The Nature of Selective Eating in Children

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Abstract

Individuals who experience selective eating are excessively preoccupied with avoiding food and severely restrict the variety of their food intake, but differ from individuals with anorexia nervosa and bulimia nervosa, as there is no evidence of fear of weight gain or irrational cognitions about weight and shape. Whilst many parents appear concerned about selective eating in their children, there is limited research in the area. This thesis investigates fundamental issues in the assessment of selective eating, and explores the psychological correlates of the phenomenon.

Four studies were conducted. Study 1 investigated parent reported prevalence of selective eating. Parents (n=504) of children between 1 and 12 years old in a community sample completed the Fussy Feeding scale on the Child Eating Behaviour Checklist. Prevalence was calculated to be 6.72% and there was a small (-0.1) but significant ($p = .018$) negative relationship between child age and selective eating indicating that the prevalence of selective eating decreased with age. No relationship was found between parent report of selective eating and gender.

Many studies have relied on parent report to identify problems in avoidant/restrictive eating in children; however, the validity of parent report is questionable. The aim of Study 2 was to investigate the validity of parent report in a community setting by determining how well parents can identify problematic levels of selective eating in their child. To achieve this parent report for 102 children aged 1-12 years was compared with dietitian ratings of adequate or inadequate diet. Parent report of selective eating (FF Score: CEBQ) was said to be validated if their child’s diet was also assessed as inadequate by dietitians. Only 33% of children reported by their parent as having high levels of avoidant/restrictive eating also had an inadequate diet. Logistic regression analysis was conducted to predict classification of adequate or inadequate
diet using parent report and variety rating (number of different foods eaten) as predictors. Only variety rating made a significant contribution to the model (p < .001) providing 57.4% of variance of the total model. Parent report (FF Score) was not significant. These findings highlight possible problems with the validity of parent report of selective eating.

Given the problems with the validity of parent report, Study 3 aimed to develop an objective assessment measure to assist in the identification of selective eating. In order to identify selective eating the measure had to identify at what point variety of food intake was indicative of nutritional deficiency. The sample of food diaries gathered in Study 2 were used in Study 3 (n=102). Food variety was assessed by counting the number of different foods (variety score) eaten as reported in a three day food diary, and nutritional deficiency was assessed via food diary analysis conducted by dietitians. Utilising sensitivity and specificity statistics cut-points were established for both research and clinical purposes. A cut-point with high specificity was recommended for research purposes, however for clinical purposes, higher sensitivity was preferred as the cut-point may be used more as a screening test. For research ≤19 foods or less was determined to be the optimal cut off value where variety of food was associated with dietary deficiency (99% specificity; 77% sensitivity), and thereby indicative of the presence of selective eating. A cut-point of ≥ 22 foods was recommended (sensitivity: 99%; specificity: 88%) for clinical purposes. The development of a new objective validated measure of selective eating, based on food intake identifies what range of foods is likely to represent problematic eating behaviour and in doing so can assist in accurate diagnosis of selective eating.

In the final study, the assessment protocol developed in Study 3 was used to identify selective eaters (n=62) who were then compared to normal eaters (n=42) aged 3-15 years on a range of psychological measures in a community sample. Parents of
children in the two groups also completed a battery of measures relating to their own functioning. On child measures, results showed that selective eaters were more likely to have an inhibited temperament when young (Short Temperament Scale for Children; $F = 14.73; d = 0.98, p < .001$), demonstrate both internalizing and externalizing problems (Achenbach Child Behaviour Checklist Total $F = 91.22; d = 1.82, p < .001$), experience more anxiety (Multidimensional Anxiety Scale for Children; $F = 83.26; d = 0.29, p < .001$) and obsessive compulsive behaviour (Leyton Obsessive Inventory; $F = 34.00; d = 1.56, p < .001$) than normal eaters. The parents of selective eaters reported feeling more stressed, anxious or depressed (Depression Anxiety and Stress Scale; $F = 35.03, d = 1.09, p < .001$) and had higher rates of Monitoring of eating (Child Feeding Questionnaire; $F = 54.74; d = 1.45, p < .001$) and Pressure to Eat ($F = 70.92; d = 1.71, p < .001$) during mealtimes than the parents of normal eaters. There was no difference between the parents of selective eaters and normal eaters on a measures of overall parenting style (Parent Authority Questionnaire). Parent survey on developmental history found that selective eaters were more likely to have a complex developmental history characterised by reports of sensory problems, gastrointestinal and other medical issues, and early feeding problems. These results reflect the complex nature of selective eating, consistent with a psycho-bio-social understanding, and emphasize that child, parent and biological factors appear to act in an interdependent fashion.
Table of Contents

Abstract ................................................................. 2

List of Tables ........................................................................ 13

List of Figures ........................................................................ 14

Statement of Candidature Contribution .................................. 16

Chapter 1. Introduction .......................................................... 17

1.1. Eating Disorders in Children ........................................ 17

1.2. Diagnostic Issues ............................................................ 19

   1.2.1. Diagnostic History of Avoidant/Restrictive Eating Disorders in Childhood and Infancy ........................................... 22

   1.2.2. Alternative Diagnostic Categories .................................. 27

   1.2.3. Avoidant/Restrictive Food Intake Disorder (ARFID) ............ 33

   1.2.4. The Relationship between ARFID and Selective Eating ........... 36

   1.2.5. Continuum Theory of Eating Disorders ............................... 38

1.3. Background to Selective Eating ........................................ 39

   1.3.1. What is Selective Eating? .............................................. 40

   1.3.2. The Relationship with Age and Selective Eating ................. 41

   1.3.3. Range of Food Eaten by Selective Eaters ............................. 42

   1.3.4. Sensory Processing Issues .............................................. 43

   1.3.5. Physical Characteristics of Selective Eaters ....................... 44

   1.3.6. Co-Morbidity ............................................................... 46
Chapter 2. Study One: Parent-Perceived Prevalence, Age and Gender Effects of Selective Eating

