10-12 years old) were less restrictive (figure 1.2). In terms of specific foods (out of twenty-six categories), rules were most often applied to crisps and sweets.

Data were not collected from fathers.



(Data from Gevers et al 2015 table 1 p64)

Figure 1.2 - Mean number of rules used by selected groups of mothers.

- Carstairs et al (2015) compared 278 commercial infant and young child feeding meals (ie: for under 5 years old) with 408 home-cooked recipes from cookbooks in the UK. The former were on average twice as expensive per 100g. Home-cooked meals had half as much more energy than commercial meals (101 vs 67 kcal/100g). Home-cooked meals also had more carbohydrate, salt, protein, and total and saturated fat.
- The researchers concluded: "The majority of commercial meals met ED [energy density] recommendations and can provide a convenient alternative which includes a greater vegetable variety per meal¹³. Home-cooked recipes provided 6%-77% more nutrients than commercial, however the majority of these recipes exceeded ED and fat recommendations" (p1042)¹⁴.

Table 1.3 - Home-cooked meals.

Parental control rules generally which use food to reinforce good behaviour can lead to children's increased preference for high sugar/fat foods. "Under the control rules, the gratification of HR [highly reinforcing] food often follows behaviours praised by parents, leading to a sense of achievement and parents' attention. After sufficient repetition, such contingent pleasurable experiences may be added to the 'natural' reinforcing property of HR food" (Lu et al 2015 p94).

Lu et al (2015) investigated this with the parents of 207 6-12 year-olds in Montreal, Canada, who completed a web-based food frequency questionnaire. This asked parents to recall the child's food intake in the last month from a list of 136 food and beverage items. The frequency and portion size of foods eaten were estimated by the parents to allow researchers to calculate the children's daily nutrient intake.

The children were asked about the use of food as a reinforcer with items like "you received food as a reward for good behaviour". Subsequently, the children were divided into low control rules and high control rules groups for analysis.

Children in the high control rules group (ie: high use of food as a reinforcer) had significantly higher daily energy intake, higher fat and carbohydrate intake per day.

When children's responsiveness to reward was included, boys in the high control rules group who were most sensitive to rewards had the highest intake overall and of fat and carbohydrate.

¹³ Mesch et al (2014) found no difference in vegetable variety between the two types of meal in a German study. A greater variety of different tastes reduces potential food neophobia (Carstairs et al 2015).

¹⁴ Garcia et al (2013) argued that commercial meals were unsuitable for infants, but "they compared commercial foods to breast milk and not age-specific recommendations" (Carstairs et al 2015).

1.2.2. Healthy Eating At Home

A number of measures have been developed of the attributes of the home than encourage or discourage healthy eating behaviours. For younger children (3-8 years old), there is the Healthy Home Survey (Bryant et al 2008), for instance, which has sixty-six items covering food availability, eating practices, media, and the physical environment.

For 8-13 year-olds, there is the Healthy Environment Survey (Gattshall et al 2008) covering food availability, role modelling, and parental rules, for example.

Tabbakh and Freeland-Graves (2016) developed the Multi-Dimensional Home Environment Scale (MHES) to survey the home environment of adolescents and the effect on their eating behaviours. One version with eighty items (later reduced to thirty-two) is used by the adolescents, and another with 85 items (subsequently 36) by their mothers. The scales cover factors relevant to obesity under the headings:

- Psychological - eg: healthy eating attitudes;
- Social - eg: family regulation of mealtimes;
- Environmental - eg: availability of healthy and unhealthy foods.

A study with 228 mothers and adolescents in the USA using the MHES "reinforces the importance of social and psychological domains and further takes into consideration attitudes, self-efficacy, mindless eating, and emotional eating, which are fostered in the home environment" (Tabbakh and Freeland-Graves 2016 p81).

1.3. MISSING MEALS

Poor dietary habits include a large intake of "empty calories" (eg: added sugars, solid fats) and sodium, and a low consumption of key micro-nutrients (eg: vitamins, minerals) ¹⁵, through breakfast and lunch skipping, and eating of snacks ¹⁶ (Mathias et al 2016).

¹⁵ Often the focus is upon individual elements of diet, but "people consume food, not individual nutrients" (Cheng et al 2016). This has led to the development of dietary indices to score overall diet quality, of which there are nearly thirty for children, and most of them are related to the Western diet (Cheng et al 2016). Consequently, there was the development of the Chinese Children Dietary Index (Cheng et al 2016).

Over 1700 7-15 year-olds were interviewed individually face-to-face about all food and drink consumed in the preceding 24 hours on three randomly chosen days. The dietary intake was converted into nutrient intake. Scoring is based on appropriate amounts and types of nutrients compared to official recommendations, and health-promoting behaviours.

¹⁶ Approach-avoidance conflict describes the tension between two mutually exclusive motivations (eg: to ingest a substance versus known harm). In addiction, the approach is seen as dominating the

The low level of micro-nutrients is especially important for children and adolescents ¹⁷, and lunch, for instance, can contribute 20% of their daily intake. Lunch skipping, thus, has implications here. Mathias et al (2016) showed this to be the case with data from the National Health and Nutrition Examination Survey (NHANES) 2009-10 and 2011-12. Over 4700 4-18 year-olds were interviewed in these surveys. Those who self-reported missing lunch were compared to eaters.

It was found that 7% of 4-8 year-olds, 16% of 9-13 year-olds, and 17% of 14-18 year-olds missed lunch, and the energy and protein intakes of these individuals were significantly lower than 9-13 and 14-18 year-olds that ate lunch. But lunch non-consumers had significantly lower total fat and saturated fat intake as well as total fibres. There was no difference in total sugar, added sugar or solid fats intake between lunch consumers and non-consumers. The researchers concluded that there were "potential concerns for children missing lunch with respect to micro-nutrient intakes and... that the lunches consumed by children in the United States are an important source of essential nutrients, but also less healthful dietary components" (Mathias et al 2016 p667).

This study used self-reported lunch missing, which depends on the recall and honesty of the participants, but also what is defined as lunch. "Currently, a clear standard definition of a lunch meal (whether based on name, time of consumption, or food and beverage components) has not been established" (Mathias et al 2016 p674). The study was based on a single 24-hour period, and did not investigate habitual lunch missing.

Eating breakfast has been linked to lower fat intake, higher levels of vitamin C, and less snacking among children (Sudharsanan et al 2016). In a Canadian study of pre-schoolers, children who did not eat

avoidance (Editorial 2016).

Symbolically pushing away the substance can improve the avoidance. For example, students who pushed away pictures of chocolate, subsequently ate less chocolate muffins than students who pushed pictures towards themselves (Schumacher et al 2016).

On the other hand, students trained to avoid images of chocolate ate more than a control group (Becker et al 2015). "Existing motivation to avoid chocolate, and cravings to approach it, might be influencing the results" (Editorial 2016).

¹⁷ Deficiencies in micro-nutrients, like zinc, and omega-3 fatty acids, have been linked generally to perinatal and maternal mortality, cognitive deficits, and weakened immune function (Golden et al 2016). Fish are an important source of micro-nutrients, and with the global decline in fish populations, Golden et al (2016) calculated that over 10% of the world's population may suffer micro-nutritional deficiencies consequently, in particular zinc, iron and vitamin A (and especially in low-latitude nations - eg: Pacific Islands, Sub-Saharan Africa).

The researchers used data from the "Global Expanded Nutrient Supply" (GENuS) database, which covers world food production, and supplies of 225 foods. Fish populations are detailed in "The Sea Around Us" database, which covers catches between 1950 and 2010 for every coastal nation.

breakfast were twice as likely to be obese at five years old than those who did eat it (Dubois et al 2006) ¹⁸.

In the USA, breakfast is available at many schools through the School Breakfast Program (SBP). This programme has been evaluated in relation to weight gain by a number of studies including:

i) Gleason and Dodd (2009) - Children of all ages on the SBP had lower BMI (body mass index) scores than those not on the programme.

ii) Bhattacharya et al (2006) - No relationship between SBP and BMI.

iii) Millimet et al (2010) - After controlling for other variables, children in the first three years of school on the SBP had a reduction in weight over that period.

iv) Sudharsanan et al (2016) - After controlling for variables, receiving school breakfasts at ten years old was associated with weight gain at age 13 for children from families below the federal poverty line only ¹⁹.

Table 1.4 summarises key differences between the four studies.

The content of breakfast when eaten is important. Leidy and Racki (2010), for example, found that a protein-enhanced breakfast for "breakfast-skipping" adolescents led to less energy intake at lunch-time, but not over the whole day, as compared to a normal-protein breakfast. While Leidy et al (2013) found that a high-protein breakfast significantly reduced evening snacking of high-fat foods as compared to breakfast skipping in older female adolescents.

Kral et al (2016) compared three types of breakfast - eggs, cereal, or oatmeal - with forty 8-10 year-olds at the Center for Weight and Eating Disorders at the University of Pennsylvania, USA. Lunch content and quantity was controlled by the researchers, and food intake for the whole 24-hour period was based on caregiver reports.

The children consumed significantly less at lunch

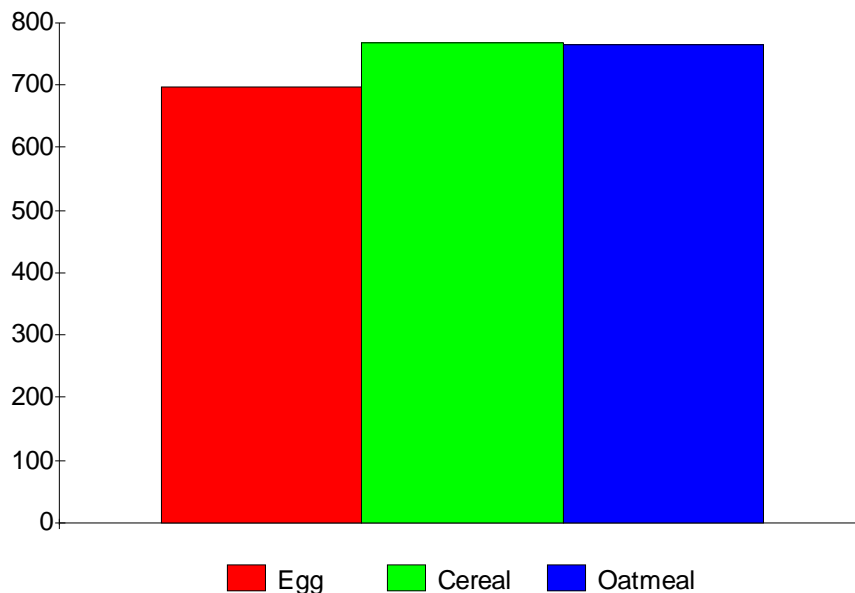
¹⁸ Observational studies suggest the health benefits of eating breakfast, but these studies tend to not have control groups (Mohammadi 2016). Controlled studies, like Chowdhury et al (2016a), that systematically compare breakfast eaters and non-eaters find that the latter eat more at lunch-time, but not greater than the amount of calories in breakfast. On the other hand, breakfast eaters have the advantage of better control over glucose levels in the afternoon (Chowdhury et al 2016b), which would give a lower risk of developing type 2 diabetes (Mohammadi 2016).

¹⁹ Schanzenbach (2009) found that consumption of school lunches was associated with obesity for children in poverty.

STUDY	
Gleason & Dodd (2009)	Based on cross-sectional data on 5-16 year-olds from the School Nutrition Dietary Assessment Study.
Bhattacharya et al (2006)	Based on cross-sectional data of 5-16 year-olds from NHANES in 1988 and 1992. Used a "difference-in-difference" approach - difference in weight between school term and holiday for children attending schools with SBP or not.
Millimet et al (2010)	The longitudinal data on weight change between 5 and 8 years old came from the Early Childhood Longitudinal Study, Kindergarten cohort of 1998-99 (ECLS-K). Used measure of SBP availability at a school rather than actual receipt of school breakfast. Many children attend schools with a SBP available, but do not receive school breakfast.
Sudharsanan et al (2016)	Using ECLS-K data for weight change of children between 10 and 13 years old. Used receipt of school breakfast (parents' reports) rather than availability of SBP. Poverty level based on classification at 10 years old.

Table 1.4 - Key differences between the four studies of SBP.

after the egg breakfast as compared to the other two types of breakfast (figure 1.4), but there was no difference among the breakfasts for energy intake over the whole 24-hour period.



(Data from Kral et al 2016 table 4 p18)

Figure 1.4 - Mean energy intake at lunch (kcal).

1.4. SUGAR-SWEETENED BEVERAGES

Sugar-sweetened beverages (SSBs) include sugar-sweetened carbonated beverages, fruit drinks, energy or sports drinks, flavoured milks, and tea/coffee with sugar. They are seen as part of the problem of weight gain in the West ²⁰, but not by all studies ²¹ (Della Torre et al 2016).

The difference in results of studies may be due to methodological issues. Della Torre et al's (2016) systematic review of 29 cohort and three experimental (randomised controlled trials) studies on SSB consumption and obesity among children and adolescents concentrated on the methodological quality of the studies found. They divided the studies into three categories:

- Positive - full details given of, for example, inclusion/exclusion criteria of participants, selection bias, and data collection and analysis.
- Neutral - some details covered and some missing.
- Negative - did not cover any of the details mentioned above.

Nine studies had a positive rating, and the others were rated neutral. The conclusion was that "the majority of studies with strong methodology indicated a positive association between SSB consumption and risk of obesity or obesity, especially among overweight children" (Della Torre et al 2016 p657).

For example, Ebbeling et al (2012) compared 110 14-15 year-olds receiving four servings of non-caloric beverages per day for 12 months with 114 usual beverage consuming adolescents. At the end of the programme, the control group had gained significantly more weight (+0.63 vs +0.06 BMI). This difference was not evident one year later.

However, Della Torre et al (2016) warned: "The physiologic mechanisms underlying the association between SSB consumption and obesity are not yet completely elucidated, and whether the effect of sugar and calories from SSBs is worse than the effect of some

²⁰ One controversial technique to reduce sweet intake generally is to increase the price (or tax) unhealthy foods or beverages. For example, in Mexico a 10% price rise on SSBs has reduced overall purchases by 12% in the first year (and by more in lower income groups) (Colchero et al 2016).

The UK Government proposes from April 2018 to tax beverage manufacturers. But this may not reduce sugar content as the tax could be absorbed by the companies or passed onto the consumer indirectly (eg: across the product range). "This would mean no relative price increase on sugary drinks and so probably no drop in consumption" (Briggs 2016).

²¹ For example, an association between higher physical activity and higher sports drink intake (Della Torre et al 2016).

other food is unclear" (p657).

Della Torre et al (2016) summarised the key methodological issues with the research on SSBs, including:

i) Measurement of exposure to SSBs - eg: on a single day; frequency in a week.

ii) Definition of SSB - eg: distinguishing SSBs from artificially-sweetened beverages.

iii) Loss of participants at follow-up leading to selection bias.

iv) Control for eating habits - eg: "SSB consumption may be a marker of a generally poor-quality diet. It is, therefore, difficult in cohort studies to isolate the effect of SSBs from the overall diet" (Della Torre et al 2016 p657).

2. MOTIVATION TO EAT AND WEIGHT

- 2.1. Hedonic hunger
 - 2.1.1. Environmental factors and intuitive eating
- 2.2. Binge eating
- 2.3. Under-reporting food intake
- 2.4. Healthy weight
- 2.5. Childhood obesity
- 2.6. "Freshman weight gain" and student experience
- 2.7. Weight stigmatisation and quality of life
- 2.8. Canine obesity

2.1. HEDONIC HUNGER

Hedonic hunger is eating food because it is available rather than needing the energy (homeostatic hunger) (Lowe and Levine 2005)²² ²³. The Power of Food Scale (PFS) (Lowe et al 2009) has been developed to measure hedonic hunger. It has fifteen items, like "I find myself thinking about food even when I'm not physically hungry".

High delay discounting (DD) (table 2.1) is linked to disinhibited eating, obesity, and binge eating, while low DD protects against future weight gain (Ely et al 2015)²⁴.

Delay discounting (DD) is "the extent to which an individual discounts the value of an outcome because of a delay to its occurrence" (Fields et al 2015 p101). Put another way, individuals value and choose smaller immediate rewards before delayed longer ones. Applying this idea to health behaviours, current benefits (eg: smoking, risky behaviour) will be valued and chosen over future health.

For example, MacKillop et al's (2011) meta-analysis found that substance users had more DD than non-users in many areas. A current smoker is more likely to choose £1 now than £2 in one hour, say, than

²² Metabolic or homeostatic hunger is regulated by hormones like leptin and ghrelin, and the hypothalamus, but the reward centre in the brain is involved in hedonic hunger. This is similar to addictive drugs, and dopamine is involved. High palatable foods trigger dopamine. "Consequently, the brains of overeaters demand a lot more sugar and fat to reach the same threshold of pleasure as they once experienced with smaller amounts of the foods. These people may, in fact, continue to overeat as a way of recapturing or even maintaining a sense of well-being" (Jahr 2016 p19).

²³ "Given the brain's strict dependence on glucose as a fuel, plasma glucose levels are precisely regulated by an array of hormones... Some are selected in response to nutritional cues, while others respond to glucose itself, producing highly co-ordinated and precise regulation of circulating glucose levels" (Romere et al 2016 p566). Romere et al (2016) reported the discovery of asprosin, a protein hormone that regulates glucose homeostasis, and may differ in obese individuals.

²⁴ High DD predicts greater consumption of high energy-dense ready-to-eat and away-from-home foods in obese women (Appelhans et al 2012), and individuals with high DD and high motivation to eat are more obese (Daniel et al 2015).

ex-smokers or non-smokers (Fields et al 2015).

DD has been found to be associated with obesity (Fields et al 2015), while obese adolescent smokers used DD more than average-weight smokers (Fields et al 2011).

Stress has a role to play in encouraging short-term gratification and DD. Thus, "when individuals are under stress, they shift to a more immediate-oriented mindset (as reflected by more impulsive delay discounting), the immediate motivation being to relieve stress, and so individuals engage in maladaptive coping mechanisms, such as engaging in risky health behaviours" (Fields et al 2015 p103).

Table 2.1 - Delayed discounting.

Neuroticism, which manifests as high levels of anxiety, moodiness, and perfectionism, is associated with DE and eating disorders (Thamotharin et al 2015). "Neuroticism renders individuals susceptible to more stress, which may result in greater impulsivity (appendix C) and willingness to engage in unhealthy coping mechanisms, such as disordered eating" (Thamotharin et al 2015 p92).

Lee-Winn et al (2016a) found a significant association between high neuroticism and high impulsivity (known as high NI²⁵) and binge eating in over 10 000 US 13-18 year-olds in the National Co-Morbidity Survey: Adolescent Supplement (NCS-A) (2001-4). This is a national representative cross-sectional study.

Using the same data, Lee-Winn et al (2016b) looked at NI and coping styles for stress - problem-solving, distraction or escape-avoidance - and binge eating. Females were more likely to have high NI, and to use more escape-avoidance coping styles than males, and this coping style was significantly associated with binge eating. For analysis purposes, 437 individuals with binge eating were compared to 9591 adolescents with no eating disorders. This figure of 437 included 162 individuals with a diagnosis of BED and 275 with sub-threshold BED²⁶. The researchers, however, could not establish "whether adolescents use binge eating as a coping strategy" (Lee-Winn et al 2016b).

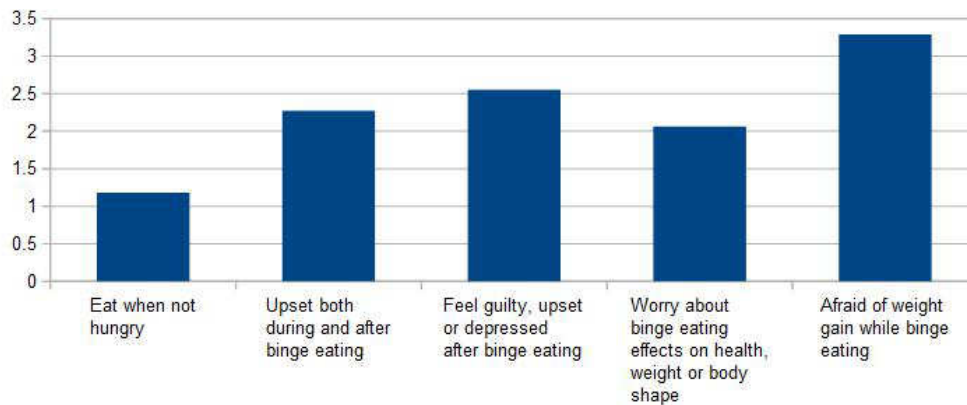
Lee-Winn et al (2016c) analysed the same data further for gender and ethnic differences in binge eating symptoms. In terms of gender, females reported more loss

²⁵ Raynal et al (2016) found an association between certain personality traits and DE in a French study. Two-thirds of 101 young adults classed as having DE showed a "morbid personality profile" (eg: schizotypal, autistic, obsessional traits).

