

CHAPTER 6

PARENTAL FEEDING PRACTICES AND AD LIBITUM

SNACK FOOD INTAKE IN TODDLERS

6.1 Introduction

The previous two chapters provide some evidence for the validity of the Toddler Feeding Questionnaire (TFQ). Chapter 4 provided evidence for concurrent and discriminant validity, showing that the TFQ factors were more closely associated with Restriction and Monitoring from the Child Feeding Questionnaire (Birch et al., 2001), than with Pressure to Eat. Chapter 4 also provided evidence for the concurrent validity of the TFQ, with the factors Allow Access, Attraction, and Flexibility showing positive correlations with mother-reported frequency of consumption of sweets and snack foods. Chapter 5 provided evidence that the TFQ factors, but not CFQ Restriction, discriminated between overweight and normal weight parents. These findings suggest that the TFQ measures unique aspects of control that are not captured by the Child Feeding Questionnaire, and that it may be a valuable tool for investigating parental influences on young children's eating behaviour. The current study will investigate the associations of the TFQ and CFQ Restriction with self-regulation of energy intake in toddlers when they are given free access to healthy and unhealthy snack foods under conditions of recent satiety. This study will also help to elucidate the role that different aspects of parental control might have in the development of overweight in children.

Investigating the association of parental feeding practices with self-regulation of energy intake is important because a child's control over his or her energy intake has been posited as a behavioural mechanism through which parental feeding practices may influence the development of overweight (Costanzo & Woody, 1985). Restrictive feeding has been associated with poor self-regulation of energy intake in children (e.g., Fisher & Birch, 1999a; Fisher & Birch, 2002; Birch, Fisher & Davison, 2003; Francis & Birch, 2005). No study has examined the cross-sectional association of restriction with self-regulation in toddlers. The

earliest developmental period for which there is evidence of this association is the preschool period, in children aged 3 - 5 years (Fisher & Birch, 1999a). Factors such as parental concern about the child's weight and concern about over-eating are known to influence parent feeding practices, including restriction, in this period (Fisher & Birch, 1999a; Fisher & Birch, 1999b). This problem is minimised in toddlers because parents are less likely to be concerned about overweight or overeating, and therefore these factors may have less impact on the relationships under investigation. The association between parental concern about the toddler's weight and parents' use of feeding practices will be examined in this chapter.

Restriction is the only aspect of parental control over feeding that has been investigated for its potential to influence children's self-regulation of energy intake. In Chapter 1, a thorough review of the research on the influence of restriction of self-regulation was conducted. Most of these studies used a Free Access Procedure to measure children's tendency to eat snack foods in the absence of hunger (Fisher & Birch, 1999). The study that did not use this procedure was an experimental study by Fisher and Birch (1999) that measured children's responses to being restricted, and their tendency to select and consume restricted foods during snack time in a day care setting. The Free Access procedure, which involves a short period of *ad libitum* access to snack foods, typically follows consumption of a meal and therefore is conducted under conditions of satiety. It is described as measuring 'Eating in the Absence of Hunger (EAH)'. Children are given unsupervised access to toys and snack foods and given permission to play and eat a selection of snack foods while the researcher leaves the room. Prior to this, children are given an opportunity to taste each of the foods in the context of a rank-order food preference assessment task. This involves the child tasting a small portion of the food and indicating their liking for it with the assistance of cartoon faces depicting "yummy", "yucky" or "just okay". Within these categories, the foods are ranked in order of preference. Although the children are led to believe that their liking ratings are of interest in the research, the actual purpose of the rank-order preference task is to

ensure the child tastes each of the foods. The Free Access procedure has been used with children as young as 3 years of age, although the average age of the children in one study was 5.0 ± 0.01 years (Fisher & Birch, 1999a). In another study, children were aged between 4.6 and 6.4 years of age participated in the procedure (Fisher & Birch, 2000). A modified version of the Free Access Procedure was used in the current study to accommodate the specific needs of younger participants.

Although EAH has not been explored in toddlers, there is some evidence that toddlers may be susceptible to environmental influences that encourage overconsumption. Fox, Devaney, Reidy, Razafindrakoto and Ziegler (2006) investigated the relationship between energy density and portion size using data from the Feeding Infants and Toddler Study (FITS). They found a significant negative relationship between portion size and energy density in children younger than 2 years of age, suggesting that infants were able to self-regulate energy intake by adjusting how much they ate according to the energy density of the meal. This relationship was not seen in toddlers. Fisher et al. (2007) investigated the effects of age on children's intake of large portions and found that, among the 2 to 3 year olds (the youngest age group in the study), children were susceptible to over-consumption during a meal, when given a large portion size compared with a reference portion size. Young children responded to the larger portion much in the same way as the older children, suggesting that external environment cues overrode their ability to respond to internal hunger and satiety cues. It follows from this that toddlers' self-regulation of intake of sweets and snack foods might be affected by a diverse range of other external cues including parental attempts to control intake.

It has been argued in the thesis that some aspects of control may be beneficial, or benign at the very least, in terms of their influence on children's self-regulation. Three factors operationalised in the TFQ (Flexibility, Rules, and Allow Access) measure different ways that parents can manage the sweets and snack foods children eat. Two additional factors, Self-

efficacy and Child Attraction, are likely to influence parent feeding practices. These constructs were developed from parent interviews and represent aspects of parental control used to manage sweets and snack foods in toddlers' diets. It is not known what the nature of the association might be, if any, between these factors and self-regulation of energy intake. *Rules* is a measure of parent rules about snack foods that proscribes what, when, and how much the child is allowed to have. It shares similar content with Overt Control, a measure of parental control developed to capture features of control that are likely to be recognised by the child (Ogden, Reynolds, & Smith, 2006). The review of the literature in Chapter 1 suggests that the child's awareness of restriction may be a feature of negative parental control. On the other hand, the setting of boundaries is an important feature of authoritative parenting (Hughes, Power, Fisher, Mueller, & Nicklas, 2005) and therefore would be unlikely to be associated with poor self-regulation. The relationship between Flexibility and self-regulation is also unknown. Flexibility measures how flexible parents are with their Rules. Flexibility implies a less restrictive approach so it is unlikely to have a negative impact on self-regulation, although it might be associated with a higher intake of sweets and snacks in the diet. Self-efficacy is also unlikely to be associated with intake because it reflects parents' confidence in their ability to manage sweets and snacks, but it is not a measure of parental control. Given that the research using the TFQ is still in an exploratory phase, and our understanding of what these factors might measure is still speculative, no specific hypotheses will be made for Rules, Flexibility and Self-efficacy.

There is a need to explore the role of *Allow Access* in children's self-regulation, given that the parent interviews suggested that the nature of parental restriction varied depending on the toddler's level of access to sweets and snack foods. The validation studies reported in the previous two chapters have provided considerable support for the validity of Allow Access. The factor analysis, in particular, provided excellent evidence of cohesion amongst the items that were identified from the interview as being markers of this construct. Allow Access was

positively correlated with mother-reported frequency of consumption of sweets and snack foods in toddlers and was positively correlated with CFQ Restriction. The observation that greater access to snack foods elicited more restriction by parents and that lower access avoided the need for parents to be restrictive, strongly suggests that there may be an interaction between these constructs. It is hypothesised that the relationship between Restriction and EAH will vary depending on the level of Allow Access. Specifically, it is proposed that the relationship between Restriction and EAH will be stronger when Allow Access is high.

It is also anticipated that Child's Attraction will be positively associated with intake of snack foods in a free access setting. In children, liking of food is known to be a strong predictor of consumption (Gibson, Wardle & Watts, 1998; Drewnowski, 1997; Skinner, Carruth, Bounds & Ziegler, 2002), and therefore it is highly likely to influence the foods that toddlers select in an unrestricted setting. A positive association between Child's Attraction and consumption of snack foods would also be evidence for the predictive validity of this factor.

Lastly, the study will investigate whether the measures of Overt and Covert control developed by Ogden, Reynolds and Smith (2006) are associated with poor self-regulation of energy intake. Ogden et al. (2006) define Overt Control as controlling feeding strategies that can be detected by the child. In contrast, Covert Control cannot be detected by the child. It is possible that the foods that a parent restricts in an overt manner would become more highly prized by the child and may therefore encourage overconsumption if the opportunity presented. The opposite would be true for foods that were restricted covertly.

This study incorporates two main aims. One aim is to investigate the association between restrictive feeding and *ad libitum* intake of energy-dense /nutrient-poor snack foods by toddlers, replicating the study protocol and method used by Fisher and Birch (1999a) in preschool children.

The second aim of the study is to explore the validity of the parent-reported Toddler Feeding Questionnaire, supplementing the validation studies in Chapters 4 and 5. The study will investigate whether parental feeding practices, measured by the TFQ, are associated with toddlers' *ad libitum* intake of energy-dense/nutrient-poor snack foods. The effect of Covert Control and Overt Control will also be explored. The following hypotheses will be tested:

- Restriction will be associated with a higher intake of energy-dense snack foods.
- Child's Attraction to sweets and snacks will be associated with a higher intake of energy-dense snack foods.
- Allow Access will moderate the relationship between restriction and intake of energy-dense foods. Specifically, restriction will be a stronger predictor of energy-intake when Allow Access is high.
- Overt Control will be associated with a higher intake of energy-dense snacks.

6.2 Method

6.2.1 Participants

Participants were sought from the general community in metropolitan Adelaide via advertisements in local parenting magazines. Parents or primary caregivers with children between the ages of 22 and 30 months, who met the following inclusion criteria were eligible to participate. Criteria were (a) the caregiver must be at least 18 years of age and the person who is mainly responsible for feeding their child, and (b) be able to read and write in English. Parents were excluded if their child had; (a) a congenital or metabolic abnormality that affected their growth and eating, (b) a serious food allergy or food sensitivity, and (c) a birth weight less than 2500g. It should be noted that the child age range criterion is slightly older than was investigated in the first two studies (i.e., 18 to 24 months) because there were concerns about the ability of an 18 month old child to cope with the demands of the study. No incentives were offered for participation and several advertisements were needed over a 6 month period to recruit 68 parents. Due to difficulty in recruiting participants for the study, the child's age criterion upper limit was extended to 36 months of age.

A total of 66 parents and their toddlers took part in the study. Two sessions were abandoned due to difficulties with the child's behaviour. The testing session was completed by 64 parents (63 mothers and 1 father) and their toddlers (29 boys, 35 girls). Parents were aged between 24 and 48 years, with a median age of 35 years. The level of educational attainment of the sample was high, with more than half the sample having completed university (57.8%), a further 26.6% had attained a TAFE qualification, and only 15.6% had completed high school or less. Based on BMI cut-offs for overweight and obesity, 35 parents (55.6%) were normal weight, 18 parents (28.6%) were overweight, and 10 were obese (15.9%). One parent was not measured. Toddlers were aged between 22 months and 36 months of age ($M = 27$ months). According to the International Obesity Task Force (IOTF) age- and sex-specific BMI cut-offs for overweight and obesity (excluding children aged under

2 years), 11 children (19%) were overweight and 1 child was obese (1.7%) (Cole, Bellizzi, Flegal, & Dietz, 2000). This is comparable with prevalence data for overweight and obesity for 4 year old children in South Australia, of which 21.4% are overweight or obese according to the IOTF criteria (Vaska & Volkmer, 2004). One child in the study was unable to be weighed due to behaviour difficulties.