2.1. Introduction ........................................................................................................ 61
   2.1.1. Prevalence of Avoidant/Restrictive Eating in Childhood .................. 61
   2.1.2. Avoidant/Restrictive Eating and the Effect of Age ......................... 69
   2.1.3. Gender and Avoidant/Restrictive Eating ........................................ 77
   2.1.4. Summary 79
   2.1.5. Differentiating between Developmentally Normal and Pathological Levels of Avoidant/Restrictive Eating ........................................... 81
   2.1.6. Overview of Study One ................................................................. 82

2.2. Method ............................................................................................................... 83
   2.2.1. Participants ...................................................................................... 83
   2.2.2. Procedure ...................................................................................... 83
   2.2.3. Measures ...................................................................................... 83
       2.2.3.1. Developing Cut-off Scores for the CEBQ ......................... 84
2.3. Results ................................................................................................................................. 87
   2.3.1. Statistical analysis ........................................................................................................ 87
   2.3.2. Parent-Perceived Prevalence ..................................................................................... 87
   2.3.3. Age and Parent-Perceived Prevalence ....................................................................... 87
   2.3.4. Age and Severity Level of Parent-Perceived Prevalence ........................................... 88
   2.3.5. Gender and Parent-Perceived Prevalence ................................................................. 88
2.4. Discussion .......................................................................................................................... 89
3.1. Introduction ....................................................................................................................... 93
   3.1.1. Factors Affecting Validity of Parent Report ............................................................... 93
      3.1.1.1. Parental Stress, Depression and Anxiety and Attributional Bias .......................... 94
      3.1.1.2. Parent Perception of Dietary Quality ................................................................... 97
   3.1.2. Validation of Parent Report for Avoidant/Restrictive Eaters ......................................... 99
   3.1.3. Summary and Rationale for Study 2 ......................................................................... 105
3.2. Method ............................................................................................................................. 106
   3.2.1. Participants ................................................................................................................. 106
   3.2.2. Procedure .................................................................................................................. 106
   3.2.3. Measures ................................................................................................................... 107
      3.2.3.1. Dietitian Ratings of Nutritional Levels ................................................................. 107
      3.2.3.2. Child Eating Behaviour Questionnaire (FF Score) .............................................. 108
      3.2.3.3. Range of Food Eaten: Variety Rating ................................................................. 108
3.3. Results .................................................................................................................................. 111
Chapter 4. Study Three: The Development of Dietary Assessment Guidelines for ARFID and Selective Eating

4.1. Introduction

4.1.1. The Assessment and Diagnosis of ARFID and Selective Eating

4.1.1.1. Operationalization of ARFID Criteria

4.1.1.1.1. Criterion One: Significant Weight Loss

4.1.1.1.2. Criterion Two: Dependence on Tube Feeding or Oral Supplements

4.1.1.1.3. Criterion Three: Nutritional Deficiency

4.1.1.1.4. Criterion Four: Psychosocial Impairment

4.1.1.2. Implications for this Study

4.2. Nutritional Assessment

4.2.1.1. Nutritional Assessment in ARFID and Selective Eating

4.2.1.1.1. Nutritional Assessment Methods

4.2.1.1.1.1. Observational Measures

4.2.1.1.1.2. Food Records

4.2.1.1.1.3. Weighed Food Records

4.2.1.1.1.4. Twenty-Four Hour Recall

4.2.1.1.1.5. Estimated Food Records or Food Diaries

4.2.1.1.1.6. Food Frequency Questionnaires (FFQ) and Semi-Quantitative FFQs
4.2.1.1.2. Implications for this Study................................................. 131

4.2.1.1.3. Assessment of Dietary Range.......................................... 132

4.2.1.1.3.1. The Sequential-Oral-Sensory (SOS) Guidelines .. 134

4.2.1.1.3.2. Greater Ormond St Hospital Criteria ................... 134

4.2.1.1.3.3. Healthy Eating Index - 2005 ............................... 135

4.2.1.1.3.4. Dietary Diversity Scores and Food Variety Scores
............................................................................................................. 136

4.2.1.1.3.5. Summary ............................................................ 137

4.2.1.2. Rationale for Study Three ..................................................... 137

4.2.1.3. Sensitivity and Specificity .................................................... 139

4.2.1.3.1. The “Gold Standard” in Nutritional Assessment .............. 140

4.2.1.4. Rationale and Hypothesis for Study Three....................... 143

4.3. Method.......................................................................................... 144

4.3.1. Participants.............................................................................. 144

4.3.2. Procedure ............................................................................. 145

4.3.3. Measures .............................................................................. 145

4.3.3.1. Range of Food Eaten: Variety Rating ............................... 146

4.4. Results ........................................................................................ 146

4.4.1. Sensitivity and Specificity Analysis ........................................ 146

4.4.2. Variety Score Validation ........................................................ 149

4.4.3. Missing Food Score Validation.............................................. 150

4.5. Discussion...................................................................................... 150
Chapter 5.  Study Four: Psychological Factors Associated with Selective Eating

5.1. Introduction ............................................................................................................ 156

5.1.1. Child Factors ...................................................................................................... 157

  5.1.1.1. Medical-Biological Factors ........................................................................ 157

  5.1.1.2. Behavioural Problems .............................................................................. 160

  5.1.1.3. Anxiety and Depression ............................................................................ 163

  5.1.1.4. Temperament ............................................................................................ 165

5.1.2. Parent Factors ................................................................................................... 169