²⁶ Among differences between BED and sub-threshold BED, the latter has binge eating on average at least two days a week for three months for diagnosis, while BED does not quantify the frequency, but has behaviours like "feeling guilty", "eating more quickly than usual", and "worry about the long term effects" (Lee-Winn et al 2016b).

of control (eg: "eat when not hungry") and distress about binge eating than males. Swanson et al (2011) had previously reported three times greater BED in females in the NCS-A data (2.3 vs 0.8% prevalence) (figure 2.1). Lee-Winn et al (2016c) worried that the "traditional view of problematic eating as a 'female issue' (Striegel-Moore et al 1986) may hinder male adolescents from reporting binge eating symptoms or may influence males not to view binge eating as a problematic or distressing behaviour" (p30).

While the ethnic differences between Black and White respondents were less guilt about binge eating and less being afraid of weight gain by the former group. Hispanics were most afraid of weight gain from binge eating (Lee-Winn et al 2016c).



(Data from Lee-Winn et al 2016c table 2 p30)

Figure 2.1 - Odds ratio of characteristics where females greater than males.

Thamotharin et al (2015) found that the relationship between neuroticism and DE was mediated by DD among forty adolescents in the USA. "Neurotic adolescents are more likely to have a preoccupation with food, fear or losing control over eating, a tendency to eat in secret, not partake in social eating and guilt about eating but this relationship was wholly explained by their decision making. Meaning that neurotic adolescents discount delayed rewards, such as healthy weight loss or weight maintenance, for immediate gratification such as eating in secret or eating unhealthy foods" (Thamotharin et al 2015 p95).

Hedonic hunger and DD interact. Appelhans et al (2011) found that high hedonic hunger (as in a high PFS score) predicted food intake in high DD overweight and obese women, but not in low DD ones. "These findings suggest hedonic hunger is moderated by the ability to

delay reward, such that improved ability to do so is protective of overeating, even in those with strong motivation toward palatable foods" (Ely et al 2015 p72).

Ely et al (2015) developed on this study with seventy-eight non-obese women at a Philadelphia university in the USA, but were not able to replicate Appelhans et al's (2011) findings. Participants completed the PFS online before the study along with other measures, including of DD. Participants were offered \$100 at a later date or a smaller amount now. The length of time was varied as was the amount available now. A DD score from 0 (high discounting - ie: immediate gratification) to 1 was calculated.

At the laboratory, participants ate a bowl of oatmeal (as much as they wanted) to cover homeostatic hunger, and then, under the pretence of a taste test, they were offered highly palatable foods (eg: chocolate cookies, popcorn, pretzels) to eat as much as they wanted (to test for hedonic hunger).

High PFS and high DD individuals ate more oatmeal and palatable foods than high PFS and low DD ones, and low PFS and low DD individuals (high self-control) ate more than low PFS and high DD ones (ie: less self-control). This latter finding was unexpected. The authors admitted: "It is unclear why low PFS scorers would be motivated to eat a lot of oatmeal or snack food" (Ely et al 2015 p74).

Furthermore, they said: "Participants may have suspected the actual objective of the study and behaved differently due to social desirability or non-conscious influences. Bogus taste tests have been widely used in eating behaviour research with great success...; but it would be prudent to measure awareness of the research aims. Additionally, taste tests may carry a demand characteristic that participants eat only a small amount, thus participants may have consumed less than they would otherwise. The palatability of the oatmeal preload may have affected consumption... We were not able to control participants' consumption prior to their study visit due to financial and space restrictions" (Ely et al 2015 p74).

Ely et al (2015) summed up: "Overall, it appears that impulsive decision-making and hedonic hunger do not increase risk for overeating in the short term, independently or in combination in non-obese participants. However, the combination of these two variables does appear to relate to ad lib intake in a fasted state, irrespective of palatability. These findings suggest hedonic hunger reflects a strong motivation to eat regardless of whether the source is internal need (ie: energy depletion) or external desire (ie: the appeal of highly palatable food)" (p74).

One way to combat DD is episodic future thinking (EFT) (Atance and O'Neill 2001), which involves "mental self-projection to pre-experience future events" (Daniel et al 2015).

Daniel et al (2013) found that EFT reduced DD in overweight and obese adults as well as intake of tempting foods freely available (ad libitum).

Children show greater DD than adults generally, and obese children more so (Daniel et al 2015). Daniel et al (2015) found benefits for EFT with children. Forty-two overweight/obese 9-14 year-olds in the Buffalo area of the USA were recruited. They either had two hours of EFT (eg: imagining positive future events) or control episodic recent thinking (CERT) (ie: recalling personal events). DD was measured by the offer of a hypothetical \$50 in 1 day, 2 days, 1 week, 2 weeks, 1 month, or 2 months or smaller immediate rewards. A taste test gave the opportunity for the participants to eat as much tempting food as they wanted.

The EFT group showed significantly less discounting (ie: more awareness of future consequences), and consumed significantly less calories in the taste test. Children with high dietary restraint (ie: high motivation to limit calorie intake) were most responsive to EFT.

The EFT used in this experiment was non-specific (ie: just about the future and not related to food). O'Neill et al (2016) used specific EFT focusing on imagining future health goals with twenty-nine overweight or obese women. The CERT involved thinking about past habits. Participants were given a \$10 voucher to spend at the food court where the experiment took place. The choice of foods were scored for calories, and how much eaten was recorded.

The EFT group consumed significantly less calories (mean 540 vs 749 kcals), significantly less fat (24% vs 37%), and more protein (26% vs 19%).

Eating in the absence of hunger (EAH) is a similar concept to hedonic hunger, which is assessed by a method devised by Fisher and Birch (1999). Individuals eat a meal until they report being full, and then are left for ten minutes with snack food freely available.

In two studies with 3-5 year-olds, Soltero et al (2015) found that between 55-80 kcals of snacks were eaten.

Not surprisingly, EAH has been linked to poor ability to self-regulate energy intake, and to overweight and obesity, particularly in children (Soltero et al 2015).

2.2.1. Environmental Factors and Intuitive Eating

Environmental factors like portion size and plate

size are also relevant to hedonic hunger. In terms of plate size, Rolls et al (2006), for example, gave normal-weight and overweight women a standard portion size over four weeks, but interspersed it with a reduced portion (25% less). On the reduced portion days there were no reports of hunger.

In relation to plate size, Wansink and Kim (2005), for instance, found that cinema goers ate more stale or fresh popcorn if given in a larger container.

Intuitive eating (IE) (or mindful-eating ²⁷) is a technique to combat the influence of external factors by encouraging an awareness of internal cues of hunger and fullness (Tribble and Resch 2012) ²⁸.

The success of this technique is mixed (Van Dyke and Drinkwater 2014). These researchers found 26 studies on IE for their literature review. Seventeen of the studies were cross-sectional, and convenience sampling of students was commonly used. Overall, IE individuals had a lower BMI than non-IE individuals, but IE was not a weight loss strategy for overweight and obese individuals.

With a sample of 137 US undergraduates, Anderson et al (2015) found that IE did not reduce overeating with a larger portion and plate size. Participants were randomly assigned to a small (8-inch diameter) plate condition or a large (12-inch) plate condition. A pasta meal was served with twice as much food in the latter condition. The amount of food eaten was the weight of the plate after subtracted from the weight before eating.

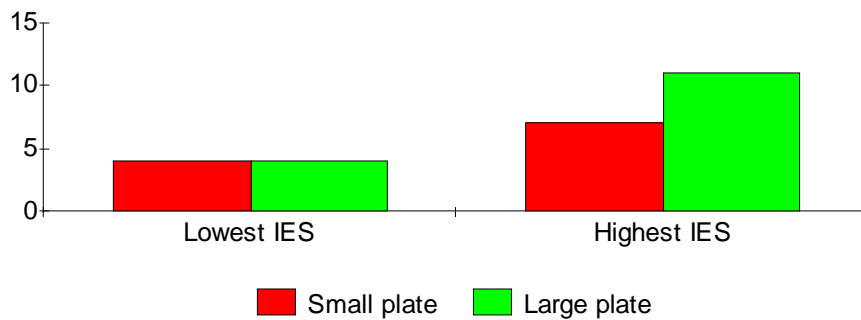
Prior to eating the participants completed the Intuitive Eating Scale (IES) (Tylka 2006). This has twenty-one items which cover reliance on internal cues of hunger and fullness - eg: "I stop eating when I feel full (not overstuffed)"; "I can tell when I'm slightly hungry"; "I trust my body to tell me how much to eat" ²⁹.

Anderson et al (2015) concluded: "Contrary to our original hypothesis that higher levels of intuitive eating would be unrelated to external cue effects, this study found that self-reported intuitive eating related to a higher, not lower, sensitivity to the external influence of portion size. Individuals who reported high levels of intuitive eating ate more as plate size increased" (p128) (figure 2.2).

²⁷ Also called "body wisdom" (Gast and Hawks 1998).

²⁸ It tends to avoid discussion of body weight (Van Dyke and Drinkwater 2014).

²⁹ Another Intuitive Eating Scale (Hawks IES) (Hawks et al 2004) includes items about intrinsic eating (ie: physical signals of hunger and fullness), extrinsic eating (eating what food wanted), anti-dieting (appreciation of food), and self-care ("valuation of health and energy more than appearance"; Van Dyke and Drinkwater 2014). It has 27 items developed from self-help and counselling literature.



(Based on Anderson et al 2015 figure 1 p127)

Figure 2.2 - Mean pasta consumption (oz) based on IES scores.

The researchers attempted to explain the results. There was a four-hour fast (minimum) requested by the researchers before the pasta meal, and "the tendency for participants who reported higher IES scores to eat more permissively following a 4-hour fast may reflect adaptive consumption, in response to hunger" (Anderson et al 2015 p128).

Another possibility is that "awareness of internal hunger and satiety cues may not be the exact mechanisms that drive the inverse relation between intuitive eating and food consumption" (Anderson et al 2015 p128). Other mechanisms might include acceptance of behaviour or emotion regulation (Anderson et al 2015).

Anderson et al (2015) also offered the possibility that the IES is not a valid measure of IE. But, for females, IES has been shown to negatively correlate with BMI (Anderson et al 2015). Any questionnaire that is self-report depends on the respondent. Anderson et al (2015) commented: "It is possible that while an individual may believe that they are aware of and eat in accordance with satiety or hunger cues, this may not be the case in practice. Therefore, using behavioural paradigms or physiological measurements of satiety that gauge the facets of intuitive eating (eg: awareness of hunger and satiety cues) in conjunction with self-report measurement may provide amore realistic measurement of intuitive eating" (p128).

The IES also measures unconditional permission to eat ³⁰, and this may be different between individuals. "For example, in some individuals, elevated levels of the unconditional permission to eat when hungry may lead to

³⁰ The IES covers three domains - unconditional permission to eat (UPE), eating for physical rather than emotional reasons (EPR), and reliance on hunger and satiety cues (RHSC). The IES-2 (Tylka et al 2013) added the concept of Body-Food Choice Congruence (Van Dyke and Drinkwater 2014).

episodes of overeating and subsequent weight gain; in others, this response may simply motivate moderate, healthy consumption. Thus, future work should seek to evaluate whether individual difference factors (ie: emotional or disinhibited eating) differentially impact the relation between intuitive eating and weight or eating-related outcomes" (Anderson et al 2015 p128).

Anderson et al's (2015) sample was undergraduates, and two-thirds were female, and two-thirds were White, which limits the generalisability of the findings. Other limitations of the study include:

- Social desirability effects/demand characteristics - Eating the whole meal in presence of the researcher. Also the participants were told that leftovers would be thrown away which could motivate some people to eat it all.
- No details of behaviour after the study - eg: compensatory behaviour by missing a later meal.
- The participants were asked not to eat for four hours prior to the meal, but there was no control over compliance. They were asked for a verbal confirmation at the start of the study.

"Intuitive exercise" (Reel 2015) is a related concept to IE. Cook et al (2015) referred to "dysfunctional exercise" as excessive and compulsive physical activity. Between one-third and over three-quarters of individuals with eating disorders show such behaviour, with the risk of injury, fatigue, and depression (Reel et al 2016).

"Intuitive exercise" is exercise based on physical cues rather than "feeling obligated to engage in rigid routines" (Reel et al 2016 p129).

Reel et al (2016) developed the Intuitive Exercise Scale (IEXS) with fourteen items to measure "intuitive exercise", which has four underlying factors:

- Emotional exercise - the use of exercise to control unpleasant emotions (eg: "I find myself exercising when I am lonely, even when I do not feel like exercising").
- Body trust - the use of internal bodily cues to exercise (eg: "I trust my body to tell me how much exercise to do").
- Exercise rigidity - flexibility in exercising routine (eg: "I enjoy different types of physical activities when I exercise").

- Mindful exercise - the awareness of bodily cues to stop exercise (eg: "I stop exercising when I feel pain").

2.2. BINGE EATING

The lifetime prevalence of binge eating (BE) in the general population is estimated at 2% for men and 3.5% for women, and it is often linked to negative emotions like depression (Spada et al 2015). In a study with students, Osberg et al (2008) found that irrational beliefs about food activated binge eating as a coping strategy for negative emotions.

"Desire thinking", which has been linked to addiction ³¹, is an alternative cognitive process that may also be involved in BE. Put simply, a conscious goal which is satisfying when the target is achieved becomes "gradually established as a routine activated in response to one or more targets" (Spada et al 2015). Or put another way, desire is "the awareness of a preference that intrudes in consciousness in the form of a positive target-related automatic thought, memory, or bodily sensation" (Spada et al 2015). Desire thinking is reported during craving (known as the imaginal prefiguration component - eg: "I imagine myself doing the desire activity"), and the loss of control (the verbal perseveration component - eg: "When I begin to think about the desired activity I find difficult to stop").

Spada et al (2015) reported the first study of desire thinking and BE, which they hypothesised was independent of negative emotions and irrational food beliefs. Two hundred and sixty-two participants were recruited in Italy, of which seventy-seven were classified as binge-eaters. They completed a series of questionnaires online, including:

- Hospital Anxiety and Depression Scale (HADS) (Zigmond and Snaith 1983) - Fourteen items covering anxiety and depression (eg: "I feel as if I am slowed down"; "I get a sort of frightened feeling as if something horrible is about to happen").
- Irrational Food Beliefs Scale (IFBS) (Osberg et al 2008) - Fifty-seven items including "food is a good way to lift depression" and "food is my only source of pleasure".
- Desire Thinking Questionnaire (DTQ) (Caselli and Spada 2011) - Ten items including "I mentally repeat to

³¹ Also known as elaborated intrusion theory of craving and desire (Kavanagh et al 2009).

myself that I need to practice the desired activity".

- Binge Eating Scale (BES) (Gormally et al 1982) (appendix D) - Sixteen items covering amount of food consumed, and mood and thoughts about BE.

All questionnaires had been translated in Italian, and higher scores indicated higher levels of the measured behaviours. The binge-eaters group scored significantly higher on all questionnaires. Controlling for HADS and IFBS scores, and self-reported BMI, verbal perseveration score of DTQ predicted BE and level of BE (ie: BES score). This fitted with the view that "binge eating may arise from a combination of emotional vulnerability, belief systems and a deficit of skills to functionally modulate negative moods" (Spada et al 2015 p51).

A similar idea is thought suppression, which is "purposively attempting to avoid certain thoughts" (Barnes et al 2016). It has been studied generally ³², and in relation to eating and weight. To measure it in the latter case, the Food Thought Suppression Inventory (FTSI) was developed with items like "I have thoughts about food that I try to avoid".

Barnes et al (2016) used the FTSI with twenty-three overweight and obese individuals with Binge Eating Disorder (BED) and 66 without BED in the USA. Individuals with BED scored significantly higher on the FTSI, and frequency of binge eating was positively correlated with FTSI score. Weight loss was associated with lowering of FTSI scores.

Binge eating disorder can occur in children (eg: up to 10% of 6-14 year-olds in the USA) (Saltzman and Liechty 2016). Saltzman and Liechty (2016) found that weight-related teasing in families, and parental emotional unresponsiveness were key in the development of the condition in under 12s. This conclusion was based on a review of fifteen relevant studies. Other variables were found to have no relationship (eg: parental weight, socio-economic status, parental education) or there was not enough evidence (eg: parental DE, family mealtime practices).

2.3. UNDER-REPORTING FOOD INTAKE

There is a relationship between higher BMI and under-reporting of amount eaten, which has been confirmed by data from the NHANES II (1976-1980) in the USA

³² The White Bear Suppression Inventory (WBSI) (Muris et al 1996).

(Klesges et al 1995). This is a problem because food recall is often used in studies.

Under-reporting is also associated with being female, socio-economic status, psychological status (eg: depression), and physical activity, among other factors (Tyrovolas et al 2016).

Tyrovolas et al (2016) specifically investigated the relationship between weight perception, satisfaction, and control, and under-reporting of food with data from the NHANES in 2007-12. Over 15 000 adults were interviewed in detail on two occasions about their food intake in the prior 24 hours to give energy intake (EI). Information about age and weight were used to establish basal metabolic rate (BMR), then the EI/BMR ratio was calculated. Put simply, this gave a figure of how much energy the average individual needed compared to how much the individual said they had eaten ³³. Participants were then divided into three groups - "low energy reporters", "acceptable energy reporters", and "energy over-reporters".

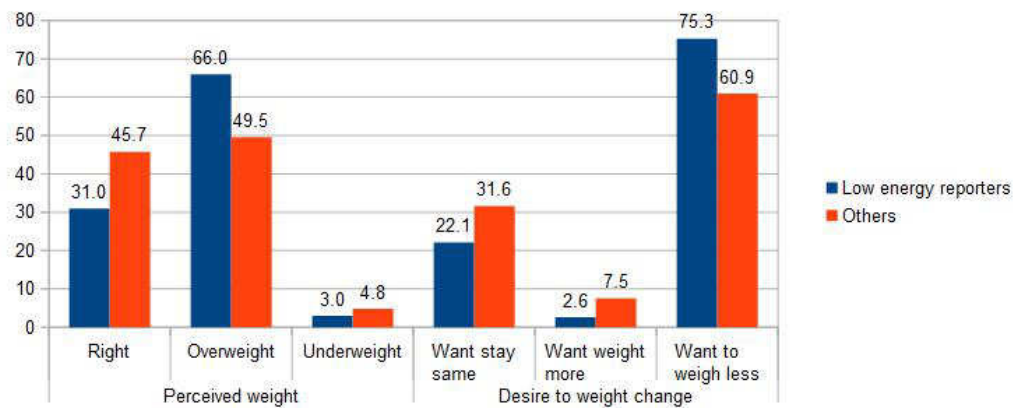
Other measures were taken:

- Weight perception - whether the individual perceived themselves as overweight, underweight or the right weight.
- Weight satisfaction - whether the individual would like to be a different weight. If so, more or less?
- Weight-control behaviour - whether the individual had tried to lose weight in the past year.

The "low energy reporters" compared to the other participants were significantly more likely to be female, poorer financially, less educated, not married/co-habiting, a larger BMI, and have less physical activity. They were also significantly more likely to perceive themselves as overweight (weight perception), want to weigh less (weight satisfaction), and not to have dieted or if so, unsuccessfully (weight-control behaviour) (figure 2.3).

Interestingly, individuals who were not obese, but perceived themselves as overweight were more likely to under-report than obese individuals who perceived themselves as overweight. Likewise, non-obese individuals who wanted to lose weight were more likely to under-report, and also such individuals who had tried to lose weight previously.

³³ Or as the researchers put it: "This method has been suggested as an indirect way of assessing the plausibility of dietary intake and has been used widely in previous studies" (Tyrovolas et al 2016 p580).



(Data from Tyrovolas et al 2016 table 3 p583)

Figure 2.3 - Percentage of responses based on reporting of food intake.

The researchers suggested reasons for under-reporting, rather than deliberately giving false information. These included:

- i) Education-related problems (eg: literacy difficulties; misunderstanding questions).
- ii) "Dietary restraint" - ie: limiting eating to prevent weight gain or aid loss of weight.
- iii) Poor accuracy in recall, but also in accurately quantifying portion sizes ³⁴.
- iv) "Socially desirable responding" - eg: social pressure to be thinner. "In addition, body weight/image dissatisfaction might also be linked to low energy reporting as a result of socially desirable responding" (Tyrovolas et al 2016 p587) ³⁵.

The study did not have objective measures of food intake (eg: direct observation) and so whether an individual was under-reporting was only an estimate.

Frequent self-weighing may be associated with

³⁴ This is the case in meals consumed away from home (appendix B).

³⁵ Socially desirable responding (or social desirability bias) usually refers to under-reporting of socially unacceptable behaviour, but among professionals it can lead to exaggerated claims of knowledge. For example, in a survey of members of the Academy of Nutrition and Dietetics in the USA, Hand and Abram (2016) noted a positive response to knowledge of official guidelines even when they were yet unpublished. Respondents seemed reluctant to choose "unsure" as a response option on a knowledge quiz.

greater weight loss and less weight gain. "Regular self-weighing may permit an individual to increase his or her awareness of eating and exercise behaviours, which can result in changes in balance of energy intake and expenditure and impact weight loss" (Zheng et al 2016 p661). But often studies use self-reported frequency of weighing.

A more objective method involves "smart scales". For example, Zheng et al (2016) reported the use of a set of scales that recorded the time of use and the weight in the Self-Efficacy Lifestyle Focus (SELF) trial. This was a trial of a behaviour weight loss programme for obese and overweight adults in the USA. Self-weighing was significantly associated with weight loss, but the strength of the relationship declined over time. Frequent self-weighing motivated the individuals in energy intake and expenditure goals, particularly in the first six months of the weight loss programme.