6.2.2 Measures⁷

6.2.2.1 Toddler Feeding Questionnaire (TFQ)

Several aspects of parent-feeding behaviours and attitudes were measured with the TFQ, the development of which has been outlined in previous chapters. The TFQ comprises 5 subscales: Allow Access (12 items), Rules (10 items), Flexibility (6 items), Self-efficacy (9 items) and Child's Attraction (5 items). These subscales reflect aspects of parental control that parents of toddlers identified as being important in managing sweets and snack foods. Allow Access measures the extent to which sweets and snacks are available in the toddler's diet (i.e., the extent to which they are allowed and offered by the parent and accessible to the child). Rules measures how often parents enforce rules about when, what and how often sweets and snacks are given to the child. Flexibility measures how often parents are flexible in determining what, when and how often sweets and snacks are given. Self-efficacy measures parent confidence in their ability to manage sweets and snack foods. Child's Attraction measures parental perception of the toddler's attraction to and desire for sweets and snacks. Participants indicated how often each item was true for them or their toddler on a 5-point Likert scale. Responses to Rules, Flexibility, Self-efficacy and Child's Attraction ranged from 'not at all true of me/my toddler' to 'always true of me/my toddler' with higher scores representing greater agreement with the factor. Responses to the items that comprise Allow Access were scored on four different response scales (see Appendix H)

⁷ The Questionnaires and other materials used in this study are presented in Appendix I.

6.2.2.2 *Restrictive Feeding*

The Restriction subscale from the CFQ (Birch et al., 2001) was used to measure parental restriction. Restriction comprises eight items that measure the degree to which parents may try to limit their child's intake of sweets, snacks and high fat foods, and use these foods to reward good behaviour. Items are scored on a 5-point Likert scale with responses ranging from 'disagree' to 'agree'. Following the findings of Chapter 2, which indicated that the two 'reward' items were conceptually distinct from Restriction, the 6-item Restriction measure (excluding the two reward items) and the Food as Reward measure proposed in Chapter 2 were also used.

6.2.2.3 *Covert and Overt Control.*

Covert and Overt control were measured with scales developed by Ogden, Reynolds & Smith (2006). Covert Control comprises 5 items and measures feeding practices that the child may not be able to detect. Overt Control comprises 5 items and measures feeding practices that the child may be able to detect. Items were scored on a 5-point Likert scale ranging from 'never' to 'always'. The authors reported that the measures had good internal consistency with Cronbach's alphas of .79 and .71. There is some evidence for the validity of the measures. The authors reported significant associations between Overt Control, Covert Control and parent reports of child snack food intake. These measures were also positively correlated with other measures of feeding control from the Child Feeding Questionnaire (Birch et al., 2001).

6.2.2.4 *Toddler's Frequency of Snack Food Consumption.*

Toddlers' usual intake of sweets and snack foods was measured with a Food Frequency Questionnaire (FFQ) that was adapted from the Anti-Cancer Council Dietary Questionnaire (Giles & Ireland, 1996). The development of the FFQ has been described in previous chapters. Parents were asked to indicate how frequently their child consumes snack foods in five snack food categories. There are 10 frequency responses that range from never to three-

or-more times per day. The responses were converted to daily equivalent frequencies. The daily equivalent frequencies for each snack category were summed together and the average score

was used to represent frequency of snack food consumption. Frequency of consumption was also recorded for each snack food used in the study so that any effect of toddlers' familiarity with the snack foods on their consumption could be accounted for in the analyses.

6.2.2.5 Concern about Toddlers' Weight.

Parental concern about toddlers' weight was assessed with four measures. The measures included two items from the Concern about Child Weight Scale from the Child Feeding Questionnaire (Birch et al., 2001); "How concerned are you that your child might become overweight?" and "How concerned are you about your child eating too much when you are not around him/her?" The phrasing of the first question is slightly different from the original CFQ as a result of pilot testing reported in Chapter 3. The pilot testing also indicated that the third item from the Concern about Child Weight Subscale (concern about dieting) was too difficult for parents of toddlers to answer in a meaningful way and therefore was not included in the study. The two remaining items were considered as separate measures in the analyses. An additional two measures of parental concern, that were pilot tested in Chapter 3, were used. The first measured parental perception of toddlers' vulnerability to becoming overweight. Parents were asked 'Do you believe your child is vulnerable to becoming overweight?' and the response options were: no, a little vulnerable, quite vulnerable, and very vulnerable. The second measured parents' current feelings about the child's weight: 'How would you describe your current feelings about your child's weight?' The response options were: totally unconcerned, only a little concerned, moderately concerned, and very concerned. Parents were also asked to indicate whether their concern was due to underweight or overweight, so parent concern about overweight could be isolated.

6.2.2.6 *Parent and Toddler BMI.*

The weight and height of the parent and toddler was measured. Parents were measured without shoes; height was recorded to the nearest centimetre using a stadiometer and weight was measured to one tenth of a kilogram using an electronic scale. BMI [weight (kg) / height (m²)] was calculated for the parent.

Toddlers' standing height was measured to the nearest centimetre using a fixed height chart, and weight was measured to one tenth of a kilogram using an electronic scale. The measurement procedures used in the study were based on advice sought from a paediatric nurse at the Women's and Children's Hospital in Adelaide. It was advised that a stadiometer should not be used with the toddlers in the sample as a child may be fearful of the equipment and particularly the pressure on the head. It was also advised that shoes should be left on. It was suggested that a seated-scale could be used however this equipment was not available to the researcher. A children's poster was placed above the electronic scales to encourage the child to stand on the scale. The help of the parent was enlisted to stand the child against a fixed height chart. Each measure was only taken once.

Weight-for-height was calculated using the U.S. Centre for Disease Control and Prevention's (CDC) growth charts (Kuczmarski, Ogden, & Grummer-Strawn, 2000). The weight-for-height charts are applicable to children under the age of 2 years as well as children over the age of 2 years. To determine weight status for toddlers 2 years of age or older, BMI-for-age was calculated using the CDC growth charts. Toddler weight status was defined as not overweight or overweight according to the IOTF age- and sex-specific BMI cut-offs for toddlers 2 years of age or older (Cole et al., 2000). For toddlers under the age of 2 years, overweight was defined as weight-for-height above the 95th percentile and not overweight was defined as weight-for-height below the 95th percentile.

6.2.2.7 Demographic Characteristics

Participants were also asked to record their age and highest level of education. Toddlers' date of birth and gender were also recorded.

6.2.3 Free Access Procedure

The Free Access Procedure described by Fisher and Birch (Fisher & Birch, 1999a) was adapted for toddlers. Toddlers were given *ad libitum* access to 6 snack foods and a wide variety of toys, supervised (for safety, and to minimise child anxiety) by the parent and the researcher. The child's food intake was recorded for a 15 minute period that started when the child entered the study room. A small web camera was installed to record the toddler's eating behaviour⁸. Toddlers were given standardised instructions before entering the study room; "Let's go inside, there are some toys to play with and food to eat if you like". To minimise parent-child interaction the parent and researcher sat at desk facing away from the child, and the parent completed a series of questionnaires. Parents were instructed to allow the child to explore the environment and to avoid verbal or non-verbal communication that would influence the child's behaviour. Parents were allowed to talk with their child if the child initiated the contact but they were reminded to keep their comments neutral. An example of the instructions to parents was "It's important that (child) chooses what s/he does when we go inside. Try not to say or do anything that might influence what s/he does. If s/he comes up to you it's fine to interact as you normally would but try to keep your comments neutral, for example, *mum's doing some writing but there lots for you to do too*". To ensure that toddlers would feel relaxed and happy during the study, a simple picture story was sent to the parent one week prior so that they could familiarise the toddler with the study procedure. The picture story included pictures of the researcher, the building, and the study room (see Appendix I). Parent and toddler weight and height were measured prior to commencing the Free Access Procedure.

⁸ Please see the attached DVD for a recording of one of the sessions.

6.2.3.1 *Snack Foods*

A selection of energy-dense sweets and snack foods (3 varieties) and less energy-dense snack foods (3 varieties) were placed in separate bowls evenly spaced along the centre of a low rectangular table. The energy dense foods were small plain salty biscuits (Mini-Ritz), teddy bear shaped plain sweet biscuits (Tiny Teddies), and mini cinnamon doughnuts. These foods were chosen because they are high in energy density (kilojoules per grams), contain a high amount of fat (particularly saturated fat), salt or sugar, and are low in fibre. The foods are also safe for young children to chew and swallow and readily available. The less energy dense options were watermelon, banana and wholemeal bread spread with margarine and vegemite. The fruit was cut into small pieces that were uniform in size. The crust was removed on the bread and each slice was cut into 6 pieces. The six foods and nutritional composition are listed in Table 6.1.

6.2.3.2 *Energy Intake from Snack Foods*

Toddlers energy intake from snack foods consumed in the Free Access Procedure was determined by converting the weight of food consumed by the child into KJ, based on the manufacturer's nutritional information for the packed products, and a food database (Foodworks[®]) for the fresh products. Energy intake from the energy-dense snacks was summed together and energy intake from the low-energy snacks was summed together.

Table 6.1*Nutritional Information for the Snack Foods Used in the Free Access Procedure*

per 100g	Doughnut					
	Mini ritz	Tiny Teddy	Holes ¹	Watermelon	Banana	Bread
Energy (kJ)	2062	1960	1520	96	371	1098
Total Fat (g)	22.8	15.1	15.4	0	0.3	5
Saturated Fat (g)	10.8	8.9	7.5	0	0	0.9
Sodium (mg)	468	380	573	2	1	615
Dietary Fibre (g)	0	2.1	0	0.5	2.6	6.5
Sugar (g)	8.7	28.2	18.8	5	12.2	1.51

¹Doughnut holes are bite-sized doughnuts about the size of the hole in a regular sized doughnut

6.2.3.3 Breakfast

To minimise the influence of toddler's hunger on energy intake, all sessions were scheduled in the morning (9:30am or 10:30am) after consumption of a standard breakfast at home. In the Fisher and Birch study (1999a), a standard lunch was provided and supervised by the researcher immediately prior to the free-access procedure. This procedure would have likely resulted in significant disruptions to eating in the case of toddlers. It was considered appropriate that parents offered breakfast at home to minimise disruption to the toddler's usual routine. Because it was not possible to determine if the child was full before commencing the free-access procedure (i.e., the toddler would be unable to reliably communicate this information), all toddlers were allowed to take part. Breakfast energy consumption was calculated so that its influence on intake could be examined and included as a covariate if required. Parents were also given guidelines for their child's breakfast and a recording sheet to record breakfast food intake. Three standard options of approximately equal energy value were offered to parents. A dietitian at CSIRO Human Nutrition assisted with the development of three breakfast menus that were equivalent in energy and

macronutrient composition. The standard options, shown in Table 6.2, included sufficient food for the toddler to eat before taking part in the study to minimise the chance that the toddler would be hungry on arrival. Parents were asked to weigh (in grams for solids, in ml for liquids) the food served to the child, and estimate actual consumption (as a percentage).