  5.1.2.1. Parental Psychopathology ........................................................................ 169

  5.1.2.2. Mealtime Parenting Practices ................................................................. 174

    5.1.2.2.1. Mealtime Practices Associated with the Development of Food Preferences ......................................................... 175

      5.1.2.2.1.1. Role Modelling ........................................................................... 175

      5.1.2.2.1.2. Feeding Practices ........................................................................ 177

      5.1.2.2.1.3. Parenting/Feeding Style ................................................................ 179

      5.1.2.2.1.4. Exposure .................................................................................... 183

      5.1.2.2.1.5. Mealtime Practices Associated with the Development of Food Preferences in the Normal Population: A Summary ........................................ 184

  5.1.2.2.2. Mealtime Practices Associated with Feeding/Eating Problems in Children ................................................................. 185

    5.1.2.2.2.1. Mealtime Practices and Picky Eating ............................................. 185
5.1.2.2.2.2. Mealtime Practices and Food Neophobia .......... 186

5.1.2.2.2.3. Mealtime Practices and Infant Feeding Disorders 190

5.1.3. Rationale for Study Four ....................................................... 192

5.1.4. Hypotheses for Study Four .................................................... 193

5.2. Method ...................................................................................... 194

5.2.1. Participants .......................................................................... 194

5.2.2. Procedure ............................................................................. 194

5.2.2.1. Measures ........................................................................... 196

5.2.2.1.1. Child Measures ............................................................. 196

5.2.2.1.2. Parent Measures .......................................................... 199

5.2.2.1.3. Developmental History Survey .................................... 201

5.3. Results ..................................................................................... 201

5.3.1. Statistical Analysis ................................................................. 201

5.3.1.1. Descriptive Statistics ......................................................... 201

5.3.1.2. Psychological Correlates of Selective Eating ................. 202

5.3.1.2.1. Child Factors ............................................................... 203

5.3.1.2.2. Parent Factors .............................................................. 204

5.3.1.3. Frequency Analysis of Parent Survey of Developmental History Data ........................................... 204

5.4. Discussion ................................................................................. 206

5.4.1. Parent Survey on Developmental History ......................... 216

5.5. Summary .................................................................................. 219
Chapter 6. Discussion of the Main Findings of this Thesis ........................................ 224

6.1. Overview ........................................................................................................... 224

6.2. Summary of the Main Findings ........................................................................ 224

6.3. Strengths and Implications .............................................................................. 230

6.4. Limitations and Future Research Directions .................................................. 231

6.5. Conclusion ....................................................................................................... 233

References ............................................................................................................. 235

Appendix A: ........................................................................................................... 292

Appendix B: ........................................................................................................... 294

Appendix C: ........................................................................................................... 295

Appendix D: ........................................................................................................... 299

Appendix E: ........................................................................................................... 312
**List of Tables**

1. **Table 1.** Criteria for Selective Eating .......................................................... 18
2. **Table 2.** Range of Terms used in Studies Investigating Avoidant/Restrictive Eating .......................................................... 21
3. **Table 3.** Common Causes of Insufficient Calorie Intake in Infants ............... 25
4. **Table 4.** DSM IV Criteria for Feeding Disorder of Infancy and Early Childhood … 26
5. **Table 5.** Categories of Feeding Disorders in Infancy and Early Childhood .... 28
6. **Table 6.** The Great Ormond Street Criteria for Childhood Eating Disorders … 31
7. **Table 7.** Diagnostic Criteria for Avoidant/Restrictive Food Intake Disorder (ARFID) .......................................................... 34
8. **Table 8.** Definitions of Picky Eating .......................................................... 57
9. **Table 9.** Studies Investigating Parent-Perceived Prevalence of Avoidant/Restrictive Eating .......................................................... 66
10. **Table 10.** Summary of Longitudinal Studies Investigating Parent-Perceived Age Effect of Avoidant/Restrictive Eating .......................................................... 74
11. **Table 11.** The Food Neophobia Scale .......................................................... 77
12. **Table 12.** Summary of Studies Investigating the Association Between Gender and Avoidant/Restrictive Eating .......................................................... 79
13. **Table 13.** Food Fussiness items on the CEBQ .................................................. 84
14. **Table 14.** FF Scale Scores on the CEBQ with Associated Percentile Ranks and Classification Ranges .......................................................... 86
15. **Table 15.** Frequency (%) of Different Severity Levels of Selective Eating Evident Across Age .......................................................... 88
16. **Table 16.** Frequency (%) of Males and Females at Different Severity Levels of Selective Eating .......................................................... 89
Table 17. Healthy Eating Index-2005 Coding Recommendations to Differentiate Between Foods ................................................................. 109

Table 18. Comparison of Dietitian Ratings of Nutritional Status with Parent Report of Avoidant/Restrictive Eating (FF Score) ........................................ 111

Table 19. BMI and Associated Malnutrition Levels ........................................ 118

Table 20. Assessment of the Development of Nutritional Deficiency .............. 126

Table 21. Sensitivity, Specify and Accuracy Percentages for Variety Ratings and Missing Food Scores ................................................................. 148

Table 22. Recommended Variety Scores to Identify AFRID and Selective Eating for Clinical and Research Purposes .............................................. 154

Table 23. Psychological Factors Associated with Avoidant/Restrictive Eating Patterns in Children ................................................................. 192

Table 24. Parent Survey Regarding Developmental History ............................ 202

Table 25. Descriptive Statistics for Clinical and Control Groups ..................... 202

Table 26. Comparisons Between Selective Eaters and Normal Eaters on Psychological Variables ................................................................. 205

Table 27. Frequency Analysis of Developmental History Survey Data ............ 206

List of Figures

Figure 1. Normal distribution curve, mean and standard deviation for the FF Score... 86

Figure 2. Formula used to calculate Sensitivity, Specificity, Positive Predictive Value (PPV), Negative Predictive Value (NPV), and Accuracy Values (Buderer, 1996) ........................................................................................................ 147

Figure 3. Sensitivity, Specificity and Accuracy percentages for different Food Variety Scores. .......................................................................................... 149
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Statement of Candidature Contribution

I declare that this thesis is my own work and does not include material from published sources without proper acknowledgement.