Mid Upper Arm Circumference (MUAC) measurements have been proposed by the WHO as an alternative measure of weight, specifically in relation to malnutrition. Lam et al (2016) reported the benefits of this method with adolescents with anorexia regaining weight, where falsification is a risk (eg: between one-third to half of adolescent patients admitted to weight falsification ³⁶; Jaffa et al 2011). Furthermore, being weighed is anxiety-producing for individuals with eating disorders (Lam et al 2016).

2.4. HEALTHY WEIGHT

The World Health Organisation defines obesity as a BMI of ≥ 30 kg/m², and this is estimated to cover 600 million individuals in the world. While 1.3 billion adults are calculated as overweight (a BMI of 25 - 29.9) (The Global BMI Mortality Collaboration 2016).

One way to establish a healthy weight (or BMI) is to map the all-cause mortality associated with different BMIs. Rather than a straight line, where higher BMI is associated with higher mortality, a U-shaped pattern has been found by some studies (Afzal et al 2016). In other words, mortality is as high at low or high BMI. There is controversy over this finding. Another controversy is that as average BMI increases in the West, say, cardiovascular risks are declining among obese individuals (Afzal et al 2016).

Afzal et al (2016) explained these contested

³⁶ Eg: water loading prior to weighing.

findings as due to methodology (eg: limited or incomplete follow-up; smallish samples).

Afzal et al (2016) investigated whether there has been a decrease in the risk of all-cause mortality at higher BMIs (ie: overweight and obese) using data for the Danish population. Data from the Copenhagen City Heart Study (CCHS), which began in 1976-8 and followed-up in 1991-4, were used along with the Copenhagen General Population Study (CGPS) 2003-13. The Danish Civil Registration records details of deaths in the population. In total, there were data on over 120 000 individuals in the study.

In all groups, a U-shaped pattern for BMI and all-cause mortality was found, with the optimal BMI being 27.0 (usually defined as overweight). The BMI associated with the lowest mortality had increased over the three decades of data. In 1976-8 it was 23.7, 24.6 in 1991-94, and 27.0 in 2003-13. Using a category of BMI of 18.5 to 24.9 as a reference point, risk of all-cause mortality was reduced over time for BMI categories of 25 - 29.9 (overweight) and greater than 30 (obese).

The authors were unsure about the reason for the change. But they speculated that "while improved treatment for cardiovascular risk factors or complicating diseases has reduced mortality in all weight classes, the effects may have been greater at higher BMI levels than at lower BMI levels" (Afzal et al 2016 p1994).

The Global BMI Mortality Collaboration (2016) found results that "challenge recent suggestions that overweight and moderate obesity are not associated with higher mortality, bypassing speculation about hypothetical protective metabolic effects of increased body fat in apparently healthy individuals".

The Global BMI Mortality Collaboration (2016) used data from 10.6 million adults in 239 prospective cohort studies in thirty-two countries (between 1970 and 2015 ³⁷) to explore the link between BMI and mortality. Using a BMI of 18.5 - 24.9 (normal weight) as the reference group (ie: 1), over a five-year period ³⁸, all other BMI groups had a hazard ratio of greater than 1. For example, obese individuals were 1.64 times more likely to die.

The risk of death was higher for younger than older overweight and obese individuals, and for men over women.

This meta-analysis only used never-smokers because "merely adjusting for smoking habits would be unlikely to eliminate important residual biases due to the effect on BMI of different intensities of smoking" (The Global BMI Mortality Collaboration 2016). Individuals with pre-existing chronic diseases were excluded, and the

³⁷ In 1975, average BMI was 23, but 27 in 2015 (Knapston 2016).

³⁸ This was the second five years of follow-up to avoid baseline conditions that could influence BMI.

researchers "omitted the initial 5 years of follow-up from the analysis because diseases at baseline that might cause death over the next 5 years could result in reverse causation (where lower BMI at recruitment is the result, rather than the cause, of the underlying pathology)" (The Global BMI Mortality Collaboration 2016). But body composition (eg: visceral fat and fat distribution) was not measured, nor was ethnicity or socio-economic status adjusted for.

The melanocortin 4 receptor (MC4R) gene regulates food intake and preference for high fat foods, as shown originally in mouse studies, but now in humans. The gene is involved with neurons in the hypothalamus (van der Klaauw et al 2016).

van der Klaauw et al (2016) recruited MC4R-deficient (MC4R-d) individuals (a variation in the gene in 1-5% of severely obese individuals) as well as lean and obese controls with the gene. In the fat preference test, participants were offered Chicken Korma and Rice, which had three levels of fat content, and the amount eaten was covertly weighed. Fourteen MC4R-d individuals, and twenty lean and twenty obese controls were involved. MC4R-d individuals consumed significantly more of the high fat version of the meal than the controls.

Ten MC4R-d individuals, twenty lean and twenty obese controls took part in the sucrose preference test, where three levels of sweetness of "Eton mess"³⁹ were available. The MC4R-d individuals consumed significantly less of all three types of the dessert than controls.

The researchers proposed an evolutionary explanation in an environment where food supply was variable - ie: "the preference for fat (which delivers twice as many calories/gram as carbohydrates or protein and can be readily stored in adipose tissue), at the expense of sugars/carbohydrates may represent an advantageous behaviour that is expressed in the face of nutritional depletion" (van der Klaauw et al 2016 p4).

2.5. CHILDHOOD OBESITY

Robinson et al (2012) pointed out that "people's health reflects an accumulation of the inter-relationships between biological, psychological, behavioural, social and environmental influences over the course of a life" (p340). They went on to outline key influences in childhood obesity:

- i) Genetic - eg: genes related to appetite and

³⁹ A pudding of yoghurt, cream, meringues, and strawberries.

fullness.

ii) Pre-conception - eg: overweight women before conception are more likely to have high birth-weight babies.

iii) Pregnancy - eg: gestational diabetes and childhood obesity.

iv) Early life - eg: rapid weight gain in the first few months of life. While one study found that "for each month of breastfeeding there is a 4 per cent reduction in the risk of childhood obesity" (Robinson et al 2012 p342). On the other hand, infants with low early weight gain had a higher "adiposity rebound" (Cole 2004) (regaining of body fat at 3 to 7 years old) "as if by way of compensation" (Robinson et al 2012).

v) Parental influences on eating and exercise - eg: children watch their parent(s)' disinhibited eating; parents overestimate how much food children need. While Goodell et al (2008) found that parents, who were aware of overfeeding their children, were not willing to limit food because they believed that "their child's size is their child's destiny rather than being due to modifiable behaviours" (Robinson et al 2012).

vi) Wider context - eg: socio-economic status; access to local recreational facilities.

2.6. "FRESHMAN WEIGHT GAIN" AND STUDENTS EXPERIENCE

Studies have found "freshman weight gain" (ie: during the first year of university or college) of between two to nine pounds (Bodenlos et al 2015).

There are a number of questions related to it (Bodenlos et al 2015):

- When the weight gain occurs? Eg: 1st semester/term.
- Are there gender differences?
- What explains the gain? Eg: alcohol consumption.

Bodenlos et al (2015) recruited three hundred new students at a US university in three cohorts (2010, 2011 and 2012). Data were collected at the start and end of the first semester, and end of the academic year. There were various questionnaires completed (eg: International Physical Activity Questionnaire; IPAQ; Craig et al 2003), and measures of height and weight were taken each time.

The average weight gain was 4.12 lbs in the first term, and 4.89 lbs for the whole academic year, and males gained non-significantly more than females (figure 2.4).

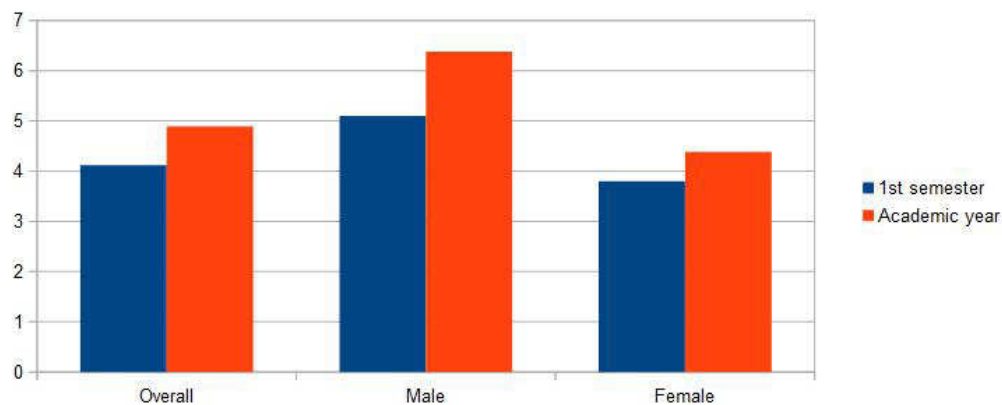


Figure 2.4 - Mean weight gains (lbs) by gender.

For males, alcohol use was positively associated with weight gain in the first term ⁴⁰, while it was self-reported physical activity for females for the first semester and the whole year. Interestingly, "higher self-reported physical activity and lower BMI were associated with more weight gain" (Bodenlos et al 2015 p3) ⁴¹. Happiness was negatively associated with weight gain for males for the whole year. "It may be that the happier males are the less likely they are to engage in overeating, drinking too much alcohol, or sedentary behaviour" (Bodenlos et al 2015 p3). Almost half the respondents dropped out of the study by the end of the academic year.

Students face another problem in the form of "academic burnout" (AB), which has been linked to DE and eating disorders. AB is "a psychological condition whereby students would experience low motivation and heightened sense of failure due to inability to cope with academic stress or school demands" (Kristanto et al 2016 p96). It is characterised by emotional exhaustion, cynicism or depersonalisation, and lowered self-efficacy (Kristanto et al 2016).

Shelton and Valkyrie (2010), for example, found that first year students, who encountered problems in adapting to university life, were more vulnerable to AB, eating to cope with stress, and DE behaviours.

Kristanto et al (2016) found a partial association between AB and DE behaviours in a study at a university

⁴⁰ "Being away from home for the first time with new freedom and access to alcohol often lead freshmen to drink higher quantities of alcohol" (Bodenlos et al 2015 p3).

⁴¹ "One explanation might be that females are actually exercising as much as they say but are compensating for this with additional caloric intake. Another explanation could be self-report bias that is often seen in physical activity research" (Bodenlos et al 2015 p3).

in Malaysia. One hundred and thirty-two students completed questionnaires on burnout, and eating behaviours. Around two-thirds of the students were classed as having a high level of AB, and these individuals showed a significant difference on emotional eating compared to other students, but not on cognitive restraint and uncontrolled eating.

The level of perceived social support has an inverse relationship to bulimic symptoms when facing negative life events (Kwan and Gordon 2016).

Kwan and Gordon (2016) recruited students at a midwestern US university to complete questionnaires at two points four weeks apart. Lower perceived social support at time 1 predicted more bulimic symptoms at time 2 when there was higher perceived stress. In other words, where social support was low, negative life events were perceived as more stressful which led to bulimic behaviours. The study, however, was based on self-reported recall of bulimic behaviours and stress over the four-week period, and half the students did not complete the second set of questionnaires.

After this questionnaire study, Kwan and Gordon (2016) performed an experiment. Stress was created by asking participants to prepare a lecture with little notice, either done with a stooge (social support) or alone (no social support). The lecture did not take place, and the participants were left alone with snacks for ten minutes. In the social support condition the participants reported lower perceived stress, but, contrary to expectations, ate more calories. The researchers admitted that the manipulation of social support was not successful as the perceived social support rating was low.

Kwan and Gordon (2016) offered these other possible explanations for the experiment's outcome:

a) The social support condition included successful restrained eaters (and this is a characteristic of bulimia);

b) Normal-weight individuals are sensitive to body cues, and during stress the body decreases gastric contraction (ie: to give a cue of non-hunger).

Finally, Kwan and Gordon (2016) pointed out that their studies "reflect the complexity of the stress-eating relationship".

There is a general problem with studying complex behaviours in the artificial snapshot of the laboratory environment, sometimes described as ecological validity. It is also possible that the participants had realised the purpose of the experiment, and knew that being left

alone with food, despite being told it was a tasting session, was measuring their eating behaviour.

Research that does not have the expected outcome can prompt future studies and thought, and should not be dismissed as a failure or as unimportant.

2.7. WEIGHT STIGMATISATION AND QUALITY OF LIFE

Weight stigmatisation (WS) (Browne 2012) involves "implicit or explicit messages surrounding the undesirability of being overweight or obese" (Shentow-Bewsh et al 2016). The media is key, commonly using terms like "obesity epidemic". Sandberg (2007) noted that newspaper articles in the four main Swedish dailies had become more alarmist in this area between 1997 and 2001. "Additionally, the articles often implied personal responsibility for overweight or obese status. Various other forms of media also tend to portray obese individuals unfavourably, depicting them as 'ugly', 'stupid', 'lazy', and 'greedy'" (Shentow-Bewsh et al 2016 p48).

For obese individuals, WS is associated with lower self-esteem, higher body dissatisfaction, and poorer psychological health (Shentow-Bewsh et al 2016). "Somewhat paradoxically, weight stigmatisation may make it more difficult for individuals to regulate their eating behaviours by increasing their levels of distress" (Shentow-Bewsh et al 2016 p48). According to the "escape theory" (Heatherton and Baumeister 1991), individuals eat to escape poor self-image and negative emotions. With WS, obese individuals "restrict their attention away from an aversive self-image and onto 'forbidden' food, since it is something that they can focus on instead. Subsequently, any dietary inhibitions dissolve and individuals become likely to overeat" (Shentow-Bewsh et al 2016 p48). WS has a stronger impact on overweight women than normal-weight ones (Shentow-Bewsh et al 2016).

Shentow-Bewsh et al (2016) presented 120 female undergraduates at a Canadian university with fictional articles on the economic and health costs of obesity or excessive sun exposure, or no article in an independent groups design experiment. Subsequently, all participants were allowed to eat as many sweets as they wanted in a ten-minute tasting test.

The researchers had three hypotheses:

1. Participants reading the anti-obesity article would report a lower self-esteem and body esteem than the other two groups. The data did not support this prediction. There was no difference in self-esteem and body esteem between the three conditions.

Shentow-Bewsh et al (2016) noted that the "finding

is inconsistent with previous research indicating that exposure to obesity stigmatisation is associated with poorer mental health... In the current study, the anti-obesity article may have been too explicit and impersonal to impact participants' psychological functioning. Research has indicated that more subtle forms of stigmatisation have a stronger impact on obese adults' mental health than more direct forms... Alternatively, other research has indicated that exposure to obesity stigmatisation may be less important to psychological functioning than an individual's ability to cope with feelings resulting from stigmatisation... We did not include any measure of coping that could be used as a potential moderator in this regard, such as defensiveness or avoidance" (p53).

2. The relationship in Hypothesis 1 will be (a) stronger for individuals with higher than lower BMI, and (b) for those with higher perceived pressure to be thin than lower. The first part of the hypothesis was not supported by the data, but perceived pressure to be thin did predict body esteem.

"This pattern of results indicates that in women who normally feel strong social pressure to be thin, reading anti-obesity messages may further increase their concerns about their weight. This finding is consistent with previous research indicating that media exposure reinforces individuals' perceptions of the thin ideal and increases body dissatisfaction" (Shentow-Bewsh et al 2016 p53).

3. Women with higher BMI in the anti-obesity condition will consume more sweets than lower BMI students in that condition. This was not found. In fact, heavier women ate less. "This finding suggests that reading about the negative effects of obesity may lead heavier women to suppress their food intake more than they otherwise would have" (Shentow-Bewsh et al 2016 p53). This is contrary to the "escape theory".

However, higher BMI individuals consumed more sweets than lower ones in the no-article condition.

The study has a number of limitations, including:

i) Only written articles used. Visual images may influence WS more.

ii) Measures of psychological distress, like depression, were not taken.

iii) The sun exposure article referred to wearing bikinis, and this "may have brought to mind the thin ideal for some participants, which may have affected their post-manipulation self-esteem or body esteem"

(Shentow-Bewsh et al 2016 p54).

iv) The ecological validity of this experiment. For example, "it is unclear whether results from the current study generalise to women's day-to-day experiences of anti-obesity media messages. However, participants rated the anti-obesity articles as similar to other articles that they had read, suggesting that the articles used in this study were representative of those that individuals might typically encounter in the media" (Shentow-Bewsh et al 2016 p54).

"Adolescents who are overweight/obese, but particularly those who perceive themselves as such, are more likely to engage in risk behaviours than those who are, or perceive, themselves of normal-weight. Weight stigma and discrimination may contribute to this association as they reinforce poor body image and create intense stress. Stress is associated with poor emotion regulation, more impulsive, contextually-determined, and less rational decision-making, leading to greater engagement in risk behaviours" (Farhat 2015 p56). The pathways between weight stigma and risky behaviours, thus, includes poor body image and stress, as well as social networks⁴².

"Social networks, largely determined by the social context, are all the people and groups with whom one has contact and the nature and extent of their interactions. Social networks are important because connected people share information and shape each other's perceptions of social norms. Adolescents' social networks include, for example, peers, families, and neighbours, and play a primordial role in either enabling or mitigating risk behaviour (table 2.2). Social networks may also protect adolescents who are overweight/obese from developing poor body image and ultimately engaging in risk behaviours" (Farhat 2015 p63).

The General Strain Theory (Agnew 2001) emphasises that perceptions of an issue are stronger than objective assessments for stress. Similarly, studies have found that perceptions of overweight/obesity predict risk behaviour (eg: risky sexual behaviour) more consistently than actual weight status, and the relationship was stronger for obesity than overweight, and "adolescents who (mis)perceive themselves as very overweight engage in more risk behaviours than those who (mis)perceive themselves as slightly overweight" (Farhat 2015 p64).

⁴² For example, overweight/obese adolescents are more likely to have impaired peer relationships than normal-weight individuals (Farhat 2015).

- The attitudes and behaviours of friends plays an important role in food eaten in older childhood and adolescence ("peer contagion"). For example, in terms of peer group affiliation, adolescents who enjoyed school and identified as "Brains" had a healthier diet than those identified as "Burnouts" (eg: getting into trouble at school) and "Populars" (eg: concerned with image) (Mackay and LaGreca 2007).
- Sawka et al (2015) performed a review of studies on friendship networks at school and dietary behaviour. Seven relevant studies were found. The following conclusions were drawn from these studies:
 - i) Based on five studies, friends, unhealthy food consumption (ie: fast food, low nutrient, high-caloric snack food or drink) was associated with the individual's consumption, especially for boys. In terms of healthy food consumption, one study found no association for fruit and vegetables, and one study found an association for whole grain and dairy intake.
 - ii) More popular adolescents consumed more unhealthy foods (in two studies).
- Sawka et al (2015) concluded: "While caregivers have the strongest impact on child and adolescent food choices ⁴³..., friends may also have a particular influence on an adolescent's unhealthy food consumption. Results from this review indicate that friends' dietary behaviour may be an important and modifiable determinant of adolescent unhealthy food consumption. The evidence presented here may assist in informing future in-school programmes that focus on improving dietary behaviours through positive peer-modelling or social support strategies" (p14).

Table 2.2 - Social networks and eating behaviours.

Obesity has been reported as both reducing life satisfaction and not doing so. For example, obese individuals are less likely to go out socially than normal-weight ones, and so have less social relationships (Grzesiuk 2009 quoted in Miniszewska and Kogut 2016), versus no difference in satisfaction about social relationships (Carr and Friedman 2006).

In a study with seventy Polish women (half obese), Miniszewska and Kogut (2016) found no difference in overall life satisfaction based on weight, but heavier women were less satisfied with their own health (among ten specific dimensions of satisfaction). Exploring satisfaction and social relationships further, Miniszewska and Kogut (2016) found that in the case of "women of excessive weight, it was, the need for social approval that affected their overall life satisfaction,

⁴³ This can be seen in the observation that adolescent BMI correlates with maternal BMI (Zamora-Kapoor et al 2016), which comes from an analysis of the National Longitudinal Study of Adolescence to Adult Health (Add Health) in the USA in 1994. Specifically, maternal obesity was the most important factor in overweight and obese teenage children, above maternal education, marital status of mother, and her employment status.

while among those of normal weight it was both social competence and the need for social approval" (p116).

2.8. CANINE OBESITY

Canine obesity is increasing in the developed countries, and this mirrors the increase in humans. Raffan et al (2016) suggested that "similar environmental factors such as reduced exercise and ready access to high-calorie food are implicated. However, despite the fact that dog owners control their pets' diet and exercise, susceptibility to obesity varies between dog breeds, which suggests the influence of genetic factors" (p1).

In labrador retrievers, which have the highest obesity of dog breeds, Raffan et al (2016) found that a deletion in the POMC (pro-opiomelanocortin) gene was involved. In a sample of 310 pet and 81 assistance-dog labrador retrievers in the UK, there was a significant correlation between the POMC deletion and higher body weight.

The applicability to humans is limited because genome-wide association studies have found that multiple genes are involved, and genes only account for a small part of the cause (Raffan et al 2016).