6.2.3.4 Energy Intake at Breakfast

An approximate value for energy consumed at breakfast was determined from the toddler's breakfast recording sheet completed by the parent (see Appendix I). The parent recorded the foods (g) and drinks (mL) the child was offered and estimated (%) how much the child consumed. An estimated measure of intake was chosen over weighed intake because of the anticipated difficulty that parents may encounter in accounting for any food lost due to spillage and to reduce participant burden. Parents were asked to adhere to the breakfast options as closely as possible. If the toddler normally drank milk in the morning as part of his or her usual diet, the parent was given the option to substitute the cheese (in Option 2) or the yoghurt (in Option 3) for 120mL of milk, which is approximately the equivalent in energy.

Table 6.2*Breakfast Options for Parents to Offer Toddler*

	Option 1	Option 2 ¹	Option 3 ¹
Foods	Sanitarium Weet-Bix (regular) 2 biscuit Milk, Whole 200mL Fruit Salad, Canned in Natural Juice, Drained 150g	Bread, wholemeal 60g Cheese, Cheddar (Mild, Tasty, Vintage) 20g Fruit Salad, Canned in Natural Juice 150g	Bread, wholemeal 40g Margarine Spread, polyunsaturated 5g Vegemite 3g Yoghurt, regular fat, fruit 100g Fruit Salad, Canned in Natural Juice 150g
Energy	1278.82kJ	1199.90kJ	1220.94kJ
Protein	11.57g	11.74g	10.37g
Total Fat	8.82g	8.65g	7.62g
Carbohydrate	42.68g	37.46g	42.54g

¹ Parent may substitute cheese (in Option 2) or yoghurt (in Option 3) if milk is given to child to drink

6.2.4 Statistical Analyses

To put the toddlers' consumption of snack foods in the 15 minute study session in context, the Nutrient Reference Values for Australia and New Zealand (National Health and Medical Research Council, 2006) were used to calculate the estimated energy requirements (EER) for children in this sample. The EER values are based on 1) the basal metabolic rate (BMR) for children determined by their height, weight and age, and 2) level of physical activity. To determine the BMR, the reference body weight and height that corresponded most closely to the average weight and heights of the current sample was used. For boys, the reference weight/height and sample weight/height were 14.3kg/0.95m and 14.5kg/0.91m. Respectively for girls, the reference weight/height and sample weight/height were 13.9kg/0.94m and 13.7kg/0.89m. A physical activity level that was mid-way between light and moderate activity was used so as not to over-estimate the energy requirements.

Initial analyses were conducted to determine whether feeding practices differed by parent weight status, toddler weight status or child gender. A one-way between groups multivariate analysis of variance was conducted for each of the following independent variables. Parent weight status was defined by a 3 group split: not overweight (BMI < 25, $n = 35$), overweight (BMI 25 – 30, $n = 18$), and obese (BMI >30, $n = 10$). Toddler weight status was defined as not overweight or overweight according to the IOTF age- and sex-specific BMI cut-offs for toddlers 2 years of age or older (Cole et al., 2000). For children under the age of 2 years, overweight was defined as weight-for-height above the 95th percentile and not overweight was defined as weight-for-height below the 95th percentile. There were no statistically significant differences on the combined dependent variables between non-overweight, overweight, and obese parents: $F(2, 60) = 1.20, p = .358$; Wilks Lambda = .73. An inspection of the mean scores also suggested that scores on each of the feeding practices were comparable in non-overweight, overweight and obese parents. There were no statistically significant differences on the combined dependent variables between overweight and non-overweight toddlers: $F(1, 61) = 0.80, p = .333$; Wilks Lambda = .89. No statistically significant differences were found on the combined dependent variables between boys and girls: $F(1, 62) = 0.90, p = .527$; Wilks Lambda = .89. Descriptive statistics are presented for the full sample and all analyses are conducted for the full sample.

Correlational analyses were used to investigate the association of the TFQ factors, CFQ Restriction, Overt Control and Covert Control on toddlers' *ad libitum* intake of energy-dense snacks. The six-item measure of Restriction and Food as Reward factor, identified in Chapter 2, were also examined.

A moderated hierarchical multiple regression analysis was used to test the interaction of 1) Restriction and Allow Access, and 2) Restriction and Frequency of Snack Food Intake, to predict intake of energy-dense foods. Assumption testing indicated that the dependent variable, energy intake, was significantly positively skewed but this could not be improved

with statistical transformation. There was no evidence of multicollinearity. Normality of the predictor variables was imperfect but no univariate or multivariate outliers were found. The assumptions of linearity and homoscedascity were imperfect but acceptable. The following procedures were used in all moderated regression analyses. The predictor variables (e.g., Allow Access and Restriction) were entered in the first step and the interaction term in the second step. Following the recommendations of Aiken and West (Aiken & West, 1991), all variables were centred to reduce multicollinearity between the predictor variables, by taking the mean score for the predictor from each raw score. The interaction term was computed by multiplying the two centred predictors.

Multivariate Analysis of Variance was conducted to investigate the influence of parental concern about toddler's weight on their feeding practices. Inspection of the distribution of responses to measures of weight concern indicated that a restricted range of responses were used, ruling out the use of correlation analyses. For each measure a dichotomous variable was created separating parents who indicated no concern from parents who indicated some level of concern. This resulted in reasonably even groups for comparison purposes for three of the four measures. Only 6 parents were currently concerned about their toddler being overweight so further analyses using this measure were not conducted. T-tests also indicated that there was no significant difference on toddlers' weight-for-height score for concerned and unconcerned groups on any measure.

6.3 Results

6.3.1 *Descriptive Statistics and Scale Reliability*

The descriptive statistics and Cronbach's alphas for the parent-feeding variables are shown in Table 6.3. Mean scores on Self-efficacy, Restriction, and six-item Restriction were high and negatively skewed. Scores on Flexibility, Rules, Overt Control and Covert Control were also slightly negatively skewed. The internal consistency for the TFQ subscales was good, with the exception of Self-efficacy which had a marginally acceptable Cronbach's alpha of .67. The six-item Restriction scale was also only marginally acceptable at .64. The internal consistency of Restriction, Food as Reward, Overt Control and Covert Control was acceptable at .73 and .80. The reliability of Frequency of Snack Intake was .63.

6.3.2 *Relationships between Measures of Feeding Practices*

The correlations between the measures of feeding practices are shown in Table 6.4. Restriction was positively correlated with Allow Access, Attraction, and Overt Control, and negatively correlated with Self-Efficacy. Allow Access was negatively correlated with Covert Control, Rules, and Flexibility and was weakly to moderately positively correlated with all other measures. Overt Control was positively correlated with most of the feeding practices and negatively correlated with Flexibility. The correlation between Overt Control and Food as Reward was very high. Covert Control and Rules were also highly correlated, and both were negatively correlated with Flexibility. Self-efficacy was negatively correlated with Overt Control, Restriction, Food as Reward, and Allow Access.

Table 6.3

Means and Standard Deviations, Minimum and Maximum Scores for Parental Feeding Practices

Feeding Practices	Min	Max	M	SD	α
TFQ allow access	1.58	3.83	2.66	0.56	.83
TFQ child's attraction	1.60	5.00	3.18	0.80	.86
TFQ flexibility	1.83	5.00	3.68	0.75	.90
TFQ rules	1.00	4.10	2.78	0.62	.84
TFQ self-efficacy	2.67	5.00	4.14	0.46	.67
CFQ restriction	2.13	5.00	3.50	0.69	.73
CFQ restriction (6-item)	2.50	5.00	3.95	0.67	.64
CFQ food as reward	1.00	5.00	2.14	1.20	.75
Overt control	1.40	4.40	3.04	0.70	.73
Covert control	1.00	4.60	3.08	0.87	.80
Frequency of snack intake	1.60	7.20	3.76	1.32	.63

Table 6.4

Correlations Between Measures of Feeding Practices

	1	2	3	4	5	6	7	8	9	10
1. Allow access	1									
2. Child's attraction	.48**	1								
3. Rules	-.41**	-.14	1							
4. Flexibility	.26*	.13	-.70**	1						
5. Self-efficacy	-.34**	-.26*	.10	-.24	1					
6. Restriction	.46**	.43**	.15	-.10	-.34**	1				
7. Restriction (6-item)	.38**	.34**	.21	-.11	.19	.92**	1			
8. Food as reward	.42**	.41**	-.01	-.05	.46**	.76**	.44**	1		
9. Overt control	.25*	.32**	.26*	-.32**	-.30*	.56**	.60**	.27*	1	
10. Covert control	-.25*	-.08	.42**	-.26*	.11	.07	.08	.27*	.27*	1

Note. Allow Access, Child's Attraction, Rules, Flexibility and Self-efficacy are factors from the Toddler Feeding Questionnaire. Restriction is from the Child Feeding Questionnaire (Birch et al., 2001). Restriction (6-item) and Food as Reward are modified subscales from the Child Feeding Questionnaire Restriction subscale, developed from confirmatory analysis in Chapter 2. Overt and Covert Control are measures of feeding control developed by Ogden, Reynolds and Smith (2006).

** $p < 0.01$. * $p < 0.05$.

6.3.3 Children's Food Intake (KJ) in the 15 Minute Session.

During the session, 43 out of 64 children ate at least some food. The least healthy options (doughnuts, mini ritz and tiny teddies) and the watermelon were the most popular, with almost half of the eaters trying these foods. Of the children who ate something, 23 ate 1 or 2 different types of snacks in the session, 15 children ate 3 or 4 types of snacks, and 5 children ate 5 or 6 types of snacks. The children also tended to eat more, on average, of the energy dense snacks. For the whole sample (including the eaters and non-eaters), consumption of energy-dense snacks ranged from 0 to 1200KJ ($M=199$, $SD = 299$), and consumption of low-energy-dense snacks ranged from 0 to 604KJ ($M = 36$, $SD = 88$). Excluding the non-eaters, average intake from high-energy-snacks was 296 KJ ($SD = 324$) and low-energy snacks was 53 KJ ($SD = 103$). The energy intake from each snack food consumed is shown in Table 6.5. In terms of estimated energy requirements (EER) for children in this age group, the average was 11% for boys and 10% for girls. When combined intake from high and low energy foods was considered, the snack foods contributed 13% and 12% to EERs, in boys and girls respectively. The highest value was 20% of daily EER, recorded for one girl in the study.