Carol Smith (Candidate) 19/5/2018
Date

Mr Neil McLean (Supervisor) 21/05/18
Date
Chapter 1. Introduction

1.1. Eating Disorders in Children

Eating problems in childhood and adolescence are recognized as a major public health issue. Eating problems in the early stage of life may impact on the growth of children due to nutritional insufficiency, can influence childhood emotional development and can cause high anxiety for parents and carers. Eating disorders are commonly understood as disorders in which there is excessive concern about body weight and shape accompanied by highly restricted food intake, with anorexia nervosa (AN) and bulimia nervosa (BN) typical of these disorders. The prevalence of AN and BN presenting in childhood (defined as the onset before age 13 years) is rare at 3/100 000 (Nicholls, Lynn, & Viner, 2011). Lask and Bryant-Waugh (2013) note that there are major challenges in assessing eating difficulties in children, a consequence of the limited number of psychometrically sound and standardised instruments and related to the cognitive competencies of children. In a review of the assessment of paediatric eating disorders (Nicholas, 2013) commented that assessment is arguably the most complex aspect of working in childhood eating disorders, as it requires an understanding of the complex interplay of multiple factors with the additional challenge of having to engage a younger client group in a way that enables insight into their internal world. A number of age-adapted self-report questionnaires for assessment of paediatric eating disorders are available (Bryant-Waugh, Cooper, Taylor, & Lask, 1996; Franko et al., 2004) however diagnosing eating disorders and assessing complex features (e.g. undue influence of shape or weight on self-evaluation) benefit from examination by a trained interviewer (Hilbert et al., 2013). Consequently, most information about children with eating disorders such as AN and BN has been derived from clinical case reviews from specialized settings (e.g. Lazaro, Moreno, Baos, &
However, there are a number of other types of eating disturbances in children that are equally clinically significant, that have also been difficult to assess and identify, and up until recently had not been formally defined or recognized. These children are excessively preoccupied with eating and avoiding food or restricting their food intake, but are diagnostically distinct from those with disorders such as AN and BN, as there is no evidence of fear of weight gain or irrational cognitions associated with body weight or shape.

Children who eat a severely restricted range of foods in their diet and who are also unwilling to try new foods may be referred to as selective eaters. The term selective eating was used by Lask and Bryant-Waugh (2000), who outlined diagnostic criteria outlined in Table 1.

Table 1

<table>
<thead>
<tr>
<th>Criteria for Selective Eating</th>
</tr>
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<tbody>
<tr>
<td>• Eating a narrow range of foods for at least two years,</td>
</tr>
<tr>
<td>• Unwillingness to try new foods,</td>
</tr>
<tr>
<td>• No abnormal cognitions regarding weight or shape,</td>
</tr>
<tr>
<td>• No fear of choking or vomiting, and</td>
</tr>
<tr>
<td>• Weight may be low, normal or high.</td>
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Selective eating is a term used to describe those children who limit their food intake, and specifically eat a very narrow range of preferred foods (Nicholls et al., 2001; Bryant-Waugh, 2013). Their weight may be unaffected as they may eat normal amounts, but there is a strong preference for certain foods. Although selective eating usually occurs in children of primary school age or middle childhood, the pattern of
selective eating can start in infancy or early childhood (Nicholls et al., 2001). There is limited empirical research investigating the course and age effects of selective eating, but the clinical impression has been that for many children the problem will resolve with time (Lask & Bryant-Waugh, 2013). However, for a significant minority of children the avoidant/restrictive eating problems can persist into adolescence and adulthood (Van Tine, McNicholas, Safer, & Agras, 2017) and may be associated with family conflict, a range of social problems and significant impairments to development and functioning (Nicholls et al., 2001; Lask & Bryant-Waugh, 2013). For these individuals it is thought that a number of factors may be at play including anxiety (obsessive compulsive disorder, food phobias, and fears of choking or dying), sensory problems, behavioural difficulties, and systemic or family factors (Farrow & Coulthard, 2012; Nicholls et al., 2001; Timimi, Douglas, & Tsiftsopoulou, 1997; Williams, Gibbons, & Schreck, 2005).

The term selective eating has been commonly used to describe children with the type of avoidant/restrictive eating patterns as defined above, however a number of other terms, definitions and diagnostic categories of avoidant/restrictive eating patterns have also been presented over the years, which highlight key diagnostic dilemmas in the field, which is presented below.