3. THIN IDEAL AND DISORDERED EATING

- 3.1. Thin ideal
 - 3.1.1. Perfectionism and emotion regulation
 - 3.1.2. Other risk behaviours
- 3.2. Appearance concerns in childhood
- 3.3. Vegetarianism and eating disorders
- 3.4. Picky eating
- 3.5. Drunkorexia

3.1. THIN IDEAL

The female "thin-ideal" of Western society ⁴⁴ is seen as contributing to disordered eating (DE) ⁴⁵ and body image disturbance with those women more influenced by appearance pressures experiencing more body dissatisfaction (MacNeill and Best 2015) ⁴⁶ ⁴⁷. "Women who internalise the 'thin-ideal' of Western society develop a cognitive schema that connects thinness with positive attitudes..., and these cognitive schemas have been shown to be associated with greater eating disturbances and body dissatisfaction..." (MacNeill and Best 2015 p71).

The important point is that it is the perception of being overweight by women who are normal or underweight that is key ⁴⁸. For example, Ahern et al (2008) found that

⁴⁴ It is part of the pressure on women to look young and attractive. Gold (2011) noted scathingly that "business has learned that women, drugged by advertising will pay all their lives to chase the ever-receding ghost that was their face at fifteen" (p36).

⁴⁵ DE is common among adolescent and young adult females (eg: up to half), but it does not always lead to a full eating disorder (Wollenberg et al 2015). Risk factors for DE include a family history of eating disorders, low self-esteem, weight appearance concerns, perfectionism, poor emotional well-being, high levels of stress, and societal emphasis on thinness for females (Wollenberg et al 2015).

However, among 631 undergraduates at a north-eastern US university, eating disorder symptoms were evident in 40% of women and nearly half of men (Schaumberg et al 2016).

⁴⁶ MacNeill and Best (2015) observed that "body dissatisfaction is so prevalent among the Western female population that researchers have long identified body dissatisfaction among women as a 'normative discontent' (Rodin et al 1985)" (p71).

⁴⁷ Penny (2010) commented on the "bikini body": "The bikini body is not supposed to be naturally occurring: it is a quasi-religious state of myth and artifice to which only the truly virtuous can aspire... The rituals of the bikini body link the obsessive self-denial that has become a watchword for feminine social capital with a tragic aspirational escape fantasy. Women waste huge amounts of time and money and forgo countless means for this fantasy, whereby we must be ready at a moment's notice to be whisked away to an exotic beach location where photographers will clamour to take pictures of us in our scanties... The bikini body has become cultural shorthand for a moral standard of female perfection whereby any physical flaw should be regarded as a source of shame, an obstacle to collective fantasies of glamour and happiness" (p26).

⁴⁸ The concept of weight suppression (WS) has been developed. It is "the calculated difference between the highest past weight and current weight" (Schaumberg et al 2016). Higher levels of WS "may be a marker for the use of more extreme weight control behaviours, as individuals who experience initial weight loss may experience biological and metabolic changes that make it difficult to maintain initial losses" (Schaumberg et al 2016 p57). So, WS has been linked to dietary restraint, and bingeing and purging behaviours as in bulimia nervosa, and also predicts treatment drop-out (Schaumberg et al

female participants rated underweight female bodies as "normal-weight", and normal-weight female bodies as "overweight".

The consequent body dissatisfaction of such perceptions leads to an ideal body that is lighter and smaller than the current weight/size, even if that is unhealthy. For example, Swami et al (2008) asked women to choose photographs for their current and ideal body types. Different ones were chosen, and the ideal was underweight (ie: BMI 15-18.5 kg/m²)⁴⁹. While a BMI of 20, which is the low end of normal-weight was rated as most attractive by women in Ahern et al's (2011) study.

MacNeill and Best (2015) investigated perception of female bodies and DE symptoms with 166 female undergraduates in introductory psychology classes at the University of New Brunswick in Canada. Disordered eating was measured by the Eating Attitudes Test-26 (EAT-26) (Garner et al 1982), and perception of weight was tested with the Photographic Figure Rating Scale (PFRS) (Swami et al 2008). This involves ten photographs of real women, two from each BMI category - emaciated (BMI <15 kg/m²), underweight, normal-weight (18.5-24.9 kg/m²), overweight (25-29.9 kg/m²), and obese (>30 kg/m²) - and participants were asked to say which photograph is their ideal.

Overall, 89% of participants chose the underweight or emaciated photographs as their ideal body size, and the remainder picked the normal-weight one. "It is apparent that females have a skewed perception of the ideal female body that may be getting even smaller and that most women strive to attain a physique that is considered underweight and difficult to maintain" (MacNeill and Best 2015 p73).

There was no difference in these perceptions between participants classed as having DE and not. The researchers stated: "This may seem counter-intuitive, as research suggests that disordered eating is influenced by the excessively thin ideals of Western society, particularly for females... It could be that the ideals of Western society are so pervasive that both eating disordered and non-eating disordered individuals are idealising a similar body size" (p73).

2016).

WS is also associated with teasing (Schaumberg et al 2016), as measured by the Perceptions of Teasing Scale (POTS) (Thompson et al 1995), which has eleven items like "people called you names like fatso" (scored 1 to 5; "never" to "very often").

⁴⁹ Yet obesity has also increased three-fold in the last generation in the West (MacNeill and Best 2015).

But, in the study, the women tended to underestimate their actual body size by 3-7 BMI points on average. For example, overweight participants (mean BMI 27) estimated themselves at 23 kg/m². MacNeill and Best (2015) tried to explain the findings: "The messages that women receive are mixed. On the one hand, the media portrays a thin ideal but, on the other hand, the size of the average woman is increasing. Thus, women who are not overweight may use unrealistic media images as they select an ideal body..., but when judging their current body size, women may use personal comparisons with other people they encounter during their everyday lives. In this case, women who consider themselves to be a normal weight may underestimate their size in order to stay consistent with the average (but overweight) bodies they encounter. Thus, the ideal body and the current body are at odds for all but the underweight women" (p74).

3.1.1. Perfectionism and Emotion Regulation

Perfectionism is another risk factor for DE (eg: restraint eating, emotional eating (appendix F), and night eating), especially in eating disorders (Peixoto-Placido et al 2015).

Peixoto-Placido et al (2015) found this to be the case with 276 overweight women attending a hospital for weight loss treatment in Portugal. A Portuguese version of the Multi-Dimensional Scale of Perfectionism (H+F-MPS) (Hewitt and Flett 1991) was used, and this measures two dimensions of perfectionism - socially oriented perfectionism (SOP) (ie: unrealistic own standards) and socially prescribed perfectionism (SPP) (ie: imagined high standards required by others). There are thirty-two items, each rated on a seven-point Likert Scale.

Both SPP and SOP were significantly positively correlated with DE attitudes. The participants were divided into three groups for analysis based on their H+F-MPS score (high, medium and low perfectionism). The low perfectionism group had significantly lower scores than the other two groups on weight and shape concern and dissatisfaction, and other DE attitudes.

The researchers concluded that perfectionism influenced weight and body image in the overweight women, but "negative affect may counteract any potential positive effect that SOP could have in motivating overweight women to lose weight" (Peixoto-Placido et al 2015). Negative affect is a known predictor of binge and excessive eating (Peixoto-Placido et al 2015).

Muyan et al (2015) found that perfectionism together with intimate partner violence (IPV) predicted eating disturbances. IPV victimisation by itself has been reported as a predictor of female eating disturbances,

but not for males (eg: Jonas et al 2014; English study). While a study of Turkish female students found a link between sexual victimisation and bulimia (Elal et al 2004). In terms of the psychological mechanism, victims may develop eating disturbances as a means to regain a sense of control (Root and Fallon 1989), or because the victim self-blames and self-punishes (Kaner et al 1993).

Muyan et al (2015) was another Turkish study with 170 female students at a university in Ankara, who completed measures of IPV, perfectionism, and eating behaviours. Specifically, the parental expectation aspect of perfectionism was key in dieting behaviour, while bulimia was linked to other aspects of perfectionism (namely, personal standards, doubts about actions, and parental criticism).

Being involved in competitive sports, and emotion regulation are also involved, and Wollenberg et al (2015) investigated these factors in DE in 540 female college students at a university in the USA (of which 151 represented the university in one of nine sports). They completed the EAT-26, and the Difficulties in Emotion Regulation Scale (DERS) (Gratz and Roemer 2004). The DERS covers six aspects of emotion regulation with thirty-six items:

i) Non-acceptance of emotion responses - eg: "When I'm upset, I feel guilty for feeling that way".

ii) Difficulties engaging in goal directed behaviour - eg: "When I'm upset, I have difficulty concentrating".

iii) Impulse control difficulties - eg: "When I'm upset, I lose control over my behaviours".

iv) Lack of emotion awareness - eg: "I am attentive to my feelings".

v) Limited access to emotion regulation strategies - eg: "When I'm upset, I believe that I'll end up feeling very depressed".

vi) Lack of emotion clarity - eg: "I have difficulty making sense out of my feelings".

Total scores vary from 36 to 180, with higher score showing poorer emotion regulation.

Non-athletes were significantly more likely to be "at-risk" of eating disorders (based on EAT-26) (17% vs 7%), and had higher DERS scores than athletes (mean 76 vs 71). The findings, Wollenberg et al (2015) stated, "suggest that female college athletes in our sample, regardless of type of sport, were somewhat protected from DE compared to female students who were not involved in

athletics" (p5).

This is supported by other studies. For example, Martinsen et al (2010) found that elite adolescent athletes had less DE symptoms, body dissatisfaction, and drive for thinness than non-athletes.

But some studies found the opposite - female elite athletes have a greater risk of DE than the general population (eg: Sundgot-Borgen and Torstveit 2004).

The pressure to be thin can be experienced differently among sub-cultures in the West. For example, Latina women in the USA experience a sub-culture where larger, more voluptuous and curvy body types are valued than in mainstream American culture (Stein et al 2015).

This does mean that standardised measures of body dissatisfaction, say, could lack validity and reliability for sub-cultural women. Stein et al (2015) studied the Body Dissatisfaction Sub-Scale (BDS) of the Eating Disorder Inventory version 3 (EDI-3) (Garner 2004) (table 3.1) with 477 Mexican American (MA) women at US colleges and universities. The BDS has ten items covering dissatisfaction with different areas of the body (eg: "I like the shape of my buttocks").

Two dimensions of body dissatisfaction emerged from the analysis:

i) Dissatisfaction with overall body shape including stomach size (OBSS).

ii) Dissatisfaction with hips, thighs and buttock (HTB).

OBSS significantly positively correlated with DE (as reported in the previous fourteen days) than HTB (eg: $r = 0.20$ for binge eating episodes and OBSS sub-score vs 0.10 for HTB sub-score). So, "dissatisfaction with overall body shape and stomach is associated with a conceptualisation of the self as fat, whereas viewing one's hips, thighs and buttock as big is unrelated" (Stein et al 2015 p7).

Total BDS score usually correlates with DE in the general population. Stein et al (2015) stated: "Our study suggest that even in an acculturated sample of MA women, attitudes toward body size and shape continue to reflect culture-specific values and norms that should be addressed in the measurement of body dissatisfaction" (p7).

- Segura-Garcia et al (2015) compared the EDI-2 (Garner 1991) and the EDI-3 in a sample of ninety-two patients with eating disorders (EDs), and of 265 female students in Italy. The EDI-2 has ninety-one items, which are each scored on a six-point Likert Scale ⁵⁰, and eleven sub-scales (eg: drive for thinness). EDI-3 has some small adjustments (eg: five-point scoring system in practice). Cut-off scores are used in both versions.
- Among the patients, EDI-2 correctly identified 48% and EDI-3 99%. This meant that EDI-2 had a large number of "false negatives" (ie: classed as no ED on questionnaire when in reality was sufferer).
- Among the students, both versions of the questionnaire identified similar numbers of women at risk from EDs.
- Segura-Garcia et al (2015) summed up: "the EDI-3 is more reliable than the EDI-2 in the characterisation of patients, as it correctly typifies nearly all patients across the ED spectrum. As for the screening of at-risk individuals, both the EDI-3... and the EDI-2 show comparable efficacy, although the new version of EDI is more reliable" (p22).

Table 3.1 - EDI-2 and EDI-3.

3.1.2. Other Risk Behaviours

"Body checking" (BC) (Walker and Murray 2012) is "any behaviour intended to gain information about one's size, weight, shape, or appearance..., such as weighing oneself, comparing one's body to others, or examining oneself in a reflective surface" (Stefano et al 2016 p51). More than that, Stefano et al (2016) pointed out: "Repeated checking of disliked body parts may cause excessive vigilance and result in the belief that certain parts of the body are too large. This may precipitate increased checking, negative affect, and body dissatisfaction, forming a harmful cycle that may result in disordered eating behaviours" (p51).

BC is common among individuals with anorexia, and female non-sufferers with high shape and weight concerns (Stefano et al 2016).

Stefano et al (2016) investigated BC among female undergraduates on an introductory psychology course in the USA using ecological momentary assessment (EMA). This involves sampling behaviour by random assessment via a mobile phone, for example, over a period of time.

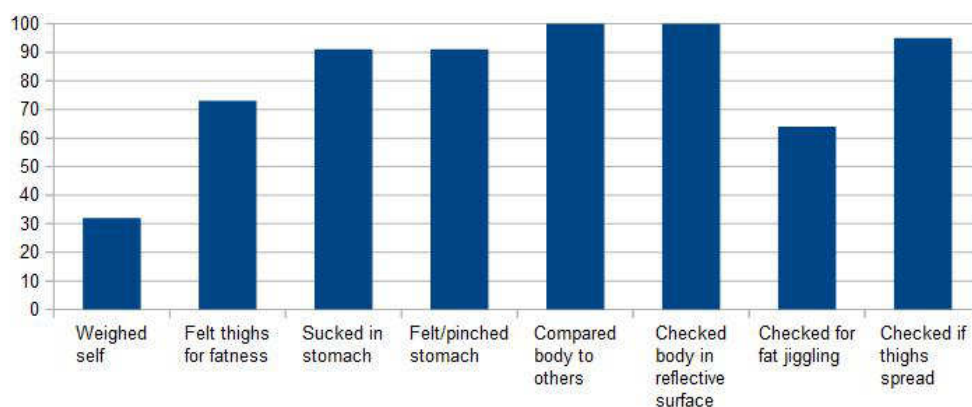
Sixty-eight students were classed as having body concern from a questionnaire about body dissatisfaction, and twenty-two of them completed the study. The women were contacted on five occasions per day between 9 am and 10 pm for five days via text message. In response to the text each time, they reported on eight BC behaviours (eg:

⁵⁰ In effect it is a four-point scale as "sometimes", "rarely", and "never" are scored as 0 (Segura-Garcia et al 2015).

feeling thighs for fatness; weighing oneself).

The most common behaviour was "checking body size in a reflective surface", followed by "comparing one's body to others" (which were reported by all participants at least once) (figure 3.1).

The frequency of BC significantly predicted body dissatisfaction, and negative mood. The researchers commented on an interesting finding: "it appears that the study itself served as a type of intervention, as checking frequency significantly decreased over time. It is possible that merely becoming aware of checking behaviours and their subsequent effect on body image and mood steered participants to decrease this behaviour over time" (Stefano et al 2016 p53).



(Data from Stefano et al 2016 table 1 p52)

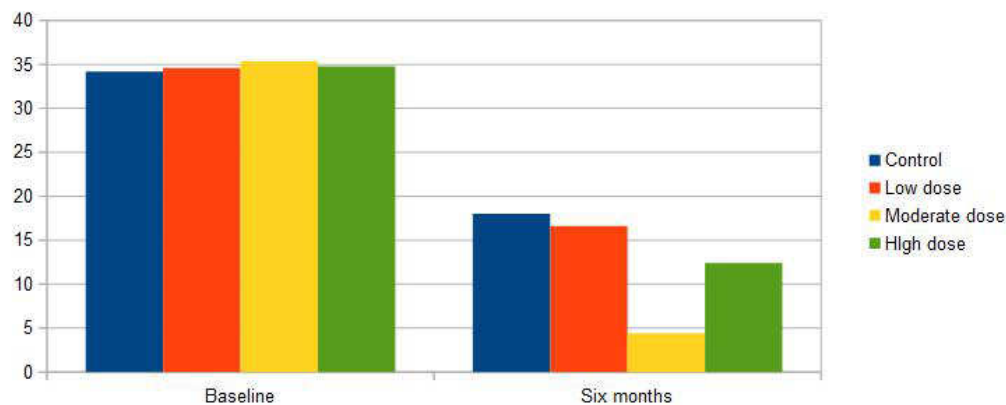
Figure 3.1 - Percentage of participants reporting BC behaviour at least once during the study.

Behavioural weight-loss programmes can reduce binge eating episodes as well as weight, though it may not be as effective as cognitive-behavioural therapy (CBT) for binge eating symptoms (eg: Grilo et al 2011).

Ariel and Perri (2016) compared three levels of behavioural treatment with nutritional education over six months with around 600 obese adults in north Florida, USA. The behavioural programme focused on implementing a low-calorie diet, increased physical activity, and behaviour change strategies (eg: self-monitoring food intake). There were either 24 (high dose condition), 16 (moderate) or eight (low dose) weekly group sessions. Participants in the high and moderate dose conditions had significantly lower binge eating severity at six months compared to the low dose and control conditions (figure 3.2).

Note that the behavioural weight-loss programme did not directly address binge eating behaviours. "Rather, it

is likely that the program's emphasis on self-monitoring, regulating eating patterns, non-restrictive dietary recommendations, stress management techniques, and individual problem solving - which are also components of CBT for binge eating... - address some of the underlying mechanisms that maintain binge eating behaviours. Specifically, researchers have argued that behavioural interventions for weight management that focus on self-monitoring and the establishment of regular eating patterns may reduce binge eating episodes..." (Ariel and Perri 2016 p59).



(Data from Ariel and Perri 2016 table 2 p58)

Figure 3.2 - Percentage of individuals reporting moderate or severe binge eating behaviour.

Inflexible eating patterns and rules may be a way to deal with body image-related unwanted thoughts (or body image-related cognitive fusion) (Trindade and Ferreira 2015).

Trindade and Ferreira (2015) asked over six hundred female university students in Portugal to complete various questionnaires including the Inflexible Eating Questionnaire (IEQ) (Ferreira, Pinto-Gouveia et al 2014 quoted in Trindade and Ferreira 2015), which has eleven items including "I rather follow my eating rules than eating in function of the context or my hunger or my will", and the Cognitive Fusion Questionnaire: Body Image (CFQ:BI) (Ferreira et al 2014). This has ten items including "I tend to get very entangled in my thoughts concerning my body or body image". Other questionnaires measured shame (eg: "I think other people look down on me"), body dissatisfaction, and the desire to lose weight/have ideal figure.

IEQ scores correlated with CFQ:BI scores. Also body dissatisfaction was high (60% of respondents), and the desire to lose weight (70%) (figure 3.3). It was found

that "the effects of weight dissatisfaction and external shame on inflexible eating were fully mediated through the mechanism of body image-related cognitive fusion... These findings suggest that it is when a woman gets fused and entangled with her body image-related thoughts that these unwanted inner events most impact on her eating rules. In addition, the inflexible adherence to eating rules may therefore be a strategy to control or avoid the negative content of the body-related thoughts one is entangled with. However, as rigid dieting holds paradoxical consequences (eg: weight gain...), this strategy may lead to greater suffering and psychological distress" (Trindade and Ferreira 2015 p51).

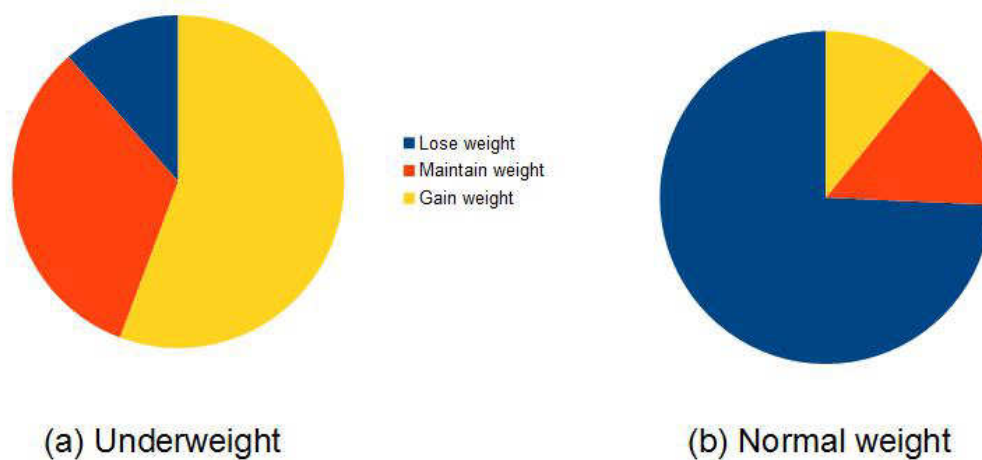


Figure 3.3 - Percentage of respondents desiring to change weight based on body weight.

Two aspects of temperament that have been studied in relation to eating disorders are effortful control (EC) and negative emotionality (NE). NE is a dimension of temperament that covers, frustration, fear, sadness, and anger, with higher NE involving more frequent and intense experiences of these emotions. EC relates to self-regulation of responses, and planning, with low EC showing poor behaviour control (Burt et al 2015).