Independent-samples t-tests were conducted to determine if energy intake from high-energy foods differed by child gender, child weight status and parent weight status. There were no significant differences in energy intake between boys ($M = 219.73$, $SD = 316.50$) and girls ($M = 181.81$, $SD = 287.93$; $t(62) = .50$, $p > .05$); between overweight ($M = 153.28$, $SD = 283.60$) and non-overweight children ($M = 210.43$, $SD = 308.19$; $t(61) = .95$, $p > .05$); and between children with overweight parents ($M = 170.16$, $SD = 265.96$) and non-overweight parents ($M = 227.74$, $SD = 327.41$; $t(62) = .27$, $p > .05$).

Table 6.5*Average Energy Intake (KJ) from Each Snack Food Consumed by Toddlers*

Snack Food	n	M	SD	Min	Max
Doughnuts	23	313.25	349.17	15.20	1033.60
Mini Ritz	30	94.16	104.54	20.62	494.88
Tiny Teddies	24	112.73	102.54	17.80	445.00
Watermelon	23	23.54	21.97	2.88	81.60
Banana	12	49.47	52.86	7.42	178.08
Bread with vegemite	7	163.13	196.77	54.90	603.9

Note. The KJs shown in the table are approximately equivalent to 1 doughnut (11.02g), 3 mini ritz (3.19g), 2 tiny teddies (3.53g), 2 small cubes of watermelon (13.12g), one tenth of a slice of bread (2.42g), and 2 thin slices of banana (3.72g).

Average energy intake at breakfast was 909KJ ($SD = 313$ KJ). There was no significant relationship between energy intake at breakfast and intake of high-energy snacks ($r = -.05, p > .05$) or low-energy snacks ($r = .16, p > .05$). There was no significant difference in snack food intake between children who took part in the 9:30am ($M = 243, SD = 334; n = 25$) session compared with the 10:30am session ($M = 171, SD = 276; n = 39; t(62) = 0.94, p > .05$).

Parent-reported frequency of consumption for the energy-dense snack foods was very low. The doughnuts, tiny teddies and mini ritz were each consumed 1 – 3 times per month or less respectively by over 90% of toddlers. The low energy-dense foods were consumed more frequently. Frequency of consumption was negatively associated with intake during the study session for the bread ($r = -.35, p < .05$), but there were no significant associations for any of the other foods.

6.3.4 Relationship between Feeding Practices and Energy Intake from High-Energy Snacks

Pearson's correlations (one-tailed) were calculated for the full sample and for a subset of the sample that excluded the children who did not eat any foods (see Table 6.6). Consistent with hypotheses, Child's Attraction and Restriction were significantly positively correlated with energy intake. The 6-item Restriction measure just failed to reach significance (i.e., $p = .056$ in the Full Sample and $p = .099$ in the Eaters). Contrary to expectations, Overt Control was not significantly correlated with energy intake. Although no specific hypotheses were made about the relationship between Allow Access and energy intake, it was significantly positively correlated with intake when non-eaters were excluded but not in the full sample. Food as Reward was also significantly correlated with energy intake. Covert Control just failed to reach significance in the Eaters ($p = .061$). This indicates that high levels of restriction, attraction, and access to foods were associated with toddlers eating more energy-dense snacks.

Table 6.6

Correlations Between Feeding Practices and Energy Intake from Energy-Dense Snack Foods

<i>Feeding Practices</i>	<i>Full Sample</i> <i>(n = 64)</i>	<i>Eaters</i> <i>(n = 43)</i>
TFQ allow access	.184	.26*
TFQ child's attraction	.33**	.27*
TFQ flexibility	.08	-.03
TFQ rules	.10	.14
CFQ restriction	.25*	.27*
CFQ restriction (6-item)	.20	.20
CFQ food as reward	.23*	.30*
Overt control	.08	.08
Covert control	.15	.24

* $p < .05$, ** $p < .01$.

6.3.5 *Interaction of Restriction and Allow Access*

The results of the moderated regression analysis indicated that the interaction of Allow Access and Restriction was a significant predictor of energy intake, as indicated by a significant increase in R-squared change in step 2 of the model (see Table 6.7). There were no significant main effects for Allow Access or Restriction, as indicated by the non-significant betas in step 1. To understand the nature of the interaction, the regression of intake on restriction was plotted for low, moderate (M), and high levels of Allow Access; defined as 1 SD below the mean, mean, and 1 SD above the mean (see Figure 1). To determine whether the slopes were significantly different from 0, t-tests for simple slopes were calculated. The slope depicting the relationship between Restriction and intake was significant only for high levels of availability. This suggests parental restriction is a significant predictor of toddlers' intake of energy dense foods in settings where snacks are easily or frequently available. Restriction is not a significant predictor of intake when availability is low, or moderate.

Because Attraction was a significant predictor of energy-intake, a second moderated regression was conducted to control for Attraction. Attraction was entered in Step 1, Allow Access and Restriction were entered in Step 2, and the product term (i.e., Allow Access x Restriction) was entered in Step 3). The interaction remained significant, and was the only significant independent predictor of energy intake (see Table 6.8). The overall model was also significant and explained 12 percent (adjusted R^2) of the variance in energy intake.

Table 6.7

Moderated Multiple Regression Analysis to Predict Energy Intake from the Interaction of Restriction and Allow Access

Predictor variable	B (SE)	β	ΔR^2
Step 1			.07
Allow access	48.07 (74.35)	.09	
Restriction	88.69 (60.43)	.20	
Step 2			.07*
Allow access	58.22 (71.99)	.11	
Restriction	85.12 (58.42)	.20	
Allow access x restriction	220.76 (95.81)	.28*	
Overall R	.38		
Overall R ²	.14		
Adjusted R ²	.10		
Overall F (1, 60)	3.33*		

*p < .05

Table 6.8

Moderated Multiple Regression Analysis to Predict Energy Intake from the Interaction of Restriction and Allow Access, Controlling for Attraction

Predictor variable	B (SE)	β	ΔR^2
Step 1			.11**
Attraction		.33**	
Step 2			.02
Attraction	101.66 (53.51)	.27	
Allow access	-4.05 (77.80)	-.01	
Restriction	57.37 (61.43)	.13	
Step 3			.06*
Attraction	85.39 (52.70)	.23	
Allow access	13.38 (76.23)	.03	
Restriction	59.19 (59.82)	.14	
Allow access x Restriction	197.62 (95.61)	.25*	
Overall R	.42		
Overall R ²	.18		
Adjusted R ²	.12		
Overall F (4, 59)	3.22*		

** $p < .01$. * $p < .05$

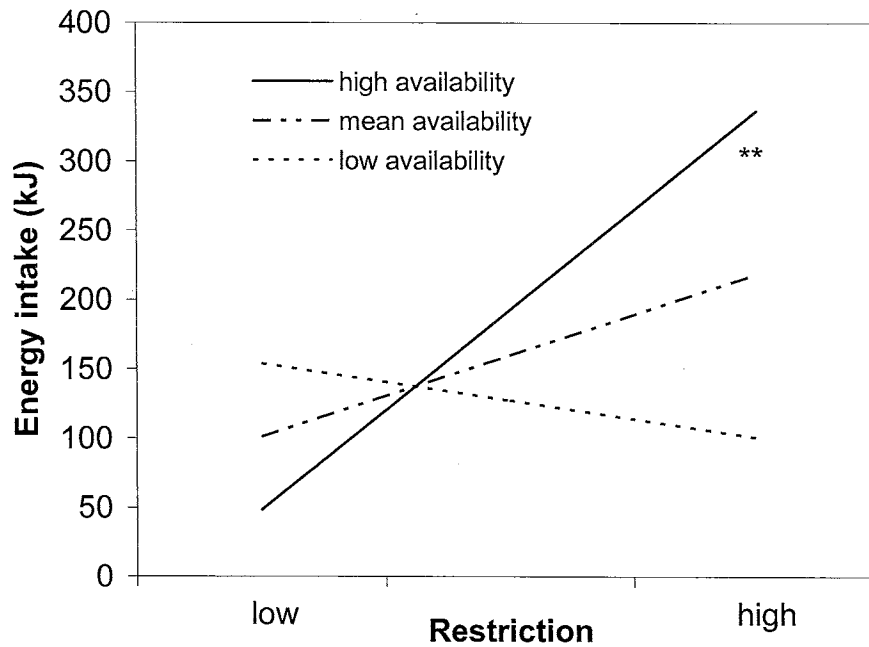


Figure 1. Regression slopes depicting the relationship between restriction and energy intake for different levels of Allow Access: high availability (1 SD above the mean); mean; and low availability (1 SD below the mean).

** Regression slope is significantly different from 0.

A further two moderated regression analyses were conducted substituting the six item measure of Restriction and Food as Reward in place of Restriction. Both analyses were conducted controlling for Attraction in step 1. The results are shown in Table 6.9 and Table 6.10 respectively. The first of these analyses indicated that the interaction between Restriction and Allow Access was not significant when the six item measure of Restriction was used. The overall model was significant due to the variance in energy intake accounted for by Attraction. The second analysis indicated that there was a significant interaction between Food as Reward and Allow Access. There were no significant main effects of Food as Reward or Allow Access. The interaction explained an additional 8% of the variance in energy intake, with the overall model explaining 14% (Adjusted R^2) of variance in energy intake.

Table 6.9

Interaction between Restriction (6-item) and Allow Access in Predicting Intake of Energy-Dense Snacks, Controlling for Attraction

Predictor variable	B (SE)	B	ΔR^2
Step 1			.11**
Attraction	121.48 (44.84)	.33**	
Step 2			.01
Attraction	107.29 (52.73)	.28	
Allow access	4.42 (76.53)	.001	
Restriction – 6 item	44.48 (59.71)	.10	
Step 3			.03
Attraction	93.28 (52.93)	.25	
Allow access	9.71 (75.75)	.02	
Restriction – 6-item	65.15 (60.56)	.15	
Allow access x restriction	151.12 (98.32)	.19	
Overall R	.39		
Overall R ²	.15		
Adjusted R ²	.09		
Overall F (4, 59)	2.59*		

** $p < .01$. * $p < .05$

Table 6.10

Interaction between Food as Reward and Allow Access in Predicting Intake of Energy-Dense Snacks, Controlling for Attraction

Predictor variable	B (SE)	β	ΔR^2
Step 1			.11*
Attraction	121.49 (44.84)	.33	
Step 2			.01
Attraction	103.76 (53.55)	.28	
Allow access	1.90 (76.97)	.004	
Food as reward	27.61 (34.57)		
Step 3			.08*
Attraction	92.75 (51.88)	.25	
Allow access	25.05 (74.91)	.05	
Food as reward	17.67 (33.62)	.07	
Allow access x food as reward	131.66 (56.35)	.28*	
Overall R	.44		
Overall R ²	.19		
Adjusted R ²	.14		
Overall F (4, 59)	3.49*		

** $p < .01$. * $p < .05$

6.3.6 Supplementary Analyses

Based on the finding of a significant interaction between Restriction and Allow Access, another moderated regression analysis was conducted to explore the interaction of Restriction and Frequency of Snack Food Consumption in predicting energy intake. Frequency of Snack Food intake is likely to be a function of how much access the child is allowed and therefore may moderate the relationship between Restriction and energy intake in a similar way. The results of this analysis did not support an interaction of Frequency of Snack Consumption and Restriction (Table 6.11). The results were unchanged when the 6-item measure of Restriction and Food as Reward was used in place of Restriction.