1.2. Diagnostic Issues

The nature and diagnosis of those avoidant/restrictive eating disorders found in childhood, which are not associated with weight and shape concerns, has caused debate and confusion over the years. Firstly, there is confusion in the literature regarding the terminology used to describe avoidant/restrictive patterns of eating in children, and a variety of interchangeable terms are often used. Variation in the language used is due, in part, to the variety of different professions involved in the treatment of children with eating problems, for example doctors, psychologists, dietitians, speech pathologists,
occupational therapists and physiotherapists. The variety and complexity of avoidant/restrictive eating problems in children has undoubtedly also contributed to this problem. Until the publication of the Diagnostic and Statistical Manual of Mental Disorders, fifth edition (DSM-5; American Psychiatric Association, 2013), no single classification system existed that described avoidant/restrictive eating patterns in children that was widely accepted and used by clinicians from different disciplines. This group of children was not well defined, and tended to be relegated to the “unspecified” diagnostic category of eating disorders, or if they met criteria for onset before age six, they were classified as having a feeding disorder. The publication of the DSM-5 has come a long way to providing a structured diagnostic criteria these types of eating problems, and has already provided a sound basis for increased research in the area. However, prior to DSM-5 a wide range of terms were employed to describe avoidant/restrictive eating and are outlined in Table 2. The plethora of terms used to describe avoidant/restrictive eating led to confusion with different labels being used to describe essentially the same eating patterns (e.g. fussy eating; picky eating; faddy eaters; choosey eaters), while other labels picked up on different and specific etiological theories of the problem (e.g. sensory food aversion; food phobia).

Not only has there been confusion in the area due to the array of various terms used to describe the problem, there has also been confusion that relates to the challenge of determining when avoidant/restrictive eating is part of a developmental stage or a more problematic pattern. Eating is, to an extent, a learned behaviour and children are experimenting with new tastes and textures and also testing out parental boundaries regarding food choices. Therefore, aspects of avoidant/restrictive eating have been seen as part of a phase that the child may grow out of (Birch, 1999; Birch & Fisher, 1998; Birch, Johnston, & Fisher, 1995). However, there is no clear understanding of when developmentally normal eating issues and challenges becomes pathological.
Finally, to add to the confusion, there is a lack of standardized protocols for the assessment of avoidant/restrictive eating disorders in childhood. This is not surprising given the problems with definition and terminology, as accurate assessment of the issue goes hand in hand with the development of a clear definition or diagnosis. So, in summary there have been long standing problems with terminology, differentiation between clinical and non-clinical presentations and measurement in the field of selective eating.

Table 2

*The Range of Terms used in Studies Investigating Avoidant/Restrictive Eating*

<table>
<thead>
<tr>
<th>Study</th>
<th>Term used</th>
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<tbody>
<tr>
<td>Rydell, Dahl, &amp; Suderlin, 1995</td>
<td>choosy eaters</td>
</tr>
<tr>
<td>Fox &amp; Joughin, 2001</td>
<td>extreme faddiness</td>
</tr>
<tr>
<td>Lask &amp; Bryant-Waugh, 1992</td>
<td>faddy eaters</td>
</tr>
<tr>
<td>Kessler &amp; Dawson, 1999</td>
<td>failure to thrive</td>
</tr>
<tr>
<td>Siegel, 1982</td>
<td>food aversion</td>
</tr>
<tr>
<td>Nicholls, Chater, &amp; Lask 2000</td>
<td>food avoidance emotional disorder</td>
</tr>
<tr>
<td>Pliner &amp; Hobden, 1992</td>
<td>food neophobia</td>
</tr>
<tr>
<td>Singer, Ambuel, Wade, &amp; Jaffe, 1992</td>
<td>food phobia</td>
</tr>
<tr>
<td>Diagnostic Classification of Mental Health and Developmental Disorders of Infancy and Early Childhood - DC: 0 - 3R, 2007</td>
<td>food refusal</td>
</tr>
<tr>
<td>Cermak, Curtin, &amp; Bandini, 2010</td>
<td>food selectivity</td>
</tr>
<tr>
<td>Wardle, Sanderson, Leigh, Gibson, &amp; Rapoport, 2001</td>
<td>fussy eaters</td>
</tr>
<tr>
<td>McDermott et al., 2008</td>
<td>irregular eaters</td>
</tr>
<tr>
<td>Becker, Thomas, &amp; Pike, 2009</td>
<td>non-fat phobic anorexia nervosa</td>
</tr>
<tr>
<td>Galloway, Lee, &amp; Birch, 2003</td>
<td>picky eaters</td>
</tr>
<tr>
<td>Sanders, Patel, Le Grice, &amp; Shepherd, 1993</td>
<td>problem eaters</td>
</tr>
<tr>
<td>Nicholls, Chater, &amp; Lask., 2000</td>
<td>selective eaters</td>
</tr>
<tr>
<td>Chattoor, 1997</td>
<td>sensory food aversion</td>
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One of the main aims of this thesis is to address the issue of diagnosis and assessment selective eating. In order to understand the current diagnostic and assessment problems associated with selective eating patterns in childhood, it is important to outline the diagnostic history of these types of childhood eating disorders, as it serves to highlight the challenges in the field.

1.2.1. Diagnostic History of Avoidant/Restrictive Eating Disorders in Childhood and Infancy

The first description of children who had a severely limited food intake focused on those children and infants in the 0-3 year age group with failure to thrive (FTT), the label first used to describe infants and children whose limited food intake resulted in nutritional deficiency. The concept of FTT has its origins in Holt’s (1899) Diseases of Infancy and Childhood. Holt described this apparent chronic disorder of children:

“The history in severe cases is strikingly uniform. The following is the story most frequently told. At birth the infant was plump and well-nourished and continued to thrive for a month or six weeks while the mother was nursing him; at the end of that period, circumstance made weaning necessary. From that time on the child ceased to thrive [emphasis added]. He began to lose weight and strength, at first slowly, then rapidly, in spite of the fact that every known infant food was tried. As a last resort the child, wasted to a skeleton, is brought to the hospital.” (cited in Kessler & Dawson, 1999, p. 7).