Higher NE is associated with a higher risk of eating disorders, as is low EC. But what about the interaction of these two temperaments and eating disorders? This is what Burt et al (2015) studied with 160 18-25 year-olds at a US university. Questionnaires were completed on temperament, and DE.

Low EC by itself was found to be associated with DE (ie: more eating disorder symptoms), but not high NE by itself. However, high NE and low EC together did associate with DE.

Burt et al (2015) summed up: "Our results suggest that high NE and subsequent increased negative self-evaluation may not result in ED symptomatology when

individuals demonstrate good EC, and as such, are able to regulate their emotions and behaviours in ways that promote adaptive coping and/or hinder the emergence of maladaptive coping. In contrast, individuals high in NE who also have significant self-regulation difficulties appear to be at the highest risk of experiencing high, stable distress about their body, and to engage in maladaptive eating patterns" (p33).

Maladaptive beliefs and behaviours in relation to eating and physical appearance have been linked to depression. Most commonly, emotional eating, external (or hedonic) eating, and restrained eating, though the relationship can vary (Rawana et al 2016). For example, Ouwens et al (2009) found an association between emotional eating, but not external eating, and depression among women, while Harrell and Jackson (2008) linked restrained eating and depression in female college students via rumination⁵¹.

In terms of gender differences, Rawana et al (2016) found that restrained eating and depression went together for both sexes, but only emotional eating and external eating and depression for women. This was a Canadian study with 473 female and 135 male young adults (18-29 years old).

Nolen-Hoeksema et al (2007) argued that a ruminative response style focused on the body led to the bingeing and purging of bulimia nervosa (BN) as a means to escape the repetitive body-focused thoughts. So, bulimic behaviours are "a coping mechanism to escape from 'the self' (Heatherton and Baumeister 1991)" (Breithaupt et al 2016).

The Self-Regulatory Strength Model of Self-Control (Baumeister and Heatherton 1996) sees self-control as a limited resource, which rumination draws upon, and this leads the individual "to be less able to handle future demands (eg: negative body related thoughts), eventually leading to a failure in resisting a binge. Thus, self-control is one factor that may moderate the relationship between ruminative response styles and BN" (Breithaupt et al 2016 p2).

Breithaupt et al (2016) found support for these ideas among 350 US college students. Individuals with higher levels of rumination and lower levels of self-control reported more bulimic symptoms (mean of 3) than those with higher self-control (mean of 1.5) or low levels of rumination (both means of 1).

⁵¹ Rumination is "a response to distress through which an individual focuses on the causes, consequences, and symptoms of one's current negative affect repetitively without proactively engaging in goal directed behaviour" (Breithaupt et al 2016 p1).

3.2. APPEARANCE CONCERNS IN CHILDHOOD

Fredrickson and Roberts (1997) proposed the idea of "self-objectification". "It is theorised that the repeated experience of sexual objectification gradually socialises women and girls to internalise an observer's perspective of their own bodies. This self-objectification is characterised by habitual monitoring of one's outward appearance, and has been associated with numerous negative psychological consequences, in particular increased body shame and appearance anxiety" (Slater and Tiggemann 2016 p113).

Self-objectification has been studied in adult women, and its link to DE, particularly through the influence of the media, and there is some evidence of dieting awareness and body dissatisfaction in girls as young as six years old (Slater and Tiggemann 2016).

Parents as just as important as the media in the self-objectification of girls, both in controlling access to the media, and in the response to media messages (ie: "media literacy" skills), and mothers "also exist within the same sexualised society and are themselves likely to be affected in some way" (Slater and Tiggemann 2016).

Slater and Tiggemann (2016) concentrated on three maternal behaviours and the influence on their 5-8 year-old daughters' self-objectification in an Australian study ⁵²:

i) Maternal self-objectification - This was measured by the Body Surveillance sub-scale of the Objectified Body Consciousness Scale (McKinley and Hyde 1996), with items like, "During the day, I think about how I look many times".

Tiggemann and Slater (2014) had previously found in Australia an association between maternal self-objectification and 4-10 year-old girls' more sexualised behaviours and appearance concerns.

ii) Maternal materialism - Materialism is defined as "the importance a consumer attaches to worldly possession" (Belk 1985). "Accordingly, mothers with highly materialistic values are apt to want to 'give their children the best' which, in a consumer driven culture, likely translates into buying their children products and clothing that might reinforce the sexualisation of girls" (Slater and Tiggemann 2016 p114).

It was measured by items like, "Buying things gives me a lot of pleasure", and "My life would be better if I

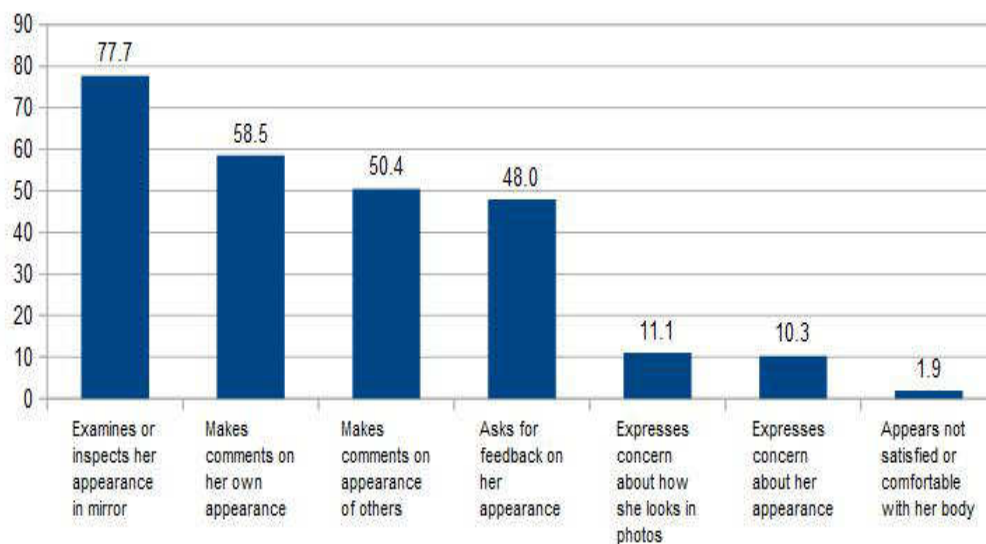
⁵² 255 mothers recruited through advertisements in school newsletters, parenting magazines and websites, and Facebook to complete a survey about "their experiences of raising a daughter in the modern environment".

owned certain things" from the Material Values Scale (Richins 2004).

iii) Parenting style - Authoritarian (eg: "When I ask my children to do something, I expect it to be done immediately without questions") or permissive (eg: "I do not direct the behaviours, activities or desires of my children").

The outcome measures of child sexualised behaviours and appearance concerns were measured by items like, "wears lip gloss", "asks for feedback on her appearance", and "expresses concern about how she looks in photographs".

Over three-quarters of the girls inspected their appearance in the mirror, and half asked about how they looked, while 10% expressed concern about their appearance (figure 3.4). Engagement in teen culture (eg: interested in fashion and what clothes are "in"; watches music videos) and use of beauty products significantly positively correlated with appearance concerns. Slater and Tiggemann (2016) commented: "Thus it appears that very young girls are taking on the concerns usually associated with much older girls. The finding that both engagement in teen culture and use of beauty products were positively related to appearance concerns indicates that 'buying into' various aspects of the sexualised consumer-driven culture is not benign for young girls" (p117).



(Data from Slater and Tiggemann 2016 table 1 p115)

Figure 3.4 - Percentage of girls reported with appearance concerns.

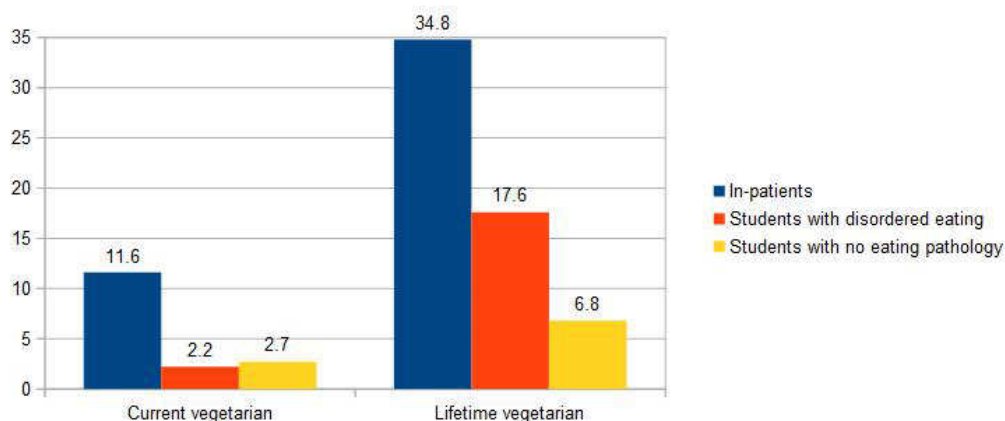
Maternal self-objectification was significantly positively correlated with daughter's engagement in teen culture, use of beauty products, and appearance concerns, while maternal materialism was significantly positively associated with engagement in teen culture and appearance concerns. Parenting style had no significant relationship.

All outcome measures of children's behaviours were maternal reports. The researchers admitted that "it is possible that mothers with higher levels of self-objectification and materialism may be more likely to identify sexualised behaviours and appearance concerns in their daughters" (Slater and Tiggemann 2016 p117).

3.3. VEGETARIANISM AND EATING DISORDERS

Though a vegetarian diet can be beneficial to health, there is research suggesting that "vegetarianism may mask the presence of eating pathology" (Zuromski et al 2015).

Zuromski et al (2015) found that one-third of sixty-nine in-patients at an eating disorders treatment centre in the USA reported lifetime vegetarianism (ie: ever in their lives) compared to half of that among 136 female undergraduates with disordered eating and 7% of 73 female students with no eating pathology (both at the same US university). The prevalence for current vegetarianism was 11% among in-patients, and 2% of both groups of students (figure 3.5). Vegan (no animal products), lacto-ovo vegetarian (eats dairy and eggs), pesco-vegetarian (eats dairy, eggs and fish) or non-vegetarian categorisation was based on self-reports.



(Data from Zuromski et al 2015 table 2 p26)

Figure 3.5 - Prevalence (%) of self-identified vegetarians in three groups.

This study was not able to explain the "mechanisms underlying relationship between vegetarianism and disordered eating. For example, other underlying factors (eg: biological, personality) may contribute to high co-occurrence of these behaviours" (Zuromski et al 2015 pp26-27). Also it could not answer the questions: "does vegetarianism serve as a way to disguise food restriction during the early stages of an eating disorder? Or, does experience with vegetarianism increase vulnerability for the development of eating disorders in vulnerable individuals?" (Zuromski et al 2015 p27).

3.4. PICKY EATING

Parental perception of poor appetite, fussiness or picky eating, and food refusal are common in pre-school children (Machado et al 2016).

Picky eating is the rejection of foods that parents see as appropriate and necessary to healthy development. At the extreme, children can end up with a different meal to other members of the family at mealtimes. There is a risk of lower nutritional variety also (Machado et al 2016).

Research has found a short duration to picky eating, from a peak at 1-3 years old to very low levels at six years old (Machado et al 2016).

Machado et al (2016) outlined four issues that their study of 959 1.5 to six year-olds in Portugal set out to cover.

i) Prevalence rate - 25% (other studies range from 8 to 50%).

ii) Differences between picky and non-picky eaters in pregnancy and post-partum experiences - The only significant differences were more unplanned pregnancies among picky eaters, along with more birth complications.

iii) Differences between picky and non-picky eaters in emotional and behavioural problems - Picky eaters had significantly higher scores on all such problems.

iv) Variables linked to picky eating - Children who had somatic complaints and attention problems were more likely to be picky eaters. Picky eating was more common in lower-income families, and with younger parents (figure 3.6).

Machado et al (2016) concluded that "although picky eating could be a transient behaviour and part of normal development in preschool children..., our results support the possibility that picky eating, as a specific eating

pattern, could also be part of a broader pattern of behavioural problems in children... It appears that feeding problems seem to be linked with other emotional and behavioural problems in pre-school children" (p20).

Picky eating was operationalised as the mother's response to "does not eat well" and "refuses to eat" from the choice of not applicable (1), sometimes (2), or often (3) (ie: maximum score of 6). Picky eating was defined as a score of four or more for analysis purposes. Thus, 235 children were classed as picky eaters.

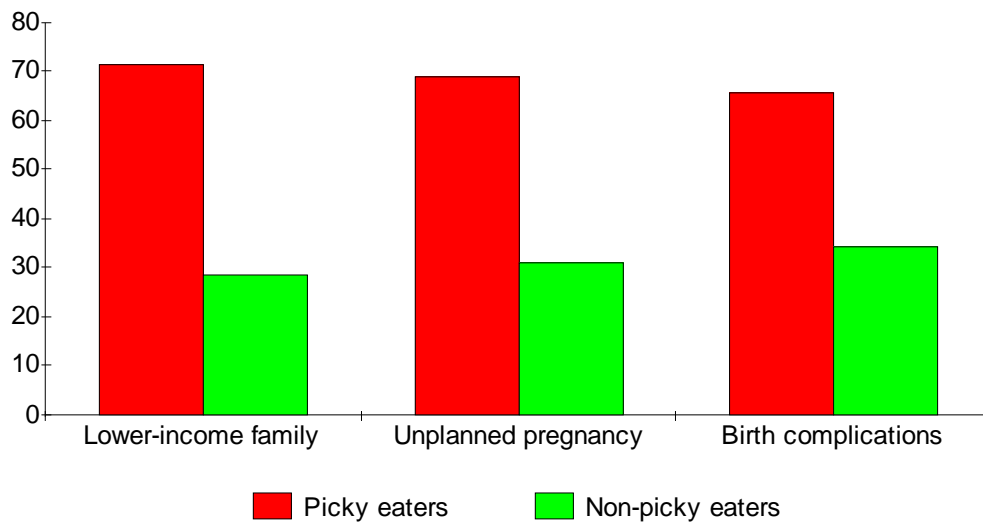


Figure 3.6 - Three significant differences between picky and non-picky eaters (%).

3.5. "DRUNKOREXIA"

"Drunkorexia" ⁵³ is the restriction of calories on days when alcohol consumption is planned to avoid perceived weight gain from the alcohol (Burke et al 2010) (table 3.2). There may also be excessive exercise to compensate or consumption of large amounts of alcohol to produce vomiting and purge the calories this way (Barry and Piazza-Gardner 2012) (table 3.3). So, the three dimensions of drunkorexia are alcohol use/abuse, DE, and physical activity.

Drunkorexia is seen as different to the co-morbidity of eating disorders and alcohol dependence - eg: 30-50% of bulimics and 12-15% of anorexics had alcohol problems, depending on the study, while one-third of alcohol and

⁵³ Drunkorexia was originally coined by the popular media in the USA in 2008, and it joined the list of other catchy terms, like "manorexia" (anorexia in men), "diabulimia" (diabetics using insulin restriction to purge), and "bridorexia" (brides restricting food to fit into a smaller wedding dress) (Burke et al 2010).

drug dependent individuals had an eating disorder (Burke et al 2010).

The counter-intuitive observation that student alcohol consumption positively correlates with physical exercise (eg: both high) has been called "the incongruous alcohol-activity association" (Musselman and Rutledge 2010). Drunkorexia is a possible explanation of this association.

- Burke et al (2010) found that 14% of 700 first-year undergraduates at a south-eastern US university admitted in an online survey in 2008 to restricting calories prior to drinking, with more of those saying they did it to enhance the effects of alcohol⁵⁴ rather than to avoid weight gain. Nearly three-quarters of these individuals were female.
- One-fifth of binge drinkers who restricted calories reported the highest number of days in the last month (more than 20) binge drinking.
- Burke et al (2010) felt that "the incidence of full blown drunkorexia may not be as widespread as portrayed by the media", but 99 students were classed as showing the behaviour.

Table 3.2 - Burke et al (2010).

University students are particularly known for drunkorexia, and Ward and Galante (2015) studied 349 at a US university in the development of four scales to measure the behaviour. Questionnaires were completed on alcohol consumption and motivation, DE, and drunkorexia:

- Drunkorexia Motives scale - eg: "so that I wouldn't gain weight".
- Drunkorexia Behaviours scale - eg: "by exercising before I drank".
- Drunkorexia Fails scale - eg: "not drink as much because I don't want the extra calories".
- Post-Drinking Compensation scale - eg: "will compensate by eating less".

⁵⁴ Students gave qualitative answers like "so the food would not take up the beer room", and "beer lasts longer that way". Burke et al (2010) stated: "This is a particular health concern because not eating prior to alcohol consumption increases alcohols' toxicity and the subsequent health consequences such as brain and organ damage. Alcohol is also known for its vitamin (eg: B-vitamins) and nutrient leaching qualities. By replacing food calories with alcohol calories students are more likely to suffer from other health problems related to nutritional deficits" (pp28-29).

- Barry and Piazza-Gardner (2012) analysed data from the American Health Association's 2008 National College Health Assessment (ACHA-NCHA), which covered over 20 000 students from forty university campuses.
- Binge drinking behaviour was measured with the statement: "Over the last two weeks, how many times how you had five or more drinks of alcohol at a sitting". Any answer above zero was classified as "binge drinker", and this was one-third of the sample. Three items were used for physical activity, and four items for DE.
- Regular strength training, and vigorous-intensity exercise each predicted a greater likelihood of binge drinking, but moderate-intensity exercise was the opposite. While individuals who vomited, or used laxatives or diet pills to lose weight were nearly twice as likely to binge drink as individuals who did not do these behaviours.

Table 3.3 - Barry and Piazza-Gardner (2012).

Hunt and Forbush (2016) preferred the long-winded term "inappropriate compensatory behaviour to avoid weight gain from consuming alcohol" (ICB-WGA) "to avoid any implication that this behaviour pattern is a trivial issue".

But is ICB-WGA an eating disorder, a substance use disorder, or both, asked Hunt and Forbush (2016)? They found, in a study of Kansas students, that both DE and alcohol use were predictors of ICB-WGA, but DE had a stronger influence, particularly among women. This study involved the completion of questionnaires on DE, alcohol use, and ICB-WGA (table 3.4).

Eating Pathology Symptoms Inventory (EPSI) (Forbush et al 2013)

- Excessive exercise (eg: "I pushed myself extremely hard when I exercise")
- Body dissatisfaction (eg: "I did not like how my body looked")
- Restricting (eg: "I skipped two meals in a row")
- Binge eating (eg: "I ate until I was uncomfortably full")
- Purging (eg: "I made myself vomit in order to lose weight")
- Cognitive restraint (eg: I tried to exclude 'unhealthy' foods from my diet")⁵⁵.

Alcohol Use Disorder Identification Test (AUDIT) (Saunders et al 1993)

- How often do you have six or more drinks on one occasion?
- How often during the last year have you found that you were not able to stop drinking once you started?
- How often during the last year have you been unable to remember what happened the night before because you had been drinking?
- Have you or someone else been injured as a result of your drinking?

⁵⁵ Two sub-scales not used - Muscle Building and Negative Attitudes toward Obesity.

5 specific items to cover ICB-WGA

- "I skipped a meal in order to counteract the calories from alcohol"
- "I ate less before going drinking so that I would not gain weight"
- "I restricted my eating prior to drinking to increase the effects of alcohol"
- "I engaged in strenuous exercise to compensate for calories consumed during drinking"
- "I drank excessive amounts of alcohol so that I could vomit food I had eaten".

Table 3.4 - Details of questionnaires used by Hunt and Forbush (2016).

4. WEIGHT LOSS

- 4.1. Meal replacement
- 4.2. Exercise
 - 4.2.1. Energy expenditure
 - 4.2.2. Sedentary behaviour

4.1. MEAL REPLACEMENT

Overweight and obesity can be a side effect of medication, like second-generation anti-psychotics (ie: "medication-associated obesity"; Gelberg et al 2015). Such individuals may not be able to lose weight through healthy lifestyles.

Kwan et al (2014) reported a randomised controlled trial of a weight loss programme for 120 individuals with severe mental illness and medication-associated obesity in the USA. Meal replacement (with shakes and bars) was part of the programme. For various reasons (eg: refusal)⁵⁶, only five participants used meal replacement shakes, but they were successful in losing weight (Gelberg et al 2015).

Concentrating on two cases of the five participants, Gelberg et al (2015) noted that the success for the individuals was based on "motivation to take responsibility for their weight loss, they remained motivated through the end of their study participation, and they found ways to incorporate the shakes into their daily habits" (p63).

Gelberg et al (2015) strongly advocated meal replacement, particularly for individuals with severe mental illness. It "can help 'jump start' a person's confidence to lose weight and help motivate him/her to focus on healthy dietary strategies, which can aid in reaching long-term health goals. Because augmenting an individual's weight loss at the beginning may ensure continued loss for the remainder of a program, it may be helpful to incorporate meal replacements into initial phases of behavioural weight management programmes..." (p63).

⁵⁶ "Reasons given by participants included dislike of the product, preference for eating 'real' food instead of shakes, ambivalence or disinterest in weight loss, inability or unwillingness to obtain weekly supplies of shakes from study staff, desire to lose weight on their own, and feeling unwell after using shakes for a few days" (Gelberg et al 2015 p63).