The findings of the moderated regression analysis identified Restriction and Allow Access as being potentially problematic in combination. To determine whether this combination of feeding practices was associated with parent overweight (i.e., a known risk factor for child overweight), a chi-square test of independence was used to compare the proportion of overweight to normal weight parents who had high scores on both Restriction and Allow Access, compared with parents who did not have high scores on these measures. High Restriction and Allow Access were defined as scores within the highest tertile of the distribution. The findings indicated that the parents with high Restriction/high Allow Access were no more likely to be overweight than parents who did not have this combination of feeding practices (21.4% vs 20.0% respectively; $\chi^2 (1, n= 63) = .00, p > .05$).

Table 6.11

Interaction between Frequency of Snack Consumption and Restriction in Predicting Intake of Energy-Dense Snacks, Controlling for Attraction

Predictor variable	B (SE)	β	ΔR^2
Step 1			.11*
Attraction	121.49 (45.20)	.33**	
Step 2			.02
Attraction	107.46 (53.00)	.29*	
Consumption frequency	-12.08 (29.11)	-.05	
Restriction	54.12 (58.87)	.13	
Step 3			.001
Attraction	108.31 (53.55)	.29*	
FFQ	-11.65 (29.40)	-.05	
Restriction	55.37 (59.58)	.13	
Consumption frequency x restriction	10.38 (43.60)	.03	
Overall R	.35		
Overall R ²	.12		
Adjusted R ²	.06		
Overall F (4, 58)	2.03		

** $p < .01$. * $p < .05$

6.3.7 Influence of Weight Concerns on Feeding Practices

Three MANOVAs were conducted to investigate whether feeding practices differed significantly between parents who expressed some concern about toddlers' weight and parents who were unconcerned. The dependent variables used were the TFQ factors, CFQ Restriction and Overt and Covert Control. The first analysis compared parents who indicated that the child was vulnerable to becoming overweight weight ($n = 34$) and parents who did not indicate any vulnerability ($n = 30$). There was no statistically significant difference on the combined dependent variable; $F(8, 55) = 1.40$, $p > .05$; partial eta squared = .17; Wilks' Lambda = .83. The second analysis compared parents who indicated that they were concerned that the child might become overweight ($n = 40$) and parents who did not indicate

concern ($n = 24$). There was no statistically significant difference on the combined dependent variable; $F(8, 55) = 1.56, p > .05$; partial eta squared = .19; Wilks' Lambda = .82. The third analysis compared parents who indicated that they were concerned about the child eating too much when they were not around ($n = 40$) and parents who did not indicate concern ($n = 24$). There was a statistically significant difference on the combined dependent variable; $F(8, 55) = 2.27, p < .05$, partial eta squared = .25; Wilks' Lambda = .75. The tests of between-subjects effects indicated that the difference reached significance for two factors: TFQ Child's Attraction, $F(1, 62) = 9.33, p < .05$, partial eta squared = .13; and, Overt Control, $F(1, 62) = 9.73, p < .05$, partial eta squared = .14. An inspection of the mean scores indicated that Child's Attraction was higher in parents who expressed some concern ($M = 3.58, SD = .87$) compared with parents who were unconcerned ($M = 2.98, SD = .69$). Overt Control was also higher in concerned parents ($M = 3.39, SD = .76$) compared with unconcerned parents ($M = 2.86, SD = .59$).

6.4 Discussion

The hypothesised relationship between restriction and intake of energy-dense foods was supported in the study and is consistent with research conducted in pre-school children (Birch & Fisher, 2000; Fisher & Birch, 1999a). In initial bivariate correlations, Restriction explained a small but significant amount of variance (6.3%) in toddlers' *ad libitum* intake of snack foods. When Restriction was considered in combination with Allow Access, only the interaction of these factors were significant predictors of children's energy intake from energy-dense snack foods, suggesting that the effect of Restriction on energy intake may depend on the context in which the Restriction occurs. Restriction was positively associated with energy intake from snack foods only when scores on Allow Access were high. The sample used in the current study was comparable in terms of level of education with samples used in previous research. The findings suggest that the influence of restrictive feeding practices on children's self-regulation of energy intake may be similar in an Australian and U.S. context, at least in well-educated parents.

The hypothesised relationship between Child's Attraction and energy intake was also supported, and provides support for the predictive validity of this measure. A positive relationship between Allow Access and intake of energy-dense foods was also found amongst eaters (i.e., toddlers who ate something in the Free Access Procedure), however, this relationship was no longer significant in the multivariate analyses that included Restriction. No other Toddler Feeding Questionnaire factor was associated with energy intake. Similarly, Overt and Covert control did not predict toddlers' energy intake.

This study extends previous research by investigating the relationship between restriction and free-access snack food intake in a younger sample than previously examined, and also by exploring the potential moderating influence of Allow Access. An explanation for this finding might rest in an examination of how feeding practices are likely to differ when Allow Access is low compared to when Allow Access is high. The exploratory research conducted at the outset of this research provided some insight into the relationship between

the availability of snack foods in the home and the use of parental restriction. Parents indicated that there was no need for restriction when sweets and snack food were not available. Despite this, parents' responses on the Restriction scale indicated a high level of restriction. It is likely that high availability (as measured by Allow Access) would be associated with more parent-toddler interactions around sweets and snacks. These may include dealing with requests for foods, monitoring intake and making decisions about what and how much of the food is appropriate. Costanzo and Woody (Costanzo & Woody, 1985) argue that parental control of this nature, particularly if the child is aware of it, encourages the child to focus on external cues for eating as opposed to internal cues of hunger and satiety. If availability of foods is low the parent can minimise these interactions. The positive correlation between Restriction and Allow Access strongly suggests that environments in which snack foods are readily available elicit parental restriction, at least in parents who are concerned about the healthiness of the child's diet.

The study also examined the influence of Food as Reward and the 6-item measure of Restriction. The zero-order correlations indicated that only Food as Reward, but not the 6-item measure of Restriction, was associated with toddlers' consumption of energy-dense snack foods. The interaction effect of Restriction and Allow Access was significant only when Food as Reward was used in the analysis. Although the direction of causality is unknown, experimental evidence (Fisher & Birch, 1999) suggests that it is possible that the use of rewards has a causal influence on children's eating behaviour. It is also possible that parents are more likely to use snack foods as a reward with children who like these foods, given that it is likely to be reinforcing to that child. The moderate sized correlation ($r = .41$) between Food as Reward and Child's Attraction supports this contention.

Interestingly, frequency of snack food consumption did not have the same moderating influences as Allow Access. Frequency of consumption is different from Allow Access in a number of ways. Firstly, it is likely to reflect the foods that the child is given by a number of caregivers. Secondly, it does not measure the parents' beliefs about what foods are acceptable

and the context in which the foods are given to the child. The food frequency measure was developed for the purpose of this research in light of the lack of parent-report measures available to assess dietary intake in toddlers. The study would have been strengthened by a validated measure of snack food intake such as 24 hour recall or weighed records. These were not feasible to implement in the current study.

There was no evidence that the parent's weight or the toddler's weight had an influence on parents' use of feeding practices. A positive relationship between maternal restriction and children's adiposity was found in two separate studies conducted by Fisher and Birch (Fisher & Birch, 1999; Fisher & Birch, 1999). Both studies included pre-school aged boys and girls. It is not surprising that no significant relationship was found between toddlers' weight and parental feeding practices in the current study given the younger age of the children compared with the Birch studies. The lack of a significant relationship is unlikely to be due to actual weight characteristics of the sample because there was a large number of overweight children and overweight parents. From a theoretical point of view, it is an advantage to be able to investigate the effects of feeding practices that are *not* motivated by concerns about the child's weight. No influence of parental concern about the child's weight was detected on any of the measures of feeding practices. However, there was evidence that parents who were concerned about their child overeating when they were not around used more overt control and indicated that their child was more attracted to these foods. This suggests that child's eating behaviour, early in life, can influence parent feeding practices, highlighting this area as a possible point of intervention or focus for early childhood health professionals.

The association between parental Restriction and energy intake at an early stage of development is alarming. To contextualise the toddlers' consumption of snack foods in the current study, the Nutrient Reference Values for Australia and New Zealand (National Health and Medical Research Council, 2006) were used to calculate the estimated energy requirements (EER) for children in this sample. Using these parameters, intake from energy-dense foods contributed approximately 10% percent of daily EERs for boys and girl, which is

a significant amount considering the children had only 15 minutes of access to the study foods. Given the popularity of the energy-dense snacks compared to the low energy-dense snacks, it is not difficult to imagine how parents might begin to use restrictive feeding practices with their children.

The findings of this study have implications for parent feeding practices. The findings suggest that parents should avoid restrictive feeding practices and the use of foods to reward behaviour. A more desirable approach would be to control the child's environment and the types of foods that are available in that environment. This type of advice is not new. It supports the philosophy of the division of responsibility in feeding that suggests that the parent is responsible for the food that is provided (and by default, the foods that are *not* provided) and the child is responsible for deciding what and how much to eat (Satter, 1986). How to best manage this as the child gets older is a question for further research. It may be relatively easy to control the child's environment as a toddler but parental control diminishes as the child ages and moves into new environments. Older children are more likely to be aware of parents' control strategies and appropriate parenting would need to be tailored to child's stage of development.

This study also contributes to research from a methodological standpoint, providing pilot testing of the Free Access Protocol in toddlers. The adapted version of the Free Access Protocol was successful in the sense that most toddlers were able to complete all aspects of the study protocol. Only two children were unable to cope with the demands of the study and the sessions had to be abandoned. This is encouraging and indicates that there is opportunity for other researchers to extend research on parental control and self-regulation by using younger children. However, in order to facilitate younger children's participation in this type of study, the procedure was adapted from the original protocol and the impact of these changes requires some evaluation.