Holt’s description of the problem implied that a strong etiological factor was early weaning. In later editions of his book, Holt added that “congenital weakness of constitution” may also be an etiological factor of the condition, indicating inherent organic factors might also be at play. The condition described by Holt did not immediately become known as FTT, and other terms were used to describe such infants, including labels such as “chronic nutritional disturbance” (as cited in Smith &
Berenberg, 1970) which focused on the consequences of the eating dysfunction. However by the 1960’s, the term FTT was part of common paediatric vernacular.

Whilst FTT was the term often used by clinicians to describe feeding problems in infancy, the first description of the problem as a formal psychiatric diagnosis appeared in 1992, and used the term feeding disorder of infancy and early childhood (International Classification for Mental and Behavioural Disorders, 10th Edition; ICD 10, World Health Organisation, 1992), and then shortly after in the fourth edition of the Diagnostic and Statistical Manual for Mental Health Disorders (DSM-IV; American Psychiatric Association, 1994). This diagnosis referred to those infants and young children who ate a severely restricted diet which resulted in weight loss or failure to gain weight or grow. The DSM IV diagnostic criteria for feeding disorder of infancy and early childhood is listed Table 4. In the ICD 10 there is a stipulation requiring the absence of an organic disease, however an important difference between ICD 10 and DSM IV classification systems is the ICD 10 does not require significant weight loss to meet criteria. The ICD 10 describes Feeding Disorder of Infancy and Childhood as:

A feeding disorder of varying manifestations usually specific to infancy and early childhood. It generally involves food refusal and extreme faddiness in the presence of an adequate food supply, a reasonably competent caregiver, and the absence of organic disease. There may or may not be associated rumination (repeated regurgitation without nausea or gastrointestinal illness).


Utilising the ICD 10 classification, selective eating may have met diagnostic criteria, but the same pattern of eating would not have met DSMIV criteria. This is because whereas ICD 10 did not require weight loss, DSMIV did. The criteria for
feeding disorder of infancy in early childhood generally applied to a limited number
children mainly because it excluded presentations associated with a medical condition,
and it also required weight loss. In categorizing feeding disorders of infancy and
childhood in this way, the diagnosis did not accurately capture the complexity or range
of the issue, and did not describe the majority of children referred for feeding problems.
Williams, Riegal, & Kerwin (2009) found that of 234 children being treated at a feeding
disorders program; only 8% met the criteria for feeding disorder of infancy in early
childhood. Those children not meeting criteria were excluded primarily on the basis of
either a medical condition being present or no associated weight loss. Thus, the issue
with this diagnostic category was that it was too narrow and excluded the majority of
children presenting with feeding and eating problems.

Both the DSM IV and ICD 10 have been criticized for containing an excessively
large number of over-specified diagnoses, such as feeding disorder of infancy in early
childhood, leading to artificially high rates of co-morbidity and frequent use of the
uninformative “not otherwise specified” and “other” categories (Uher & Rutter, 2012).
The main problem with the category of feeding disorder of infancy in early childhood
was that it did not capture the apparent bio-psycho-social complexity of eating disorders
in childhood. One study looked at the biological, neurological and behavioural
characteristics associated with feeding problems (Burklow, Phelps, Schultz, McConnell,
& Rudolph, 1998) and concluded that the presentations could be classified according to
1) structural: anatomic abnormalities of the structures associated with eating and
feeding, e.g. defects associated with Pierre-Robin syndrome such as retrognathic jaw,
cleft palate and posterior tongue placement, macroglossia, tracheotomy, esophageal
strictures or stenosis; 2) neurological: associated with central nervous system insult or
musculoskeletal disorders, e.g. cerebral palsy, muscular dystrophies, cranial nerve
dysfunction, mental retardation/developmental disabilities, brain stem injury, pervasive
### Table 3

**Common Causes of Insufficient Calorie Intake in Infants**

<table>
<thead>
<tr>
<th>Cause</th>
<th>Examples of the cause</th>
</tr>
</thead>
</table>
| Psychosocial problems                | • Poor or inappropriate diet for age (e.g., excessive intake of fruit juice)  
• Poverty or financial stressors leading to food shortage  
• Parental neglect  
• Improper formula preparation (diluted or over concentrated)  
• Food fads and special diets (e.g., applying diets appropriate for adults at risk of cardiovascular disease to children)  
• Behaviour problems in the child (e.g., misbehaviour at meal times, which can lead to power conflicts and tension resulting in inadequate feeding)  
• Oral aversion, which may result from texture issues or occur after an illness during which the child was not fed orally  
• Food phobia, perhaps following a choking episode  
• Parental mental health problems (e.g., post-partum depression)  
• Parental eating disorders (e.g., anorexia nervosa)                                                                                                                                                                                                                                                                 |
| Anatomic problems - causing mechanical feeding difficulties | • Congenital anomalies, such as cleft palate, retrognathia, or macroglossia  
• Oromotor dysfunction from a neurologic problem, such as hypotonia, cranial nerve palsy, Arnold-Chiari malformation, or neuromuscular weakness  
• Oral or oesophageal trauma, infection, or neoplasm  
• Pain from dental caries  
• Severe gastroesophageal reflux  
• Gastrointestinal obstruction, such as pyloric stenosis  
• Abdominal pain and anorexia from lead poisoning                                                                                                                                                                                                                                                                 |
| Inability to utilize calories ingested - which may be a result of malabsorption due to: | • Cow’s milk protein allergy  
• Cystic fibrosis  
• Other causes of pancreatic insufficiency  
• Celiac disease  
• Biliary atresia  
• Necrotizing enterocolitis or short-gut syndrome  
• Inflammatory bowel disease  
• Liver disease  
• Chronic diarrhoea  
• Disaccharidase deficiency  
• Improper utilization due to inborn errors in metabolism (e.g., amino acidopathies)  
• Storage disorders  
• Growth hormone deficiency (leading to failure to grow at the correct rate)                                                                                                                                                                                                                                                                 |
| Increased metabolic needs due to:    | • Prematurity  
• Recurrent infections  
• Chronic infections (e.g., human immunodeficiency virus (HIV) disease or tuberculosis)  
• Endocrine disorders (e.g., hyperthyroidism or growth hormone deficiency)  
• Cardiac disorders (e.g., congenital heart defects or congestive heart failure)  
• Pulmonary disorders (e.g., chronic lung disease, bronchopulmonary dysplasia, or poorly controlled asthma)  
• Malignancy  
• Renal disease (e.g., chronic renal failure or renal tubular acidosis)  
• Chronic liver disease  
• Child abuse  
• Diabetes insipidus  
• Rickets                                                                                                                                                                                                                                                                 |