4.2. EXERCISE

4.2.1. Energy Expenditure

The additive total energy expenditure model is the name for the idea that increasing physical activity leads to weight loss. The increasing physical activity produces increasing energy expenditure, and assuming that food intake does not increase, there will be a reduction in weight.

The alternative is the constrained total energy expenditure model (Pontzer 2015), where "total energy expenditure increase with physical activity at low activity levels but plateaus at higher activity levels as the body adapts to maintain total energy expenditure within a narrow range" (Pontzer et al 2016 p410). In other words, increasing physical activity does not lead to weight loss among highly active individuals, as the body adapts "to maintain total energy expenditure within some relatively narrow range" (Pontzer et al 2016 p411). This suggests that "total energy expenditure is an evolved, species-specific trait that is homeostatically buffered against variation in habitual physical activity" (Pontzer et al 2016 p411).

Pontzer et al (2016) provided evidence for this model in a study of total energy expenditure over seven days as the participants wore an accelerometer to measure their movement. A total of 332 25-45 year-olds from five countries (Ghana, South Africa, Seychelles, Jamaica, and the USA) were recruited.

For individuals in the top one-third of mean daily physical activity, increasing physical activity did not produce increasing energy expenditure, whereas for the other participants it did. Other studies have found compensations in behaviour, like sitting instead of standing, or in physiology among the activity individuals (Pontzer et al 2016). For example, individuals on a long-term exercise programme showed reduced metabolic rate at week 40 (Westterp et al 1992), while suppressed ovarian activity and lower oestrogen production has been found in highly active healthy women (Ellison 2003)⁵⁷.

Experimental studies with animals that can impose high levels of physical activity find that, for example, mice stop growth or mothers eat their own young at extremes, while birds have a reduction in cell repair (Pontzer et al 2016).

Exercise alone does not produce expected weight

⁵⁷ Recently, Pedersen et al (2016) found that mice with cancer who choose to exercise over four weeks had significantly fewer and smaller tumours than sedentary mice, and this was due to exercise-induced surges in adrenaline which stimulated the immune system.

loss, and exercise programmes are less popular with women than men (Emery et al 2016). For example, Donnelly and Smith (2005) found that most men lost weight on a sixteen-month supervised exercise programme, whereas "women were equally likely to lose or gain weight. Given that exercise compliance was maintained under supervision throughout the intervention, the authors posited that women who exhibited weight gain likely had behaviourally compensated for the energy expended during exercise by increasing their dietary intake or decreasing their lifestyle physical activity" (Emery et al 2016 p10).

Emery et al (2016) found behavioural compensation in an experimental study of 49 overweight and obese women in Pittsburgh, USA. In the experimental condition, the women arrived at the laboratory at 10 am, received a standard breakfast, and then walked on a treadmill for thirty minutes. For the next 24 hours their physical activity (energy expended) and food eaten (energy intake) were monitored. In the control condition, there was no walking.

Two-thirds of the women compensated for the treadmill walk by eating more and/or reducing physical activity in the following 24 hours. Women who reported binge eating were more likely to reduce physical activity.

4.2.2. Sedentary Behaviour

There is concern that sitting all day, as in an office, can be detrimental to health. For example, Ryan et al (2011) found that office workers spent two-thirds of their workday sitting. Hu et al (2003) estimated that, for example, there is a 5% increase in risk of obesity with each two-hour per day increase in sitting at work, while, generally, individuals who sit for eight to eleven hours per day have a 15% greater risk of death in the next three years than those who sit for four hours per day (Van der Ploeg et al 2012).

One solution gaining in popularity is to make the desk non-sitting (eg: sit-stand desks which can adjust to a standing position) or active (eg: pedalling workstations). Other suggestions include encouraging walking during breaks.

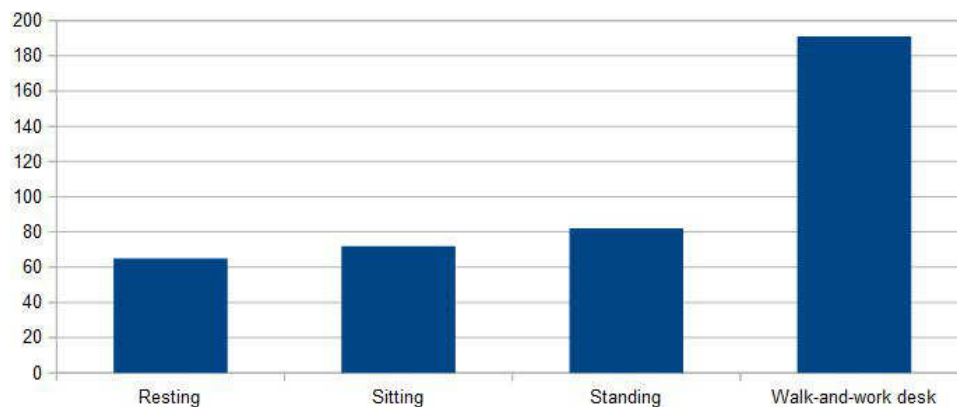
Shrestha et al (2016) reviewed the workplace interventions to reduce sitting at work, and found twenty studies (which were either randomised controlled trials or controlled before-and-after studies). The primary outcome measure was time spent sitting at work per day (either self-reported or objectively measured), and all studies had a control group.

The introduction of sit-stand desks reduced sitting at work between thirty minutes to two hours per day

compared to the control group, but for active workstations the evidence was inconsistent. Company policies to encourage walking during breaks had limited effect as did mindfulness training, while counselling to reduce sitting time led to some reduction. Computer prompting during the day to stand up and walk around had an inconsistent effect.

Most of the studies in the review were classed as low-quality in terms of methodology⁵⁸, so the conclusions were given with caution. Sit-stand desks were the best in the short-term (up to three months follow-up).

Levine and Miller (2007) reported the benefits of their invention, the "walk-and-work" desk, which is a computer workstation that incorporates a treadmill. Fifteen sedentary obese individuals expended significantly more energy per hour using the desk than sitting at the computer (figure 4.1).

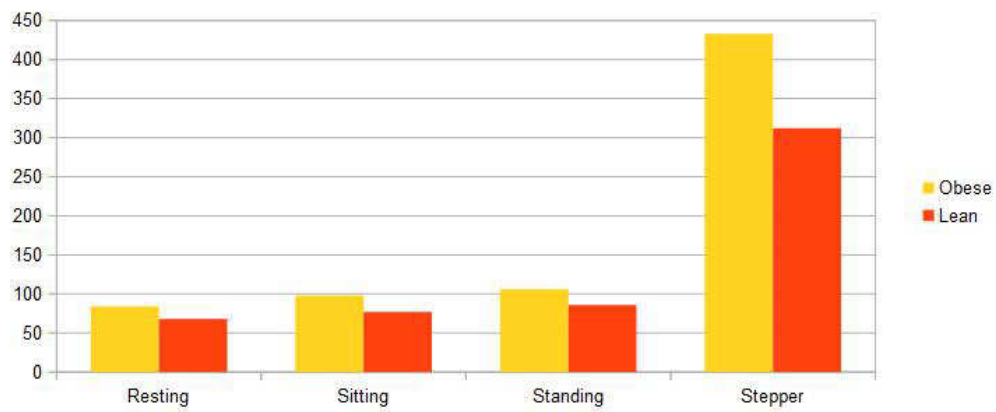


(Data from Levine and Miller 2007 table 1 p560)

Figure 4.1 - Mean energy expenditure (kcal/h) in four conditions.

While McAlpine et al (2007) reported similar benefits for the office-place stepping device (ie: a hydraulic stepping device used during telephone calls, for example). The energy expended was significantly greater than sitting, and for ten obese over nine lean individuals (figure 4.2).

⁵⁸ Eg: no blinding of conditions, or no randomisation of participants to conditions.



(Data from McAlpine et al 2007 table 1 p906)

Figure 4.2 - Mean energy expenditure (kcal/h) for obese and lean individuals.

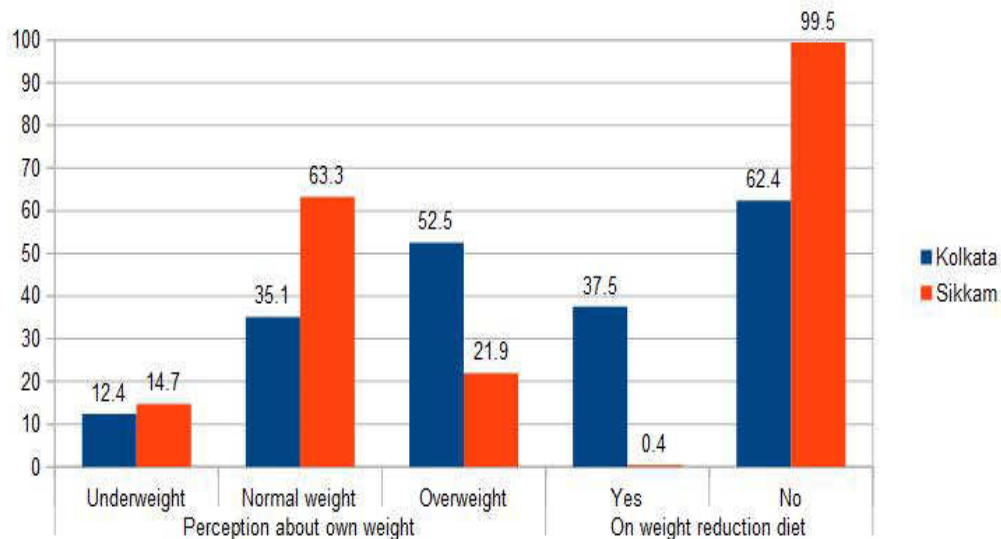
5. INTERNATIONAL PERSPECTIVES

- 5.1. Modernisation
- 5.2. Food insecurity and poverty
- 5.3. Eating disorders
 - 5.3.1. Characteristics of eating disorders

5.1. MODERNISATION

Som et al (2016) investigated the effect of modernisation in India on food habits and weight concerns among two different urban groups of female 14-19 year-olds. A structured food frequency questionnaire was used for nine major food items, and there were four yes/no questions about weight concerns.

The group from Kolkata, who were richer, perceived themselves as overweight significantly more than the group from Sikkam, and were significantly more likely to be dieting (figure 5.1). The area of residence (ie: level of wealth) was the significant predictor of weight concerns. For example, the Kolkata sample consumed more fried foods, while the other group ate more traditional foods.



(Data from Som et al 2016 table 2 p23)

Figure 5.1 - Percentage of samples answering questions about weight concerns.

5.2. FOOD INSECURITY AND POVERTY

Food security is "when all people, at all times,

have physical and economic access to sufficient, safe, and nutritious food to meet their dietary needs and food preferences for an active and healthy life" (Food and Agriculture Organisation of the United Nations 2015 quoted in Ford et al 2016). The key ideas are reliable access to food, availability of nutritional foods, and acceptable quality (Ford et al 2016). Food insecurity is the lack of these things.

Inuit communities in the Canadian Arctic face this - eg: 69% of Inuit households in the territory of Nunavut (Ford et al 2016). Store-bought foods here are expensive, of poor nutritional quality (eg: high sugar and fat content), and described negatively by the locals, while "country foods" (eg: caribou, ringed seal) are better for food security and well-being (Ford et al 2016).

As a compromise, Ford et al (2016) explored the possibility of country food markets (CFMs) in Nunavut based on their success in Greenland and Denmark among Inuit groups. Interviews were conducted in all three areas.

In Nunavut, the attitudes towards CFMs were linked to the perceived cause of food insecurity. For example, if country foods were seen as scarce because of too few animals with a growing human population, then CFMs would not help. But for individuals in full-time employment who did not have the time to hunt, CFMs were viewed positively.

Other concerns about CFMs were the undermining of sharing networks, and the belief that "harvested food is seen as a gift from nature, in which animals offer themselves to the hunter or fisher, and where the sharing, distribution, and consumption of wild foods is closely linked to cultural identity" (Ford et al 2016 p37). There were also practical issues, like regulations, and capital investment.

Overall, Ford et al (2016) concluded that despite the success of CFMs in Greenland, Nunavut was "not currently in the position to develop CFMs" (p39).

At the other end of the scale, around one-third of Canadian children and adolescents are estimated to be overweight and obese (Elgar et al 2016).

Elgar et al (2016) explored the role of relative deprivation (or "poverty among plenty") in this level of obesity. They used the data from the 2010 Health Behaviour in School-aged Children (HBSC) study, which covered over 26 000 9-19 year-olds in Canada. There were questions about physical activity, and eating behaviours (both frequency and types of food eaten). Measures were calculated for absolute deprivation between schools, relative deprivation within schools, and subjective social status.

Relative deprivation within schools was related to less physical activity, fewer breakfasts, less healthy

food choices, and lower likelihood of dieting to lose weight (4 obesity risk behaviours), as were absolute deprivation between schools and subjective social status.

Runciman (1966) introduced the idea of relative deprivation as "extent of the difference between the desired situation and that of the person desiring it" (quoted in Elgar et al 2016). Individuals within a school compare themselves to the wealthier classmates and experience frustration, which leads to the unhealthy, it is felt. Also the "causal chain between relative deprivation and healthy lifestyles is likely to involve stress" (Elgar et al 2016 p116). Subjective social status may be similar in its relationship to obesity.

In terms of the relationship between absolute deprivation and obesity, Elgar et al (2016) pointed out that other research has shown more convenience stores and fast food restaurants in lower income neighbourhoods in Canada, as well as "adolescents who live in more deprived neighbourhoods tend to be less physically active and have poorer aerobic fitness" (Elgar et al 2016 p115).

5.3. EATING DISORDERS

Kolar et al (2016) pointed out that "historically, eating disorders were perceived as culture-bound syndromes restricted to Western cultures", but subsequently "cases of eating disorders have been identified in all cultures to a varying extent" (p363).

Eating disorders are most common in young Western females, but they are increasing among older women, men, and individuals in non-Western countries (Hoek 2016).

This highlights the importance of five basic questions about eating disorders - who, what, when, where, and why (or onset, prevalence, co-morbidity, course, consequences, and risk factors) (Keski-Rahkonen et al 2016).

In terms of the Global Burden of Disease (GBD) study⁵⁹, anorexia and bulimia nervosa together ranked 12th leading cause of disability-adjusted life years (DALYs)⁶⁰ for females aged 15-19 years old in high-income countries⁶¹. The ranking in the same age group in low- and middle-income countries moved from 58th in 1990 to 46th in 2013

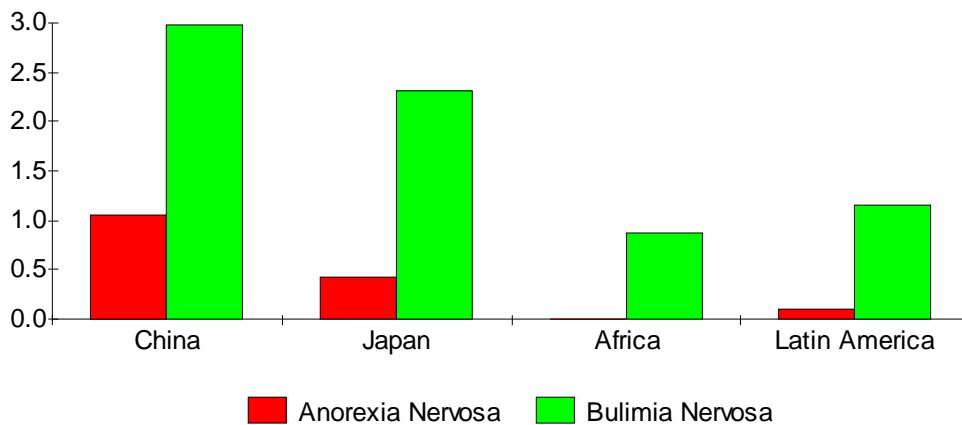
⁵⁹ The first GBD study in 1990 did not include eating disorders, while GBD 2010 did include anorexia and bulimia. GBD 2013 covered 301 diseases and injuries for 188 countries (Erskine et al 2016).

⁶⁰ "Importantly, the DALY incorporates both mortality and morbidity, and provides a consistent platform for comparing all diseases and injuries. It quantifies the gap between perfect health and the health loss attributable to a given disorder at a population level, with one DALY equalling the loss of one year of healthy life" (Erskine et al 2016 p346).

⁶¹ In total, 1.9 m DALYs were attributable to eating disorders in GBD 2013 (Erskine et al 2016).

(Erskine et al 2016).

Point prevalence is "the proportion of actual cases in a population at a specific point in time" (Hoek 2016). Hoek (2016) reported the first meta-analysis of studies of this for non-Western countries. Anorexia nervosa is highest in China (1.05%) as well as bulimia nervosa and binge eating disorder (BED) (figure 5.2). On the other hand, rates are low in Latin America or among Hispanics/Latinos in the USA (table 5.1)⁶². One reason is the idealisation of a more curvaceous shape (Hoek 2016).



(Data from Hoek 2016 table 1 p337)

Figure 5.1 - Point prevalence (%) of eating disorders in non-Western world.

- Prevalence rates of 0.08% for anorexia, 1.61% for bulimia, and 1.92% for BED.
- In terms of social context, immigration status and adaptation to the new culture will have an influence in upcoming years (ie: the role of Westernisation and increasing eating disorders). For example, in a remote rural area of Nicaragua the arrival of television led to a preference among women for thinner bodies (Boothroyd et al 2016).
- In terms of indigenous cultural values, Perez et al (2016) noted that the family environment was key: "Family members tended to discount or discredit binge eating and describe a binge as simply a big meal that is normative in Hispanic/Latino culture" (p381).

Table 5.1 - Hispanics and Latinos in the USA.

⁶² Perez et al (2016) commented: "It is important to keep in mind that race and ethnicity are social constructs that are treated as static and stable traits within research, when in reality they are constantly evolving at a group and individual level. For example, at the group level the number of people describing their race as mixed is growing in the US and is at 2.5% of the population. At the individual level, ethnic identification can fluctuate across context and time" (pp378-379).

(1) Europe (Keski-Rahkonen et al 2016):

- Prevalence - anorexia 1-4%, bulimia 1-2% and BED 2-3% of women.
- Time trend - Reported increases in anorexia in last thirty years which may be due to increased detection (ie: incidence stable), decreases in bulimia, but increases in other eating disorders.

Behaviours in the diagnostic boundaries may be increasing. These are "features of eating disorders that are not currently a part of the core phenotype but may have potential implications for treatment and outcome" (Keski-Rahkonen et al 2016 p342). For example, excessive exercise, and "orthorexia nervosa" (excessive pursuit of healthy eating) (Brytek-Matera et al 2015).

- Co-morbidity - Commonly with mood and/or anxiety disorders. For example, among Swedish eating disorders patients, 53% had an anxiety disorder diagnosis and 43% a mod disorder diagnosis as well (Ulfvebrand et al 2015).

BED co-exists with physical problems (eg: 15% of Finnish women had type-2 diabetes as well; Raevuori et al 2015).

This is an increased risk of non-suicidal self-injury, and suicide among eating disorders sufferers.

- Course of illness - The long-term outcome in anorexia, for example, seems favourable; eg: 88% of female sufferers in Finland were weight-restored by their mid-30s (Mustelin et al 2015).
- Risk factors for eating disorders - These include parental eating disorder, high parental expectations, and body image issues, for example. Keski-Rahkonen et al (2016) concluded that the "risk factors for eating disorders operate on many different levels and span generations".

(2) Asia (Thomas et al 2016):

- China - Published studies on eating disorders have increased since the 1990s, and they show "prevalent fat concern and other maladaptive eating attitudes among young females in China" (Thomas et al 2016 p355), as well as increased rates of eating disorders.

A variation of anorexia reported in Hong Kong without the fear of weight gain (non-fat-phobic anorexia nervosa) (Lee et al 2010).

- Japan - Increased prevalence of all eating disorders

(table 5.2).

- India - Few studies, but evidence of increased eating disorders (eg: survey of psychiatrists).

Study	Sample	Anorexia (%)	Bulimia (%)
Tong et al (2013)	Female university students in Wuhan, China	1.05	2.98
Nakai et al (2014)	Female 16-23 year-olds in Japan	1982 0.11 2002 0.43	1982 0 2002 2.32

Table 5.2 - Two studies from South-East Asia.

(3) Pacific region (Thomas et al 2016):

- New Zealand (Maori and Pacific ethnicity) - A lifetime prevalence of any eating disorder of 1.7% in the New Zealand Mental Health Survey in 2003-4, which covered different ethnic groups.
- Pacific Islands - Little data, but a Fijian questionnaire with fifty adult women found symptoms consistent with BED in 4% of respondents (Becker et al 2003).