The Free Access Procedure described by Fisher and Birch (Fisher & Birch, 1999a) is designed to measure children's propensity to eat in the absence of hunger and it is therefore critical to minimise the influence of hunger. In older children there is much more scope to control this (i.e., providing *ad libitum* lunch in a laboratory setting; asking the child whether they are full) whereas this presents a difficulty in a toddler sample. The protocol used in the current study to minimise hunger (i.e., standard breakfast protocol) has some limitations in this respect. It is quite possible that some of variance in energy intake was due to hunger, given that the sessions were not held immediately after the child's breakfast. However, there was no evidence of a relationship between how much was consumed at breakfast and energy intake in the study. Furthermore, the children who participated at 10:30am did not eat more, on average, than the children who participated at 9:30am, suggesting that any influence of hunger was not systematic. It may be advantageous to schedule the study session closer to when the toddler finishes breakfast but the experience of conducting this study suggests that scheduling with parents and toddlers is difficult due to unpredictability of the breakfast routine. These factors make it difficult to control the timing of breakfast consumption. Anecdotal reports from parents indicated that the flexibility of the three menu option and the recording system that was provided was easy to follow.

Another point of difference in the adapted Free Access Protocol was the presence of the parent in the free-access setting and the influence of the parent on the child's eating behaviour. Although the parent was facing away from the child to avoid unconsciously influencing their child's behaviour through non-verbal cues, inspection of the session tapes strongly suggests that the child was influenced by the presence of the parent. A number of children appeared to look back at the parent before selecting food, possibly to seek approval or reassurance from the parent before eating. Some of the children who did not eat showed interest in the food by sitting at the food table, picking up the food, and staring at the food. It was also difficult to manage the parent-child interactions, especially when the interaction was

prompted by the child. Unfortunately the tapes did not capture enough information to enable an analysis of the child's behaviour during the session. The room that was used in the study was possibly too small and a greater distance between the parent and child may have minimised this problem.

The importance of maintaining good rapport with the child was of crucial importance to the child's willingness to cooperate in the study and to minimise the influence of other factors on their behaviour during the session (e.g., fear and uncertainty, clinging to the mother). The picture story provided to participants before the session may have contributed to the cooperative behaviour of most children. Many parents bought the picture story with them and most indicated that they had read the story to the toddler. Most children appeared to have some expectation about what was happening.

In conclusion, this study provides support for an association of parental restriction and *ad libitum* intake of energy-dense snack foods in toddlers. The influence of parental restriction varies depending on the toddler's level of access to snack foods, measured by Allow Access from the TFQ. Specifically, Restriction is a significant predictor of intake only when Allow Access is high. This finding remains when the influence of Child's Attraction to snack foods is controlled. The combined influence of TFQ Allow Access, TFQ Child's Attraction, and CFQ Restriction, explained more variance in energy intake (up to 14%) than explained by CFQ Restriction alone (6.7%), highlighting the value of the TFQ in describing the influence of aspects of parental control over feeding on the eating behaviour of young children.

CHAPTER 7

SUMMARY AND CONCLUSIONS

7.1 Aims of the Thesis

The overarching aim of this thesis was to explore parental influences on childhood obesity with a focus on parental control over feeding, an aspect of parenting that has been linked to the development of poor self-regulation of energy intake and overweight in young children. In the context of parental influences on children's eating and weight, control over feeding is only one small piece of the puzzle. Parents influence their children's eating and physical activity patterns through a variety of avenues; the complexity of these influences can be seen in the ecological model of obesity (Davison & Campbell, 2005). This model places parents at the centre, highlighting their importance in shaping children's behaviour and their influence on energy balance. It is likely that the combined influence of a range of factors, interacting with children's genetic pre-dispositions to overweight, explain the development of obesity (Birch & Davison, 2001; Faith et al., 2004; Tholin, Rasmussen, Tynelius, & Karlsson, 2005; Wardle & Carnell, 2007). This discussion will aim to explain the findings of the thesis, acknowledging the wider context of influences in which they are embedded.

A considerable amount of empirical research and commentary on parental influences and childhood obesity implicates parents in the poor nutritional quality of children's diets or in sedentary behavior of children, leading to positive energy balance (e.g., Birch & Davison, 2001; Hodges, 2003; Stang, Rehorst, & Golicic, 2004). Although numerous other explanations have been posited (e.g., changes in the environment, nature of the food supply, and food advertising), parents rarely avoid the spotlight for the role that they play as gatekeepers of children's nutrition. These explanations, as far as they involve parents, suggest that parents, quite often mothers, have relinquished control of their children's eating habits. Thus, they imply that parents need to take back control of their children's food choices, in order to facilitate the development of healthy weight in children.

This idea is reinforced by the finding that interventions involving parents have been the most successful in changing children's diets and influencing weight (Campbell & Hesketh, 2007; Epstein, Valoski, Wing, & McCurley, 1994; Golan & Crow, 2004). Effective interventions and prevention strategies are needed given the adverse consequences associated with childhood obesity (Dietz, 1998). At the same time it is important that any strategies that are implemented do not have undesirable or unintended consequences for children's health and wellbeing (O'Dea, 2005). Put another way, it is crucial that we are aware of the potential for adverse consequences, and attempt to describe them, so that appropriate strategies can be included to mitigate their influence.

The Model of Obesity Proneness and research by Birch and colleagues are unique in the literature because they suggest that parental strategies to limit their children's consumption of low quality foods could decrease children's sensitivity to internal cues for hunger and satiety, leading to overconsumption of foods that should be eaten in moderation. The premise of this research contrasts with other literature on parental control, which has suggested that more control might help children to maintain a healthy weight (e.g., Faith et al., 2003; Robinson, Kiernan, Matheson, & Haydel, 2001; Wardle, Sanderson, Guthrie, Rapoport, & Plomin, 2002). The approach also focuses on one area of children's diet, highly palatable energy-dense foods. Limiting energy-dense/nutrient-poor foods, sometimes referred to as 'extra or non-core foods', has been highlighted as one target area for obesity prevention (Ritchie, Welk, Styne, Gerstein, & Crawford, 2005; Tabacchi, Giammanco, La Guardia, & Giammanco, 2007). In early childhood (i.e., in infancy and toddlerhood), the dietary recommendations for extra foods are particularly strict, advising parents to avoid giving their child these foods (Smith, Kellett, & Schmerlaib, 1998), yet survey data indicate that young children from all backgrounds are over-consuming these foods (Bell, Kremer, Magarey, & Swinburn, 2005; Skinner, Ziegler, Pac, & Devaney, 2004; Webb et al., 2006). This suggests that parents need to develop better control mechanisms in order to prevent overweight

developing in their children. Paradoxically, research by Birch and colleagues has provided some compelling evidence to support the negative effect of parental control (restriction) on children's intake, at least in high SES samples. The confusion in the literature regarding the role of parental control prompted an exploration of parental control in this thesis. A combination of qualitative and quantitative research sought to answer the questions: what does 'restriction' actually mean and how does it help researchers to understand the influence of parental control on children's eating and weight in a socio-economically heterogeneous population?

7.2 Examining the Validity and Reliability of Restriction

In the first study, the factor structure of the Child Feeding Questionnaire, developed by Birch et al. (2001), was explored in Australian preschool children. It suggested that there were some problems with the Restriction subscale, specifically the cohesion of the reward items with the remaining items in the subscale. From these results, it was suggested that Restriction be calculated as a six-item scale, dropping the reward items. This modified Restriction subscale was used in analyses described throughout the thesis, along with the full Restriction subscale and the two-item Food as Reward scale. It was argued that the six-item measure of Restriction provides greater factor stability and therefore may result in an increase in the strength of associations with other variables. In Chapter 2, the six-item Restriction scale, but not Food as Reward, was positively correlated with BMI z scores in girls. In Chapter 4, a comparison of the correlations between the three measures of Restriction (original eight-item Restriction, six-item Restriction and Food as Reward) and the Toddler Feeding Questionnaire factors indicated that the original eight-item measure showed the strongest associations with the TFQ factors. The strength of these associations was weakened slightly when the six-item measure of Restriction was used. A significant correlation between the six-item measure and a TFQ factor was almost always matched by a significant correlation between Food as Reward and the TFQ factor, although the correlation with Food

as Reward tended to be smaller in magnitude. This was not surprising given that the Food as Reward scale comprised only two items.

Interestingly, the Food as Reward scale was positively associated with toddlers' *ad libitum* snack food intake in the final study. The six-item Restriction measure was not significantly associated with snack food intake, suggesting that the reward component is particularly important empirically, however, it may be conceptually distinct from Restriction. In contrast to expectations, the six-item Restriction scale did not show stronger associations with other variables of interest in comparison to the original Restriction subscale. The significant contribution of Food as Reward was unexpected, providing an insight into the respective contribution of restrictive beliefs and the use of food as a reward in young children's snack food intake. Parental use of food to reward behaviour might encourage a greater desire for these foods in toddlers because it links energy density with positive antecedents. Although a causal link is suggested by this interpretation, it was not possible to determine whether Food as Reward caused toddlers to overeat. Furthermore, the temporal ordering of these variables could not be ascertained due to the cross-sectional nature of the study.

The results of the factor analysis justified further qualitative exploration of parental restriction to determine how parents interpreted the items on the Restriction subscale. The qualitative investigation was conducted in a parent-toddler sample because the toddler period was identified as being a critical period for the development of eating behaviours, as well as being a particularly challenging period for parents. The study examined whether Restriction could be used to examine parent feeding practices in the toddler years. Parents completed the CFQ Restriction subscale and the Restricted Access Questionnaire and were interviewed about the strategies they used to control their toddlers' intake of snack foods. The interviews revealed that there was very little variability in parents' responses to the CFQ Restriction subscale (Birch et al., 2001) and the Restricted Access Questionnaire (Fisher & Birch, 1999a).

In particular, there was overwhelming agreement with most of the statements that had been used to measure parental restriction. The interesting finding was that these beliefs were not consistent with parents' reports of their own behaviour and attitudes to their toddler's consumption of snack foods. A thematic analysis of the parent interviews suggested that there were individual differences in the feeding practices that parents used to limit snack foods. The data analysis involved identifying themes and conceptualizing feeding behaviours and attitudes from low levels of control to high levels of control.

The interviews provided an insight into how parents' responses to CFQ Restriction corresponded with their reports of their feeding practices and attitudes on limiting their toddlers' intake of snack foods. Interestingly, CFQ Restriction did not appear to correlate with parents' reports of how many snack food their toddler consumed in the diet. Parents who reported having more control over their toddler's access to these foods found that they did not need to restrict how much their toddler ate. The association between restriction and access to foods was not surprising yet the interview process clearly showed how restriction could be understood differently when information about the availability of snack foods was considered. Parents who allowed very little access to snack foods had no need to limit their toddlers' intake. Therefore, for some parents, their responses to the Restriction subscale reflected their control of the environment.

In the parent interviews, several issues emerged as important potential constructs that might impact on a child's later behaviour. The factor analysis conducted in Chapter 4 suggested that five constructs could describe the data in the Toddler Feeding Questionnaire. These constructs were: Allow Access, Rules, Flexibility, Self-efficacy, and Child's Attraction. Allow Access, Rules and Flexibility represented three aspects of control; Allow Access measured the extent to which sweets and snack foods were allowed by the parent and made accessible to the child; Rules measured how often parents enforced rules about when, what, and how often sweets and snacks were given to the toddler; Flexibility measured how

often parents enforced these rules. Self-efficacy measured parents' confidence in their ability to manage sweets and snacks in their toddlers' diet. Child's Attraction measured parents' perception of toddlers' attraction to and desire for sweets and snacks. Self-efficacy and Child Attraction were identified as constructs that could potentially influence parents' use of feeding practices. Chapters 4 to 6 explored the validity of the TFQ, and also provided an insight into the negative and positive aspects of parental control.