Table 4

DSM IV Criteria for Feeding Disorder of Infancy and Early Childhood.

1. Feeding disturbance as manifested by persistent failure to eat adequately with significant failure to gain weight or significant loss of weight over at least 1 month.
2. The disturbance is not due to an associated gastrointestinal or other general medical condition (e.g., oesophageal reflux).
3. The disturbance is not better accounted for by another mental disorder or by lack of available food.
4. The onset is before age 6 years.

Note: Adapted from: Diagnostic and Statistical Manual of Mental Disorders, 4th edition. Copyright 2000, American Psychiatric Association.

developmental disorder; and 3) behavioural: poor environmental stimulation, dysfunctional feeder-child interaction, negative feeding behaviours shaped and maintained by internal and/or external reinforcement, and/or emotionally based difficulties, e.g. phobias, conditioned emotional reactions, depression, elements. Using this classification, the authors found that varying combinations were evident in children with feeding disorders: structural-behavioural-neurological (30%); neurological-behavioural (27%); behavioural (12%); structural-behavioural (9%); and structural-neurological (8%). This indicated that a large majority of children with feeding disorders had a neurological and/or structural component (74%) but also that there was also a behavioural element in 78% of presentations. This study serves to highlight the multifactorial understanding of the issue and the evolution from dichotomous organic and non-organic conceptualisations. To add to this complexity, it is possible that the child may have experienced a medical condition early in their life that had resolved, but the feeding difficulties may persist and be maintained by other psychological factors such as anxiety. In addition, the application of the term non-organic does not always indicate strict exclusion of medical or physical components. For example, Reilly and colleagues reported that a significant proportion of children (38%) diagnosed with non-
organic FTT (that is thought to have no underlying medical or biological condition) were found to have oral-motor dysfunction (Reilly, Skuse, Wolke, & Stevenson, 1999).

As a consequence of these diagnostic limitations, feeding disorder of infancy in early childhood was a category that was rarely applied, and offered little value for research purposes (Kenney & Walsh, 2013). Indeed Kenny and Walsh noted that in a PubMed search using this diagnostic term, no publications were identified within the previous 10 years. Subsequently there was almost no information on the characteristics of the children who had the diagnosis. The problems associated with the diagnosis meant that there was no accepted means of validly and reliably classifying childhood feeding disorders. This made it difficult to compare children’s outcomes or responses to treatment across studies, and as a result little research was reported.

1.2.2. Alternative Diagnostic Categories

In the absence of useful diagnostic criteria a number of researchers developed alternative, more descriptive, classification systems. The various proposals differed in terms of the emphasis on parent/child interactions and the proposal of sub-types of eating disorders based on apparent etiological pathways. A classification initially developed by Chatoor and colleagues (Chatoor, 1997; Chatoor, Dickson, Schaefer, & Egan, 1985), and further developed by the Work Group for the Diagnostic Classification of Psychopathology in Infants and Preschool Children and adopted by Diagnostic Classification of Mental Health and Developmental Disorder of Infancy and Early Childhood (DC: 0-3R, 2005), sub-classifies feeding disorders and encompassed a broader understanding of the etiology of these disorders. This classification system has a psychiatric focus, and emphasizes aspects of the parent/child interaction, and is outlined in Table 5.
Table 5

Categories of Feeding Disorders in Infancy and Early Childhood

| 1. Feeding disorder of state regulation (onset during newborn period). |
| 2. Feeding disorder of reciprocity (onset between 2 and 6 months). |
| 3. Infantile anorexia (onset during the transition to spoon and self-feeding). |
| 4. Sensory food aversions (onset during transitions to solid foods). |
| 5. Feeding disorder associated with concurrent medical condition. |

Note: Adapted from: Diagnostic Classification of Mental Health and Developmental Disorder of Infancy and Early Childhood, DC: 0-3R, 2005.

The first category, feeding disorder of state regulation, refers to those infants who have difficulty reaching and maintaining a state of calm alertness for feeding; they are either too sleepy or too agitated to feed. This is based on the idea that to feed successfully an infant must develop cycles of sleep, wakefulness, feeding and elimination, and for this to occur the caregiver must read the infants signals and respond contingently. The second category of feeding disorder of reciprocity refers to child neglect with major disturbances in the parent/infant relationship and is often associated with caregiver psychological disturbance. Infantile anorexia is considered to occur between the age of 6 months and three years of age, when the infant progresses through the developmental phase characterized by separation and individuation. Issues of independence and dependency are thought to be played out daily in the feeding situation. It is proposed that these developmental processes need to be worked through successfully by the parent/infant dyad. It was found that toddlers with infantile anorexia in general demonstrated less dyadic reciprocity, less maternal contingency, more dyadic conflict, and more struggle for control than healthy eaters (Chatoor, Egan, Getson, Menvielle, & O’Donnell, 1988; Chatoor, Ganiban, Hirsch, Borman-Spurrell, & Mrazek, 2000;).
These categories suggest that feeding disorders may be understood in a relational context, and that feeding difficulties may arise as a result of disruptions in the attachment and attunement between parent and child. This relational conceptualisation is an important addition to the multifactorial understanding of childhood eating disorders, however it is important to emphasise that psychological elements may be only part of the picture, as this can reduce stigma to parents. Psychological factors such as parental psychopathology, attachment patterns and infant temperament may serve to interact with biological and medical factors in complex ways and it is important to hold many different etiological pathways in mind.