(4) Africa:

There are few studies on eating disorders in Africa, and van Hoeken et al (2016) could only find four articles published on the prevalence of anorexia, bulimia, and eating disorders not otherwise specified (EDNOS) ⁶³. Combining the data, there were no cases of anorexia in 1500 women (from Egypt, Ghana, Tanzania, and Kenya), and less than 1% prevalence for bulimia among eight hundred women with 4.5% prevalence of EDNOS ⁶⁴. In terms of specific studies, Eddy et al (2007) found four cases of anorexia among 214 13-30 year-old Tanzanian women, and the risk of eating disorder symptoms was linked to the degree of media exposure. "With increasing access to television, film, and Internet use on the African continent, the exposure to western cultures, particularly

⁶³ van Hoeken et al (2016) admitted: "Thus, the study of the epidemiology of eating disorders in Africa is challenging and it is important to note that the limited literature available only provides part of the actual picture" (p376).

⁶⁴ Studies in the USA have found lower rates of eating disorders in young African-American women than Euro-American (eg: Striegel-Moore et al 2003).

in highly educated persons, is rising, and with it the risk for developing an eating disorder" (van Hoeken et al 2016 p376).

Widening the search to cover epidemiological studies of eating pathology, van Hoeken et al (2016) found twenty-six using questionnaires (eighteen of them from South Africa). For example, Gitau et al (2014) found that around 12% of 13-17 year-olds in the Birth-to-Twenty longitudinal birth cohort study in South Africa had DE.

(5) Latin America:

Kolar et al (2016) performed a systematic literature review of studies on eating disorders in Latin America (defined as "all American countries in which Romance languages are spoken" - ie: seventeen countries speaking Spanish and Portuguese). Seventeen relevant studies were found. Table 5.3 gives the mean point prevalence rates calculated by the researchers.

Eating disorder	Point prevalence	Number of studies based
Anorexia	0.1	10
Bulimia	1.16	13
Binge eating disorder	3.53	9

Table 5.3 - Mean point prevalence rates (%) in the general population in Latin America.

Overall, anorexia was significantly lower than in Western countries, but bulimia was similar or higher than in Western Europe, and BED was higher than in Western populations. Kolar et al (2016) commented on the latter finding: "A possible explanation might be that food has a high emotional value in many Latin American cultures which reflects in the language (eg: 'Las penas con pan duelen menos', - the sorrows with bread hurt less, 'barriga llena, corazo'n contento' - a full belly is a pleased heart), and addressing the cultural assumptions regarding food is of importance in nutritional interventions for Latinas" (p369).

The main limitation of this review was the different measures used in the studies. Furthermore, most studies came from Brazil, Mexico, or Colombia (Kolar et al 2016).

5.3.1. Characteristics of Eating Disorders

Gramaglia et al (2016) studied thirty-nine individuals with anorexia in Italy and compared them to

forty-eight matched healthy controls on emotion regulation and identification. The former group scored significantly higher on the Toronto Alexithymia Scale (TAS-20) (Bagby et al 1994). Alexithymia has three main aspects as measured by this questionnaire - difficulty identifying feelings (DIF) (eg: "I am often confused about what emotion I am feeling"), difficulty describing feelings (DFF) (eg: "I find it hard to describe how I feel about people"), and externally oriented thinking (EOT) (eg: "I prefer to just let things happen rather than to understand why they turned out that way"). Gramaglia et al (2016) only found a difference on DIF and DFF, which means the patients had difficulty "identifying feelings, distinguishing them from the bodily sensations of emotion..., and also describing feelings to others" - (p48).

Jenkins and O'Connor (2012) talked of a "cognitive-affective division" among individuals with eating disorders "when trying to translate what they 'think' cognitively into what they 'feel' emotionally" (Gramaglia et al 2016).

In non-Western countries, body image dissatisfaction may be different. Nikniaz et al (2016) focused on Iran, and they speculated thus: "Iran is an Islamic country with Islamic culture. These cultures emphasize on some Islamic laws, such as requiring the covering of the body, especially by women and this may result in better body satisfaction and reduce preoccupation with the body... However, recently, media emphasis that thinness is the sign of attractiveness, beauty, social acceptance and success" (p5).

These researchers surveyed five hundred women in Tabriz, Iran, to resolve the two possibilities. It was found that a large number of the women had body image distortions - 71% of those who were obese, 45% of overweight women, and 54% of normal-weight women. The latter two groups overestimated their body size, while the obese group underestimated using silhouettes of body shapes. Body image dissatisfaction was also high - 98% of obese women, 96% of those overweight, and 55% of normal-weight ones. Nikniaz et al (2016) concluded that "the prevalence of body image dissatisfaction was high in Iranian women. Normal-weight women were also dissatisfied with their body size which may predispose them to the development of risk behaviours for eating disorders. Besides, more females with obesity tended to underestimate their body size than normal weight and overweight woman which may be problematic in terms of motivation to lose weight" (p8).

6. GUT MICROBIOTA

- 6.1. Gut microbiota and health
- 6.2. Mental health
- 6.3. Sex differences
- 6.4. Microbiomania

6.1. GUT MICROBIOTA AND HEALTH

The gut microbiota comprises of thousands of different microbial species in the gastrointestinal system ⁶⁵.

Tremaroli and Backhed (2012) stated: "Each person has a distinct and highly variable microbiota, but a conserved set of gut colonisers (the core gut microbiota) and genes (the core microbiome) are shared among individuals and may be required for the correct functioning of the gut" (p242) ⁶⁶. The human gut microbiota (ie: microbial communities in the gastrointestinal system) is dominated by five bacterial groups (phyla) - Firmicutes, Bacteroidetes, Actinobacteria, Proteobacteria, and Verrucomicrobia (Tremaroli and Backhed 2012) ^{67 68}.

Gut microbiota composition is different in hyperphagic transgenic mice (eg: mutation in gene for satiety) (Ley et al 2005), and obese humans (Ley et al 2006) than lean comparables ⁶⁹. The faecal microbiota of obese humans had "an increased capacity to harvest energy" (eg: breakdown non-digestible carbohydrates) (Tremaroli and Backhed 2012).

⁶⁵ "The total mass of bacteria within the intestine is approximately the same as that of the human brain, and these bacteria have a highly rich and complex biochemistry, comprising many more cells than the total number of human cells. It is estimated that this ecosystem has in excess of 1000 species and 7000 strains..." (Dinan and Cryan 2016). Another way of looking at it is that there are as many microbial cells as human cells in the body. Thus, we are "holobionts" (Gordon et al 2013) - ie: the product of the interaction of microbe and microbe, and microbe-host (Charbonneau et al 2016).

⁶⁶ "For instance, early in development, the gut microbiota educate the immune system, fine-tune neural circuits within the gut, induce anti-microbial peptides to ensure rapid clearance of pathogens, metabolise vital dietary components and distribute dietary fat to peripheral tissues" (Jasarevic et al 2016 p1).

⁶⁷ There could have been co-evolution of the gut and brain such that "expansion of the brain resulted in a corresponding reduction in the overall size of the gut" (Jasarevic et al 2016). Yet, "the reduction of the mammalian gut was paralleled by increased capacity to synthesise essential amino acids, ferment complex carbohydrates and more efficiently extract energy, suggesting an essential co-evolution between bacterial communities residing within the gut and increased metabolic demands necessary for an energetically expensive brain" (Jasarevic et al 2016 p1).

⁶⁸ Gut microbiota not only help in digesting food, but through "colonisation resistance" prevent pathogenic micro-organisms invading (Sana and Monack 2016). An unwanted side-effect of oral anti-biotics is an increase in dangerous gut bacteria, according to a study with mice (Faber et al 2016).

⁶⁹ Studies of long-living individuals have also found a higher gut microbial diversity (eg: Italian centenarians; Biagi et al 2016, and over 90s in Sichuan province, China; Kong et al 2016).

Certain bacteria levels are increased with reduced weight, as seen in post-gastric bypass humans (Tremaroli and Backhed 2012).

Germ-free mice receiving transplanted microbiota from obese mice fed on high-fat diets gained significantly more adiposity than those transplanted from lean mice (Turnbaugh et al 2008).

The gut microbiota respond particularly to dietary fat, and changes in the number of types of bacteria in mice on high-fat diets have been found within 24 hours (Tremaroli and Backhed 2012).

Tremaroli and Backhed (2012) summed up: "Studies in humans tend to be correlative, so the role of the microbiota in obesity and its co-morbidities in humans remains to be proven. However, this role can be examined in animal studies. Germ-free mice can be 'humanized' by colonising them with human intestinal communities, providing tools for examining the function of a specific human microbiota and testing how it interacts with specific diets. Genetically engineered germ-free mice could help to identify the molecular mechanisms by which the gut microbiota affects host metabolism" (p247).

While much focus is upon obesity and overweight, particularly in the developed world, there is also the issue of under- or malnutrition, which is not necessarily due to lack of food, but to low nutrient diet, for example (Blanton et al 2016). Gut microbiota may also play a part.

Subramanian et al (2014) studied the bacteria from the gut microbiota in the faeces of infants and children in an urban slum in Dhaka, Bangladesh. Children with moderate and severe acute malnutrition had "immature" gut microbiota. In other words, it was similar to younger healthy children.

Blanton et al (2016) used faecal samples from young twins (0-36 months old) in five rural villages in southern Malawi to measure gut microbiota, and from that to predict future growth. The microbiota samples were implanted in germ-free mice (ie: genetically engineered without gut microbiota and kept in a sterile environment), who were observed for four to five weeks. Mice with microbiota from healthy twins gained significantly more weight than mice with microbiota from undernourished children. So "gut microbiota immaturity is not only associated with undernutrition but casually related to it" (Blanton et al 2016).

Sonnenburg and Backhed (2016) highlighted three themes from recent human studies:

- i) The gut microbiota responds quickly to large

changes in diet (eg: within 1-2 days).

ii) Long-term dietary habits are the basis of the composition of the individual's gut microbiota.

iii) A change in diet will have different effects for different people because of the individualised nature of gut microbiota.

6.2. MENTAL HEALTH

Recent research has looked at the microbiota and psychiatric disorders.

Gut microbiota interacts with the immune, neural and endocrine systems in what is called the "gut-brain axis", "even if the communication routes are still not defined" (Mangiola et al 2016)⁷⁰. Many common neurotransmitters found in the brain can be produced by bacteria (Dinan and Cryan 2016).

Most of the studies involve germ-free mice (ie: genetically-engineered with no live gut microbiota)⁷¹.

For example, Neufeld et al (2011) found that anxiety-like behaviour of such mice was reduced when the microbiota was restored. While the release of microbial species into the blood causes an immune reaction, which could lead to depression (Mangiola et al 2016).

Collins et al (2013) transferred gut bacteria between mice strains using faecal microbiota transplantation, and found that germ-free mice behaved as the source of the transplant (ie: from an anxious or non-anxious mouse strain). The transplant altered brain chemistry (Dinan and Cryan 2016). But how? One possible answer is via the vagus nerve. Dinan and Cryan (2016) reported that the cutting of this nerve in animals limited the effects of transplanted microbiota on mood.

Sudo et al (2004) found that germ-free mice raised in a sterile environment had an exaggerated hypothalamic-pituitary-adrenal (HPA) axis response to stress, and this was reduced by transplant of one bacterial strain.

In human studies, Jiang et al (2015) analysed the faecal samples of forty-six individuals with major depression and thirty controls. The most depressed individuals had higher levels of three groups of bacteria and significantly less of another type. But this study needs replicating (Dinan and Cryan 2016).

⁷⁰ A number of physiological mechanisms are probably involved in the gut-brain axis, including the vagus nerve, the immune system, and metabolites like short chain fatty acids (Dinan and Cryan 2016).

⁷¹ The brain does not develop normally in germ-free animals. "Moreover, fundamental brain processes such as myelination, adult neurogenesis and microglia activation have also shown to be critically dependent on microbiota composition" (Dinan and Cryan 2016).

One particular microbial species (*Alistipes*) was found in large amounts in the faeces of individuals with depression (Naseribafrouei et al 2014).

6.3. SEX DIFFERENCES

Jasarevic et al (2016) produced an overview of the research on sex differences in the gut microbioma-brain axis across the lifespan, including:

i) Pre-natal - eg: elevated levels of short-chain fatty acids (microbial by-products) in late gestation leads to anxiety-like behaviour in male, but not female, rats.

ii) Post-natal - eg: children born by caesarian sections do not have the microbes ingested during vaginal birth, and this has been linked to increased risk of allergies, especially for girls.

iii) Childhood and puberty - eg: pubertal testosterone in male rats found to alter the gut microbiome.

iv) Adulthood - eg: reductions in ovarian hormones associated with increased gastrointestinal symptoms and infection for women.

6.4. MICROBIOMANIA

Jonathan Eisen coined the term "microbiomania" to cover the increasing number of studies linking gut flora to physical and mental illnesses, and the related scientific and pseudo-scientific explanations (Adee 2016). "Although possible connections between bacterial products and medical conditions are multiplying fast, not everyone agrees that the bacteria are causing the observed effects, rather than the other way around" (Adee 2016 p16).

Two trends have emerged with this mania - "DIY microbial transplants", and the probiotics foods industry (Adee 2016). In the former case, claims are being made that faecal transplants can "cure" conditions like Parkinson's disease, autism, and obesity. Faecal transplants have only been shown to work for *Clostridium difficile* infections (Adee 2016).

Concerning probiotics, Kristensen et al (2016) found no evidence of benefits for healthy people in four of seven randomised controlled trials reviewed, and the other three trials were poorly designed (Adee 2016).

7. APPENDIX A - SELF-EFFICACY

One barrier to the success of weight loss programmes, particularly when individuals start to regain weight lost, has found to be self-efficacy. This is defined as "confidence in one's ability to perform specific behaviours in the presence of challenging situations" (Ames et al 2015 p115).

The Weight Efficacy Lifestyle Questionnaire-Short Form (WEL-SF) (Ames et al 2012) has been developed to measure eating self-efficacy. It has eight items about controlling eating behaviour in different situations (eg: at a party; when angry or irritable), and each is rated from 0 ("not confident at all that I can resist overeating") to 10 ("very confident that I can resist overeating"). Lower scores, thus, signify less self-efficacy.

Ames et al (2015) used the WEL-SF with 1740 US patients undergoing assessment for bariatric surgery between 2012 and 2014. Lower scores were significantly associated with higher rates of binge eating episodes, food addiction symptoms, and depression and anxiety, and higher WEL-SF scores with motivation to change lifestyle. WEL-SF score was not associated with a history of child sexual abuse.

Randomised controlled trials (RCTs) to assess the effectiveness of weight loss interventions have attrition rates (drop-out) from 10% to 80% (Goode et al 2016). Who drops out of weight loss programmes (and such RCTs)?

Inconsistent associations between baseline factors like depression, and binge eating, have been reported, but most studies cover short-term interventions and follow-up (Goode et al 2016). Thus, Goode et al (2016) analysed the drop-outs in three RCTs in the USA that had weight loss interventions up to 24 months.

- PREFER (Paving the Road to Everlasting Food and Exercise Regimes) - Participants were randomised by choice or not to a calorie-restricted, lacto-ovo-vegetarian diet or a standard calorie- and fat-restricted diet over eighteen months.
- SMART (Self-Monitoring and Recording Using Technology) - Three methods of self-management of weight over 24 months: paper diary, personal digital assistant (PDA), or PDA and daily feedback messages.
- SELF (Self Efficacy Lifestyle Focus) - Enhanced self-efficacy about weight loss or not for eighteen months.

The following variables at baseline predicted attrition:

a) Higher BMI - For every one unit increase in BMI at baseline, drop-out increased by 11%. "Possible reasons may include increased difficulty adhering to calorie- and fat-restricted diets,... being discouraged about needing to lose a significant amount of weight, and... possibly seeing the success of others in the trial that began the study with a lower BMI" (Goode et al 2016 pp30-31).

b) Less education - For extra year of education, drop-out decreased by 10%.

c) Previous attempts to lose a large amount of weight (over 50 lbs) - Around twice as likely to drop-out than individuals with no previous attempts.

d) No health insurance (taken as an indicator of poverty) - Over three times less likely to complete the trial than participants with health insurance.

Also relevant were younger age, higher binge-eating score, and less attendance at meetings in first six months of trial/programme. Goode et al (2016) stated that the "relationship between age and attrition may be explained by the competing responsibilities that are typically associated with young adulthood, such as the demands of parenting and familial responsibilities" (p30).

8. APPENDIX B - MEALS CONSUMED AWAY FROM HOME

In the past forty years in the USA, for example, food consumption/energy intake has increased by up to 500 kcal/day (Urban et al 2016).

One explanation is the increase in meals consumed away from home, and the high energy content of such takeaways. Fast food is "particularly obesogenic" (Urban et al 2016).

However, Urban et al (2016) said, "eating out does not need to lead to overeating if consumers are able to practice restraint, but large portions typical of many restaurants appear to consistently override restraint and result in overeating" (p591).

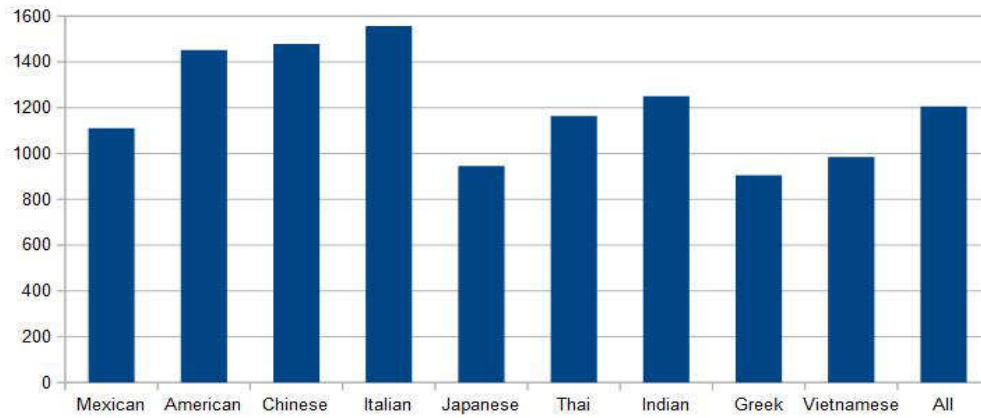
These researchers measured the energy contents of the most frequently ordered meals at non-chain and large-chain restaurants in three US cities. The gross energy of each meal was determined in the laboratory. Three main measures were taken - gross energy content (kcal), portion size (grams), and energy density (kilocalories per gram).

The non-chain restaurant meals contained an average of 1200 kcal energy ⁷² (figure 8.1), which is over 50% of the recommended daily energy requirement of an adult female (2000 kcal/day) and just under that for an adult male (2500 kcal/day) (Urban et al 2016). The matching large-chain meals contained an average of 1150 kcals. Over 90% of all measured meals "contained amounts of energy that were in excess of human energy needs at a single meal" (Urban et al 2016 p595). Put another way, a restaurant meal in the study provided the equivalent in energy content of two full meals for an average woman, say (Urban et al 2016).

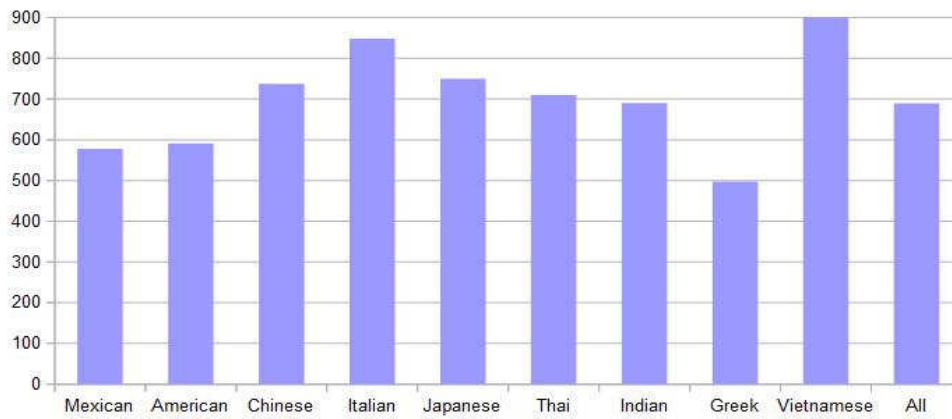
The researchers also pointed out that there was "a significant effect of cuisine on meal energy content, but variability between meals was substantial and the relationships between meal energy content and portion size and energy density were weak, making it likely impossible for consumers to use visual cues such as portion size to accurately estimate the energy content of provided meals" (Urban et al 2016 p595).

⁷² This did not include starter, dessert, or beverage.

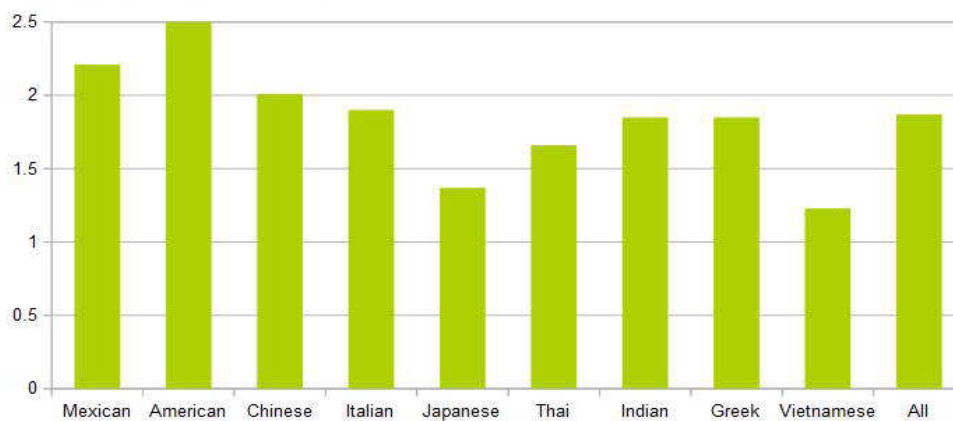
(a) Gross energy (kcal)



(b) Portion size (grams)



(c) Energy density (kcal/g)



(Data from Urban et al 2016 table 2 p592)

Figure 8.1 - Main measures of different types of food - (a) gross energy (kcal), (b) portion size (gram), (c) energy density (kcal/g).