7.3 Toddler Feeding Questionnaire Factors and Weight Status

A key finding in Chapter 4 was that feeding practices, measured by the Toddler Feeding Questionnaire, varied between normal weight, overweight and obese *parents*. Normal weight parents of preschool children reported being less Flexible in the toddler years compared with overweight parents. Normal weight parents also had more Rules and Allowed Access to snack foods less frequently compared with obese parents. Other studies that have measured aspects of control comparable to those things measured by Rules and Allow Access, have also reported similar findings. For example, Faith et al. (2004) measured parental control over food choices and found that more control was associated with lower adiposity in children. Wardle et al. (2002) also measured general parental control, with items that describe parental boundaries (e.g., I decide how many snacks my child should have). In this study, obese parents were found to have a slightly lower level of control, or fewer rules. Although no studies have investigated Flexibility in feeding practices, the current study suggested that normal weight parents were less likely to report being Flexible in determining what, when and how much their toddler should eat. The items that comprise the Flexibility scale ask parents to indicate how likely they are to be influenced by the situation when making decisions about their toddlers' snack food intake, and therefore high levels of flexibility might reflect a lower level of control over feeding. The influence of Flexibility on parents' decisions about feeding their toddlers may be particularly relevant in the current environment, in which energy-dense foods are so readily available. Children whose parents are very flexible may be more

susceptible to overconsumption in obesogenic environments. Although cross-validation of these findings was not achieved in a second sample of parents, they provide some support for Wardle and Carnell's (2007) conclusion that a higher level of parental control may be beneficial for children's weight.

It is important to note that the questionnaire did not provide any evidence for an association between the TFQ factors and children's weight. Consistent positive associations between BMI and parental control have proved somewhat elusive in the literature, possibly reflecting the complex etiology of overweight in young children, and the different pathways of influence. The associations between diverse measures of control and children's weight may actually reflect the different pathways through which parental control can influence children's weight. Restriction, arguably, exerts its influence on children's weight through its effect on children's ability to self-regulate intake (Costanzo & Woody, 1985). Feeding practices measured by Allow Access, Flexibility and Rules (i.e., more access and flexibility and fewer rules) could contribute to higher intake of energy-dense foods, and it is the provision of these foods on a regular basis by the parent that may drive the child's eating habits and contribute to weight gain. Does this mean that limiting a child's intake of sweets and snack foods might be beneficial form of control if operationalised in terms of Rules, Flexibility and Allow Access?

The findings of the current research suggest that it may be important to distinguish between two levels of control. The first level represents the parents' control of the child's food environment and the second level represents the parent-child interactions. The term 'nutritional gatekeeper' has been used to describe the influence that a parent, usually the mother, has on the family's diet (Wansink, 2006). Allow Access operationalises this 'gatekeeper' role indicating the decisions parents make about what types of foods they will make accessible to their child. Rules and Flexibility might also be considered examples of control at this level. The second level, parent-child interactions, refers to how the parent tries

to influence the child's eating behavior. An example of this type of control might be overt restrictive feeding practices such as setting strict limits on the amount of a particular food that a child is allowed, or when and where, and for how long they have access. Ogden et al. (2006) distinguished between these two types of control with their measures of Overt Control and Covert Control. There is likely to be some overlap in the two levels of control but they are also likely to have unique influences on the children's behaviour including food intake, self-regulation of energy intake, and actual weight outcomes. The overt-covert distinction could prove to be a useful way of conceptualizing the similarities and differences amongst different measures of control.

It is interesting to revisit some of the research on restriction by Birch and colleagues that was described in Chapter 1. Two experimental studies were conducted that simulated restriction within the child's environment (Fisher & Birch, 1999a). Restriction was simulated by placing one food (the target food) in a glass jar in the middle of the table during snack time. Another food, which was known to be liked equally to the target food, was made accessible for the duration of the snack food period (i.e., 20 mins). The children were allowed to access the target food (i.e., the food in the jar) for a 2 minute period, 10 minutes into the snack period. This procedure was repeated twice a week for five weeks. Baseline and follow-up testing was also conducted, during which time both foods were freely accessible for the children to eat. In Study 1, behavioural observations were recorded to assess children's response to the restriction. The measures included comments or behaviours about the restricted food or about being restricted, and requests for the food or attempts to get the food. The authors reported the children made more comments about the restricted foods and that they were aware that they were being restricted, compared to baseline when both foods were accessible. The second study used the same basic procedure with a different group of children and experimental foods. In addition to the observational measures of children's behaviour, they recorded how much of the restricted food was taken (selection), and how much was eaten

(intake) during the 2-minute period of granted access. Parental restriction was also measured using the Restricted Access Questionnaire (i.e., items about restriction similar to that used in Fisher & Birch, 1999a). In study 2, the restriction was associated with a greater behavioural response (cf study 1), a greater selection of the restricted food, and a greater intake of the food. In addition, mothers' restriction of the experimental food in the home environment was associated with greater selection of the restricted food in the restricted context, but not with greater intake. How often mothers purchased the food was associated with the number of comments made by the children about the food but not with selection or intake.

It is interesting to note the differences in the types of restriction that were explored in these studies. The placing of the food in the glass jar, within view but inaccessible, is an extremely overt means of restriction. Maternal restriction within the home setting, measured by the Restricted Access Questionnaire, is likely to be somewhat less overt compared to the experimental simulation with the glass jar. Lastly, mothers' purchasing habits (i.e., how often they buy the snack food) is the least overt of these restriction strategies. The children's response to these strategies mirrored these levels of restriction, with the most overt restriction associated with an increased behavioural response, selection and intake of the restricted food. Restriction in the home was associated with selection, but not with intake. Lastly, how often the food was purchased was associated with an increased response to the food, but not with selection or intake. It is therefore possibly that less overt means of restriction could be relatively harmless.

7.4 Toddler Feeding Questionnaire, Restriction, and Self-Regulation

One of the key findings reported here was the significant interaction between the factors Restriction and Allow Access in predicting toddlers' *ad libitum* intake of energy-dense snack foods. The influence of restriction on children's intake of snack foods was modified by the level of access to snack foods that the toddler was typically allowed by the parent. Parent reported Restriction was associated with a higher *ad libitum* intake of snack

foods in the unrestricted setting only when Allow Access was high. This analysis controlled for the influence of the toddler's attraction to snack foods. The finding that Restriction was associated with higher intake of foods, a proxy measure of self-regulation of energy intake, is consistent with the findings reported by Birch and colleagues in European-American parents and preschool-aged children (Birch & Fisher, 2000; Birch, Fisher, & Davison, 2003; Fisher & Birch, 1999a; Fisher & Birch, 2000; Fisher & Birch, 2002; Francis & Birch, 2005), but extends these findings by suggesting that Restriction may not always lead to negative consequences for children. The results of the study inform our understanding of the role of Restriction on self-regulation and highlight that there may be helpful strategies for parents to control young children's intake of energy-dense foods.

7.5 Relationship between Control over Feeding and Parent Feeding Styles

Delineating positive and negative aspects of control has been a challenge for research because of the complex and multidimensional nature of control. The interaction of Restriction and Allow Access is consistent with the notion that some level of control is appropriate. Restrictive feeding measures one aspect of parental control and it has been suggested that Restriction reflects an authoritarian style of feeding (Wardle & Carnell, 2007). The qualitative investigation conducted as part of the first study of the thesis found that information from parents about other aspects of their feeding practices was needed to qualify and understand parents' responses to the items on the Restriction scale.

Research in the area of parenting style provides a useful framework from which to contextualize the Restriction/Allow Access interaction. Parenting styles are defined against two broad dimensions: Demandingness and Responsiveness (Baumrind, 1971). Demandingness is characterised by the setting of standards, and ensuring that the child adheres to those standards. Responsiveness is characterized by warmth, affection and encouragement. Authoritative parents are both demanding and responsive, and Authoritarian parents are demanding but unresponsive. The benefits of an Authoritative style of parenting

on self-regulatory behaviours (e.g., compliance, inhibition and emotion regulation) in pre-school children, was examined in a recent meta-analysis of parenting. Karreman, van Tuijl, van Aken & Dekovic (2006) concluded that positive control, defined by limit setting and providing the child with clear direction, was positively associated with self-regulated behaviours in children. High scores on Restriction and low scores on Allow Access might reflect an Authoritative style of parenting or feeding; the high scores on Restriction indicating high expectations for the child nutrition and diet, and the low scores on Allow Access indicating an appropriate way to control the child's intake (i.e., by limiting their availability in the environment). High scores on Restriction and Allow Access might reflect a more Authoritarian approach to managing the child's intake of snack foods, where the parent uses inappropriate feeding practices to limit the child's consumption of snack foods.

The relevance of parenting style to research into children's eating behaviour and obesity has been described by Hughes et al. (2005), who have developed a measure of parent *feeding* styles based on parenting style typologies. Four typologies of feeding style were identified: Authoritative, Authoritarian, Uninvolved, and Indulgent. They found that Authoritarian and Authoritative parents did not differ in their level of Restriction. This is consistent with the theory posited above, that the nutrition demands set by Authoritative and Authoritarian parents are likely to be similar. Hughes et al. (2005) did find that parents with an Authoritative style were more likely than Authoritarian parents to use appropriate types of control including reasoning and reminding. In the current research, Parents who score low on Allow Access might have a range of alternate foods available to their child thereby controlling intake of energy dense foods. Consistent with findings from Hughes et al. (2005), Blissett and Haycraft (in press) found no significant association between Restriction and Authoritarian or Authoritative parenting styles. Somewhat confusingly, the researchers observed that Restriction was associated with a Permissive parenting style. The research in this thesis found evidence of a positive correlation between restriction and frequency of

consumption of sweets and snack foods, which might also be evidence of more a more Permissive parenting approach. No study could be located that investigated the influence of parent feeding styles on children's self-regulation, but it might be hypothesized that an Authoritative feeding style or parenting style would be associated with superior self-regulation of energy intake by children.