9. APPENDIX C - IMPULSIVITY

Impulsivity is seen as "a multi-faceted trait marked by motor ⁷³, non-planning ⁷⁴ and attentional ⁷⁵ impulsiveness" (Lundahl et al 2015).

Lyke and Spinella (2004) found associations between motor and attentional impulsivity and disinhibited eating, and between attentional impulsivity and feelings of hunger.

Lundahl et al (2015) found that motor and attentional impulsivity were linked to aspects of DE in a study of over 1200 students at a midwestern US university. Specifically, attentional impulsivity was associated with poorer self-perception of body shape, more dieting, and a greater preoccupation with food, while motor impulsivity was associated only with poorer self-perception and preoccupation with food. There was no relationship found between non-planning impulsivity and DE, nor any gender differences in impulsivity generally and DE.

Impulsivity was measured by the Barratt Impulsiveness Scale - Version 11 (BIS-11) (Patton and Stanford 1995) with items like "I do things without thinking" and "I plan for the future" (reverse scored).

⁷³ Doing things without thinking - ie: acting on spur of moment.

⁷⁴ Not planning for the future.

⁷⁵ Difficulty focusing and maintaining attention.

10. APPENDIX D - BINGE EATING SCALE (BES)

The BES (Gormally et al 1982) was developed to assess the cognitive, affective, and behavioural aspects of binge eating. These aspects include eating large amounts of food (rapidly), guilt, and feelings of out of control or unable to stop eating.

The BES has sixteen items, and each item contains a number of statements of which one is chosen. For example (Duarte et al 2015):

1. I usually am able to stop eating when I want to. I know when "enough is enough".
2. Every so often, I experience a compulsion to eat which I can't seem to control.
3. Frequently, I experience strong urges to eat which I seem unable to control, but at other times I can control my eating urges.
4. I feel incapable of controlling urges to eat. I have a fear of not being able to stop eating voluntarily.

Total scores range from 0 to 46, and are divided into three groupings - no or minimal binge eating (0-17), mild to moderate binge eating (18-25), and severe binge eating (27-46). In a sample of over 1000 women in Portugal, Duarte et al (2015) found that 5.5% were categorised as mild or moderate, and 1.8% as severe binge eating.

The BES has the following strengths (Duarte et al 2015):

- Widely used for screening, and measuring treatment outcomes.
- High sensitivity and specificity for discriminating between binge eaters and non-binge eaters.
- Good reliability (internal and external).
- Good validity.

In separate research, regular evening meal consumption has been found to disrupt the cycle of binge eating and purging behaviour in bulimia nervosa. Evenings are also known to be a high-risk time for binge eating (Ellison et al 2016).

10.1. Loss of Control Eating Disorder

Binge Eating Disorder is an impulsive-related adult condition, and rarely seen in children, though they may show episodes of binge eating, classed as loss of control eating disorder (LOC-ED) (eg: up to 30% of 6-13 year-olds; Matherne et al 2015).

LOC-ED is diagnosed from the following symptoms (Tanofsky-Kraff et al 2008):

i) Recurrent episodes of LOC eating characterised by a feeling of lack of control over eating.

ii) LOC eating episodes occur at least twice a month for three months.

iii) LOC eating episodes have at least three of the following:

- Eating in response to negative emotions
- Secrecy about LOC eating episode
- Feeling of numbness (lack of awareness) during eating
- Eating more or perceiving that eating more than others
- Food-seeking when not hungry
- Negative emotions, like shame and guilt after an episode.

iv) No inappropriate compensatory behaviours after eating episodes (eg: vomiting, use of laxatives).

Matherne et al (2015) found that children classed as LOC-ED were more overweight, and had more disordered eating attitudes than non-LOC-ED children. This was based on a convenience sample of 251 healthy 8-12 year-olds in the USA. LOC episodes were assessed for the three months prior to the interview.

Nineteen children were classed as LOC-ED, thirty-three as sub-LOC-ED, and the remainder as non-LOC-ED (n = 199). The non-LOC-ED group had a significantly lower mean BMI relative to age-norms than the other two groups.

The LOC-ED group were significantly different to the other two groups on measures of disordered eating as measured by the Eating Disorder Examination for children (ChEDE) (Bryant-Waugh et al 1996).

There is a difference between the subjective experience of LOC, irrespective of objectively large binge episodes (OBES) or subjectively large binge episodes (SBES) (Tanofsky-Kraff et al 2012).

Radin et al (2015) explored OBES and SBES with a convenience sample of 329 12-18 year-olds in the USA, of which 150 had LOC eating (based on the Eating Disorder Examination (EDE) score). Among this latter group, 53% reported SBES, 25% OBES, and the remainder both.

The adolescents with LOC had higher systolic blood pressure and LDL-cholesterol than non-LOC adolescents, while individuals with OBES had higher LDL-cholesterol than those with SBES. Radin et al (2015) explained: "LOC episodes are characterised by greater consumption of carbohydrates, including snacks and desserts, and less from protein... High intake of sweets and snacks could potentially contribute to worsened metabolic factors in youth, including higher LDL-cholesterol and blood pressure" (p89).

11. APPENDIX E - DIFFERENT EATING DISORDERS

DSM-5 (APA 2013) renamed "feeding disorder of infancy and early childhood" as "avoidant/restrictive food intake disorder" (ARFID)⁷⁶. ARFID is a persistent disturbance in eating leading to significant weight loss (or failure to grow), nutritional deficiency (in the presence of food), and/or "marked interference with psychosocial functioning" (Norris and Katzman 2015). But there is not the body image disturbance seen in other eating disorders related to weight loss (Norris and Katzman 2016).

The prevalence of ARFID has varied from 5-22% of children and adolescents in clinical samples, and sufferers were younger⁷⁷ and more likely to be male, and have anxiety disorders compared to anorexia nervosa (Norris and Katzman 2016). In a general population survey (Kurz et al 2015), 3.2% of over 1400 Swiss 8-13 year-olds self-reported symptoms of ARFID (but no formal diagnosis was made) (Norris and Katzman 2016).

King et al (2015) reported the case study of ARFID in a 41 year-old woman in the USA who had the fear of gastrointestinal symptoms after childhood hospitalisation for Crohn's disease.

11.1. Chewing and Spitting

Chewing and spitting out food before swallowing (CHSP) is common among individuals with eating disorders (eg: up to two-thirds) (Makhzoumi et al 2015). It was initially seen as a variation of the binge-purge behaviour and sense of loss of control (LOC) overeating in bulimia nervosa, but CHSP is now viewed as more common in other eating disorders (eg: anorexia nervosa and eating disorders not otherwise specified) and with more disturbed eating behaviours (Makhzoumi et al 2015).

Makhzoumi et al (2015) surveyed 324 consecutive admissions to an in-patient eating disorder treatment programme in the USA between 2003 and 2012. The participants completed various questionnaires on eating disorders, and personality variables. Of them, 40% reported CHSP at least once in their lives, and sixty-nine individuals engaged in the behaviour at least once a week. These individuals (CHSP+) were compared to the rest of the sample in the statistical analysis.

⁷⁶ Part of the reason for the change was the extreme pickiness and/or low calorie intake in middle childhood and adolescence which was not covered by feeding disorder of infancy and early childhood (Schmerler 2016).

⁷⁷ 11-12 vs 14-15 years old.

The CHSP+ group were more likely to have a purging rather than restricting eating disorder (ED) diagnosis, and had more symptoms in the eight weeks prior to admission (mean 6.33 vs 4.61). Makhzoumi et al (2015) noted: "As illness severity increases, patients may experiment with the full spectrum of ED behaviours, eventually adding CHSP to their behavioural repertoire" (p61). They engaged in more restrictive eating behaviours, diet pill and laxative use, and excessive exercise, but less frequent binge eating. A sense of LOC when chewing and spitting was reported by many.

The CHSP+ group had a greater drive for thinness and body dissatisfaction as measured by the Eating Disorders Inventory (EDI-2), and more depressive and suicidal symptoms. The groups did not vary on personality as measured by NEO Five Factor Inventory (NEO-FFI).

Based on video-recordings of lunchtimes of twenty-six females with anorexia nervosa at the New York State Psychiatric Institute, and ten healthy controls, Gianini et al (2015) distinguished two sets of behaviours by the former participants:

i) Avoidance strategies - staring at food in the absence of eating; longer time to start eating.

ii) Ritual behaviours - tearing food; nibbling/picking; dissecting food; inappropriate utensil use (eg: using knife and fork to eat sandwich).

The researchers stated: "Avoidance strategies, such as staring at food, may serve to reduce dietary intake simply because they reduce the amount of time an individual is eating. Ritualistic behaviours, such as tearing and nibbling foods, may slow down the process of eating and result in smaller individual bites of food, resulting in decreased intake" (Gianini et al 2015 p31).

11.2. Trans-Sexuality

Trans-sexuality or gender dysphoria is a risk factor for eating disorders, particularly anorexia, and especially for "biological women" (ie: Female-to-Male). For example, Algars et al (2010) found more DE among Female-to-Male individuals pre-reassignment than control biological women, but no difference between Male-to-Female individuals and control males. Hormonal and surgical reassignment treatment does lead to an improvement in the eating disorder (Turan et al 2015).

11.3. Night Eating Syndrome

Night eating syndrome (NES) is described as "recurrent episodes of night eating, as manifested by eating after awakening from sleep or by excessive food consumption after the evening meal" (Sevincer and Allison 2016 p83). This is quantified as at least two awakenings to eat per week or consumption of 25% or more of daily food intake after dinner. The behaviour should continue for a minimum of three months, and without another medical condition. NES is included under "other specified feeding or eating disorders" in DSM-5 (Sevincer and Allison 2016).

It is possible that NES is a genetic condition, in the form of a delay in the circadian pattern of food intake. Sevincer and Allison (2016) explored this idea with a case study of three individuals in the same family with NES referred to a clinic - the mother (index case) (table 11.1), her adult son, and her adult niece. Four other family members showed NES-type behaviours - her brother and sister, and two more adult nieces. Other family members were reported as showing the behaviour, but the researchers could not verify the information.

Other studies have found a greater risk of NES among children of mothers with the condition (eg: eight times greater than children of non-NES mothers in German study; Lamerz et al 2005). The Quebec Adipose and Lifestyle Intervention in Youth (QUALITY) study found little prevalence of NES between parents and children, but night eating behaviours were high between them (eg: cravings to eat at night; morning anorexia) (Lundgren et al 2012).

Sevincer and Allison (2016) confirmed the observation from other studies that NES is co-morbid with other psychiatric disorders, particularly mood disorders.

- 47 year-old woman
- 20 years of night eating
- Problems falling asleep without eating
- 1-2 awakenings to eat per night 3-5 times per week
- No appetite until afternoon after night eating
- Weight gain of 5 kg in six months
- Depression

Table 11.1 - Details of index case.

11.4. Quality of Life

The disability-adjusted life years (DALYs) from eating disorders globally increased by 38% between 1990 and 2010 (Murray et al 2012).

Individuals with eating disorders (EDs) in the general population report poorer health-related quality

of life (QoL) than controls on general measures of QoL, though there are differences between different types of ED (Hovrud and De Young 2015). Different symptoms also affect QoL differently. For example, men were more affected by binge eating and women by over-evaluation of weight and shape (Mitchison et al 2013).

Hovrud and De Young (2015) investigated the experience of individual ED symptoms on QoL with 113 volunteers in a city in the north-eastern USA. All participants had a "clinically significant eating pathology", and they completed questionnaires on symptom severity and QoL via the Internet.

Concerns about body weight and shape, and binge eating frequency were the symptoms with the greatest influence on QoL, with purging frequency and dietary restriction having the least effect, and fear of fatness and actual BMI were inbetween. It was also found that co-morbidity of depression with an ED led to poor subjective QoL.

12. APPENDIX F - EMOTIONAL EATING

Bariatric surgery is an effective means of weight loss in morbid obesity, except for about one-fifth of patients who regain weight two years after surgery (Taube-Schiff et al 2015) (table 12.1). DE related to emotions is involved in these cases. For example, Canetti et al (2009) found that high emotional eating scores prior to bariatric surgery predicted less weight loss one year post-surgery⁷⁸.

- Generally over four-fifths of those who lose weight regain it within one year (Hume et al 2015). The difference between those who maintain the lower weight and those who do not may be related to inhibition and control.
- Hume et al (2015) found that reduced overweight/obese women had greater mental control over external food cues and inhibition of reward-oriented feeding responses. Fifty-one women were recruited in South Africa from four groups - successful weight loss, unsuccessful weight loss, and low and high weight controls with no history of weight loss.
- The participants were given a food-related, and an office-related Stroop task. The basic Stroop task involves naming the colour of a word as quickly as possible, say. The reaction time to name the colour red for the word "red" is compared to naming the colour red for the word "blue". Individuals will be slower in the latter case because of the distraction of the word meaning. In a food-related Stroop task, individuals who cannot inhibit their response to food will take longer to name the colour of food-related words than neutral or office-related words.

Table 12.1 - Weight relapse.

Weight gain after bariatric surgery may be countered by Motivational Interviewing (MI). This assumes that the motivation for change is a product of the interaction between the individual and a clinician/therapist. "Accordingly, MI is a client-centred, yet directive method for enhancing intrinsic motivation for change... by targeting the client's beliefs about the importance

⁷⁸ Post-surgery DE, not surprisingly, consistently predicts lack of weight loss (Parker et al 2015). Parker et al (2015) argued that DE post-bariatric surgery is different to DE generally because of the changes to the gastrointestinal system, and so traditional measures of DE are not appropriate. They stated "that post-surgery recommendations including reducing portion sizes, eating slowly and chewing thoroughly... mimic some disordered eating symptoms (eg: rigid dietary restriction) assessed by existing measures... [And] maladaptive eating symptoms including vomiting, regurgitation, diarrhoea and other gastrointestinal complications can arise from a failure to adhere to post-surgical eating recommendations... and may appear very similar to disordered eating (eg: vomiting as purging)" (p40). Thus the need for adapted versions of traditional measures of DE that include items, for example, that cover binge eating with a gastric band (eg: what would be an amount of food that is slightly larger for non-gastric band individuals), and to distinguish DE from maladaptive eating (eg: induced vomiting to stop food getting struck).

of change and his/her self-efficacy for making changes" (David et al 2016 p88).

Adaptations of MI (AMI) includes other psycho-social interventions, and can be effective (David et al 2016). David et al (2016) recruited fifty-one female post-operative bariatric surgery patients in Toronto for a study that allocated half to immediate AMI and half to AMI in twelve weeks time (waiting list control - WLC). The AMI session included self-efficacy, planning and sustaining change, and the benefits and costs of non-adherence to dietary guidelines. The AMI group reported improvements in binge eating behaviours and dietary adherence.

"Emotional eating is a maladaptive way of coping with negative affect and is thought to signify more extensive problems with emotion regulation" (Taube-Schiff et al 2015 p36). Anxious and avoidant attachment styles (ie: insecure attachment to caregiver as a child) may be relevant also as they are associated with poor emotion regulation. Taube-Schiff et al (2015) explored this with a sample of 288 men and 1095 women undergoing assessment for bariatric surgery at a Toronto hospital in Canada.

Participants completed a number of questionnaires covering attachment style, emotion regulation, depression and anxiety, and emotional eating.

The researchers tested four hypotheses:

i) There will be an association between insecure attachment and emotional eating - Anxious attachment style was correlated with emotional eating in response to anger and frustration, and avoidant attachment style was correlated with emotional eating in response to anxiety.

ii) There will be an association between insecure attachment and difficulties in emotion regulation - Both insecure attachment styles were associated with high scores on the DERS.

iii) There will be an association between difficulties in emotion regulation and emotional eating - The DERS score correlated with the emotional eating measures.

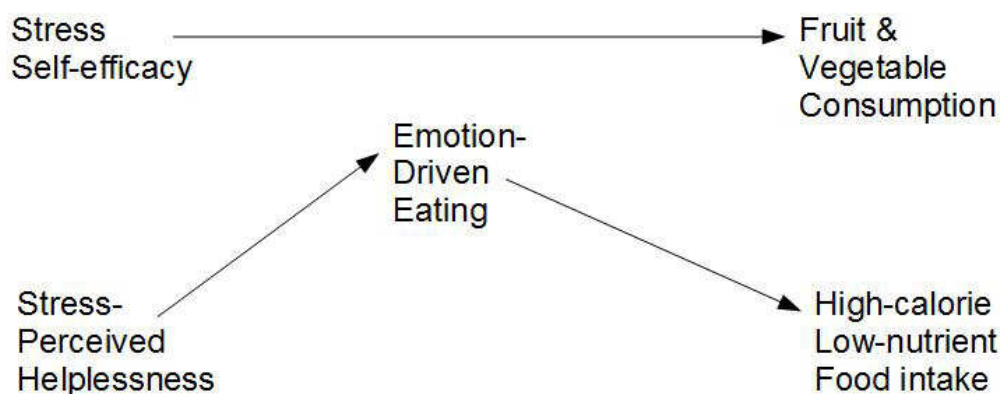
iv) Difficulty in emotion regulation will mediate the relationship between insecure attachment and emotional eating - This was supported by the data.

Altogether, it was found that "difficulties in emotion regulation were an important underlying mechanism linking insecure attachment styles to emotional eating, even when statistically accounting for the influence of concurrent anxiety, depression, and global disordered eating in bariatric surgery candidates" (Taube-Schiff et

al 2015 p39). Though, there were slight differences in the attachment styles as seen in hypothesis (i).

Emotional (or emotion-driven) eating is influenced by stress self-efficacy and perceived helplessness. Tate et al (2015) showed this in a study of 978 9-10 year-olds in twenty-eight Southern Californian schools. Stress self-efficacy was measured by statements like "I felt I could handle important changes that were happening in my life", and perceived helplessness with, for example, "I was angry because of things that happened that were outside of my control". Emotional eating was measured by the Eating in Emotional Situations Questionnaire (EESQ) (Rollins et al 2011)⁷⁹. Frequency of eating certain foods was scored - five high-calorie low-nutrient (eg: doughnuts, sweets) and seven F/V (eg: green salad, fruit juice).

It was found that children "who feel confident about their ability to handle stress eat more fruits and vegetables, yet those who feel helpless to manage stressors engage in more emotion-driven eating and report more frequent consumption of high-calorie/low-nutrient foods" (Tate et al 2015 p87) (figure 12.1).



(Based on Tate et al 2015 figure 1 p88)

Figure 12.1 - Significant relationships found by Tate et al (2015).

Emotional eating is, thus, usually seen as a way of reducing negative moods, but there is also evidence of eating as a reward (ie: positive mood). Hayaki and Free (2016) found that DE was positively associated with emotional eating to reduce negative mood for both men and

⁷⁹ Items included "I eat because it helps me deal with sadness", and "I eat because it makes talking to my friends easier".

women, but only for women was DE negatively associated with positive emotional eating. This study was similar to many in being a questionnaire-based assessment of US undergraduates.

Hayaki and Free (2016) discussed the findings: They "may reflect gender differences in social learning regarding food and eating. Women are socialised to associate multiple meanings to food and eating and are also known to be more preoccupied with food than are men... As a result, women may develop more complex associations between eating-related cognitions and behaviour, including associations that may buffer them from disordered eating. Men, however, who have not come to associate eating with pleasurable contexts to the same degree, may experience no such buffer..." (p25).

12.1. Stroop Task

The Stroop task shows how eating behaviour is related to "immediate, reactive attentional control" (Hotham and Sharma 2015).

Individuals who take less time to name the colours of the ink of incongruent words (eg: "red" in green ink) have been found to be less likely to break dieting behaviours (eg: Allan et al 2011).

Hotham and Sharma (2015) used a modified Stroop task in their study. Sixty women recruited in southern England were presented with three colour words ("green", "yellow", "red") in green, yellow or red ink in the centre of high-fat food images, non-food images (eg: office equipment), or a blank background. The task was to name the ink colour as quick as possible. The speed of response for a high-fat food image background was compared to the non-food image background as the main outcome measure. It was predicted that individuals who are faster with non-food images are more sensitive to food cues and have less attentional control (ie: less response inhibition) than individuals who are not faster. The participants were weighed before the Stroop task and three months later.

Individuals who had no weight change over the three months were not faster in naming the ink colour with the non-food images, while those who lost or gained weight were faster with the non-food images. So, individuals who had attentional control in the Stroop task (ie: not sensitive to food images) had no weight change. Put simply, a pre-occupation with food is linked to weight changes (both gain or loss).

Hotham and Sharma (2015) stated: "Resisting temptations, acknowledging when dieting rules have been broken, implementing strategies to prevent relapses, and advance planning of meals are all indicators of 'good' executive functions" (p81).

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