7.6 Parents' Self-efficacy and Child's Attraction to Snack Foods

Apart from parental control, which has been the focus of the discussion so far, the influence of parents' Self-Efficacy for dietary control and Child's Attraction to snack foods on children's self-regulation and weight, was also examined in the thesis. The findings of this research suggest that Self-efficacy could be examined further as a predictor of parental control. The parents' sense of Self-efficacy for feeding their child was negatively correlated with Restriction and Pressure to Eat. It was also negatively correlated with six-item Restriction and Food as Reward, and weakly negatively correlated with Allow Access. Parents with high self-efficacy were less likely to use negative forms of control (i.e., Restriction, Pressure to Eat). Parents may use inappropriate feeding practices when they are unsure about how to manage their toddlers' eating. Or perhaps parents have poor self-efficacy because their children already have well ingrained maladaptive eating behaviours. It may be especially difficult for parents to manage sweets and snacks foods in the toddler years when children can exhibit difficult eating behaviours. Sweet and salty flavours are likely to be readily accepted by toddlers. Energy-dense foods are also readily available, convenient, well marketed and inexpensive options that have become part of our diet. These factors are likely to have a powerful influence on parents' sense of self-efficacy. Therefore if we want parents to use appropriate strategies to encourage healthy eating in their toddlers, it will be important that parents feel confident that they can use these strategies effectively.

High Self-efficacy could also create a problem if it is unrealistic. Most parents had high scores on Self-efficacy, indicating a high level of confidence in managing energy-dense

foods. The results of dietary surveys on toddlers food intake suggest parents are giving their children too many of these foods, therefore the high levels of self-efficacy may indicate a level of optimistic bias. Mean scores on certain items on the Self-efficacy scale were low. For example, parents indicated that they *never* or *rarely* felt pressured to give their toddler sweets and snacks when they hadn't eaten other foods or worried that their toddler ate too many sweets and snacks. The definition of sweets and snack foods in the study was informed by the Australian Guide to Healthy Eating definition of 'extra foods' (Smith et al., 1998). Parents' perceptions of extra foods are likely to be different from the definition used in nutrition guidelines. Therefore, high Self-efficacy may not necessarily be associated with the use of more effective parent feeding strategies.

The factor, Child's Attraction to sweets and snack foods, might also make it difficult for parents to manage their toddler's intake of energy-dense foods and it is not surprising that toddler's attraction to energy-dense foods was raised by parents in the interviews as influential on their feeding practices. There were individual differences in parents' perceptions of their toddlers' attraction to these foods, with Child's Attraction correlating positively with parents' use of Restriction and Food as Reward. Child's attraction was associated, albeit weakly, with Allow Access, and it is likely that giving children these foods encourages children's preferences for energy-dense foods. Parents may need support in implementing strategies to limit the amount of energy-dense/nutrient poor snack food children consume in their diets. Strategies that focus on encouraging consumption of nutritious alternatives rather than decreasing consumption of forbidden foods might be more effective, as suggested in a recent study by Epstein et al. (2008). The study consisted of a 24 month family-based behavioral intervention program in which participants received either (a) an intervention targeting increased consumption of healthy foods, or (b) an intervention targeting the reduction of energy-dense foods. The former was found to be more successful in reducing children's BMI z scores over the 24months. The current research only investigated parental

feeding practices in managing snack foods, and did not address how parents encouraged consumption of nutritious alternatives. The parents who were able to manage sweets and snack foods well might also have been successful in encouraging intake of healthy choices.

7.7 Issues with Methodology

The findings of this research must also be considered in light of some methodological limitations. Recruiting low SES participants was found to be a major difficulty in conducting the research. Consequently, the information gathered in the initial qualitative study may have been biased by the high SES of the participants. The factor analysis that was conducted in the second stage of the research with two large groups of parents provided some evidence for the robustness of the constructs; the initial constructs that were identified influenced the focus of the research to a large degree, however, it is likely that different themes would have emerged in a qualitative exploration of parent control in a low SES sample.

The use of retrospective reports and the cross-sectional nature of the study design was also a limitation of the research presented in Chapters 4 and 5. It is not known how accurately the parents of preschool children were able to recall their feeding practices when their child was a toddler. It is likely that their responses may have been contaminated by their subsequent experiences with their toddlers' eating. The major disadvantage with cross-sectional research is the difficulty in untangling the direction of causality between feeding practices and children's weight. It is further complicated by the true bidirectional of the relationship (Birch & Fisher, 2000). As has been already discussed, there was no evidence that feeding practices measured by the Toddler Feeding Questionnaire differed between normal weight, overweight and obese children in the current research.

The recruitment of parents through the Child and Youth Health preschool program was the most successful recruitment method in terms of attracting a broad cross-section of parents. Participants had varied cultural backgrounds, occupations and levels of education. In contrast, participants recruited through child care centres were more likely to be high SES

parents, with professional occupations and high levels of educational attainment. This underscores the importance of working with community health agencies in conducting research of this nature. Some of the research conducted in the US, which focuses on parent feeding practices and low income or minority families, utilizes community services and clinics to recruit low SES parents. The Supplemental Nutrition Program for Women, Infants and Children (WIC) has been used in a number of studies (e.g., Baughcum, Chamberlin, Deeks, Powers, & Whitaker, 2000; Sacco, Bentley, Carby-Shields, Borja, & Goldman, 2007). Fostering partnerships between community clinics, hospitals and other agencies that provide services to parents and children will widen the recruitment net and facilitate further research in this area.

Another area of concern is the difficulties associated with the measurement of snack food consumption in toddlers. Australian and US research clearly shows that toddlers are consuming energy-dense snack foods well in excess of recommendations (Devaney, Ziegler, Pac, Karwe, & Barr, 2004; Fox, Pac, Devaney, & Jankowski, 2004; Webb et al., 2006), and therefore this represents an important area of research. Weighed food records and 24-hour recall measures have been used to measure snack food intake but these are labour intensive for the researcher and participant, require specific expertise, and are expensive. The current research adapted a measure based on the Anti-Cancer Council Food Frequency Questionnaire (Giles & Ireland, 1996) that could be easily completed as part of a self-report survey. The validity and reliability of this measure for assessing frequency of snack food consumption in toddlers is not known. A validated measure of snack food intake would be a valuable tool for future research.

7.8 Contributions of the Research to our Understanding of Children's Eating

Behaviour

This research investigated one aspect of parental influence on children's eating behavior. In the current climate of childhood obesity, it is crucial that we understand the role

of parents in shaping unhealthy (and healthy) eating habits in their children, and to determine the best ways for parents to teach their children how to regulate their intake in an environment where energy-dense foods are abundant. The findings of the final study of the thesis suggest that one way to limit young children's consumption of energy-dense/nutrient poor foods is by limiting the availability of unhealthy foods in the child's home environment. Of course the extent to which parents are able to achieve this depends a lot on their knowledge of nutrition, and personal attitudes to, and values placed on good nutrition. Assuming parents have this knowledge, it may be relatively easy to apply this principle in the home environment, however, the external influences may be difficult to manage, particularly as the child gets older. Ideally, it will be important for parents to assist children to maintain their innate capacity to understand their hunger and satiety cues, so that they can self-regulate their own eating behavior in different situations.

One area of focus for future research should be optimizing the definition and measurement of parental control. Wardle and Carnell (2007) have suggested that we have some way to go before being able to translate research into advice for parents, and this is partly due to the confusion that is created by the use of different measures of control. As discussed above, it may be useful to conceptualise control in terms of two levels of influence, (a) aspects of parental control that are directed at influencing the child's environment (e.g., choice of foods in the home), and (b) overt means of control that are evident in parent-child interactions (e.g., using dessert to entice a child to eat his vegetables). A basic framework is required to progress understanding in this area, to provide a clearer picture of the influences of control on children's eating and weight, and ultimately to assist with the formulation of parental guidance. Measures of feeding style described by Hughes et al. (2005) could also be utilized in this area. Measures of parenting style, upon which the feeding style measures are based, incorporate both controlling behaviours (i.e., authoritative and authoritarian styles) and less controlling behaviours (i.e., uninvolved and indulgent styles).

7.9 Future Research

The final study of this thesis revealed a concerning association between parental control over feeding and increased ad libitum intake of snack foods in toddlers, underscoring the importance of research in this age-group. This was the first study, to the researcher's knowledge, to use the Free Access Procedure (Fisher & Birch, 1999a) with a toddler sample, and to pilot-test a modified version of this procedure. Further research is needed in this age-group in diverse samples of parents and using different measures of control. As a first step, it will be important to replicate the findings and the interaction effect of Restriction and Allow Access to determine its robustness.

Further research examining parental influences on the development of self-regulation of energy intake in children is needed, particularly because poor self-regulation has been associated with overweight in children (Francis & Birch, 2005). The Free Access Procedure provides a simple laboratory test of self-regulation that is relatively inexpensive and requires minimal equipment. At present, laboratory studies involving the Free Access Procedure have been conducted by one group of researchers and have focused mainly on the influence of parental restriction (Birch & Fisher, 2000; Birch et al., 2003; Fisher & Birch, 1999a; Fisher & Birch, 2000; Fisher & Birch, 2002; Francis & Birch, 2005). The research could easily be expanded by other researchers to examine the impact of different parental feeding strategies on self-regulation. In doing so, it may be possible to distinguish strategies that are beneficial from those that are potentially harmful to children's development.

As discussed above, one area of investigation could be to examine the influence of authoritarian and authoritative feeding styles with a particular focus on managing palatable foods. This approach may help to distinguish maladaptive parent feeding strategies from beneficial feeding strategies. The less controlling feeding styles, such as indulgent and uninvolved styles, could also be investigated in this context. There is some evidence that these practices are differentially associated with children's BMI (Hughes et al., 2005). In terms of

study design, longitudinal investigations would be informative in determining the influence of toddler feeding practices and self-regulation on children's growth trajectories, and also to determine the temporal ordering of feeding practices, self-regulation and weight. Furthermore, the way that parents and children influence each other is poorly understood. A challenge for future research will also be to tailor the research to reflect the different parenting approaches that are likely to be successful at different stages of child development. Limiting the availability of snack food may be an effective control strategy when used with toddlers but it may be less effective with older children.

7.10 Conclusions

The Toddler Feeding Questionnaire measured several aspects of parental control over toddlers' snack food intake, and these were examined in conjunction with the Child Feeding Questionnaire Restriction scale to investigate the influence of parental control on children's weight and self-regulation. Although no evidence was found to support an association between control and BMI in the preschool years, limited evidence suggested that feeding practices varied between normal, overweight and obese parents, indicating a lower level of control with increasing weight status. Systematic differences in the feeding regimes used by normal weight and overweight parents might explain, in part, the intergenerational transmission of obesity, and describes a potentially modifiable factor that could be addressed in intervention strategies. Attempting to change parents' feeding practices requires a considered approach to ensure that adverse consequences are minimized. The thesis found that parental restriction, measured by the Child Feeding Questionnaire, was commonly used by parents of toddlers, and was higher in parents who allowed their toddlers more access to snack foods. This somewhat *paradoxical* association suggested that it was important to consider restriction in the context of the obesogenic environment in which it can occur. The combined influence of *allowing a high level of access* and *restricting intake* of snack foods was found to have negative consequences for children's ability to regulate their energy intake

in settings where these foods are freely available. Strategies to control children's intake of energy-dense foods may need to be executed carefully so that the focus of the control is directed towards creating healthier environments, avoiding the need for restrictive feeding practices.

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