In this schema, the category of sensory food aversions describes children who refuse to eat specific foods with certain textures, tastes, smells or appearances, and tends to surface as the child is introduced to “finger food”. Whilst this type of feeding disorder focuses on child factors (e.g. sensory processes) as being a major contributor to the problem, it is possible that difficulties in the parent/child relationship may also serve to interact with sensory factors and thereby serve to maintain the problem. In this situation, when certain foods are placed in the infant’s mouth, the infant may grimace, gag or vomit. After this type of aversive reaction, the infant may refuse to continue to eat the food and become distressed if forced to do so. This can become a challenge for the parent, and more so if there are issues in the attachment relationship. Some infants are thought to generalize their reluctance to eat one food to other foods that look or smell similarly (e.g. aversion to spinach may generalize to an aversion for all green vegetables). The category of feeding disorder associated with a medical condition refers to eating difficulties as a result of medical issues such as reflux, food allergies, and respiratory distress. And finally, post-traumatic feeding disorder develops following frightening or traumatic events associated with eating or food. Events that may trigger a traumatic response include choking, severe vomiting, and insertion of naso-gastric
tubes. Reminders of the traumatic event (e.g. bib, bottle, and/or spoon) can cause distress. The child may resist being fed by crying, arching and refusing to open their mouths. Infants and toddlers with this condition have been found to experience the most intense feeding resistance (Chatoor, Ganiban, Harrison, & Hirsch, 2001). These same categories as proposed by Chatoor et al., (2001) were adopted under the heading behavioural feeding disorders in the diagnostic manual for the zero to three age group: Diagnostic Classification of Mental Health and Developmental Disorders of Infancy and Early Childhood, (DC: 0-3) in 1994, and then again in the revised version (DC: 0-3R), in 2005.

A recent Italian study indicated that three of the subtypes suggested in DC 0-3R are valid and useful on the basis of evidence that they capture clearly discriminable patterns of eating behaviour and associated features (Lucarelli, Cimino, D’Olimpio, & Ammaniti, 2013). In this study 147 mother-child dyads (with an average age of 24 months) were diagnosed via clinical interview into one of three DC: 0-3R categories: infantile anorexia; sensory food aversions, and; feeding disorder associated with the gastro-intestinal tract insult. Each dyad was then assessed in areas of the quality of interactional patterns during feeding (observational measure and parent questionnaire); the child’s temperament and emotional functioning (via parent questionnaires); maternal psychological functioning and eating attitudes (via parent questionnaire and semi structured interview of the parent). This research found that each subtype could be differentiated on the basis of these measures providing preliminary support for the notion of subtypes of childhood feeding disorders (Lucarelli et al., 2013). This study is important as it is one of the very few studies to provide data to validate subtypes of feeding disorders.

The Great Ormond Street criteria is a classification system applied to eating disorders in children and young adolescents (Lask & Bryant-Waugh, 1992; Nicholls et
The Great Ormond Street criteria was an attempt to classify all eating disorders seen in childhood and adolescence, and as well the more widely known disorders such as AN and BN. These authors also listed criteria for the classification of selective eating and their discussion remains the most detailed description of issue. They provided diagnostic criteria for eight eating disorders in children and adolescents, presented in Table 6.

Table 6
The Great Ormond Street Criteria for Childhood Eating Disorders

1. Anorexia Nervosa (AN).
2. Bulimia Nervosa (BN).
3. Food Avoidance Emotional Disorder (FAED): Need to demonstrate an emotional disorder such as anxiety or depression in association with the food avoidance.
4. Selective Eating: Eat a narrow range of foods and are unwilling to try new foods. Weight is usually normal.
5. Restrictive Eating: Eat a wide range of foods but only in small amounts and tend to be of low weight.
6. Food Refusal: Food refusal is defined as episodic.
7. Functional Dysphagia. Show marked food avoidance and fear of swallowing or choking or vomiting, which may be triggered by an adverse event in the past (e.g. choking incident)
8. Pervasive Refusal Syndrome (PRS). Children who refuse to eat, drink, walk, talk or care for themselves. In this serious condition the refusal extends to all areas of social and personal functioning.


Food avoidance emotional disorder (FAED) deserves mention. FAED is experienced by children who are troubled by emotional problems such as anxiety or grief, but the presenting concern is apparent lack of appetite and/or weight loss. This
term was introduced to describe those children who had an inadequate overall food intake and emotional disturbance, but did not meet criteria for anorexia nervosa, on the basis that there were no distortion of cognitions associated with weight or shape, and no fear of fat (Higgs, Goodyear, & Birch, 1989). Food avoidance emotional disorder is commonly associated with middle childhood and in those children with a history of physical illness, or medically unexplained symptoms, suggesting that for some individuals FAED may be part of a somatoform condition (Kreipe & Palomaki, 2012). Food avoidance emotional disorder can also be part of a clinical picture that includes school refusal (Lask & Bryant-Waugh, 2013). In addition, FAED is not necessarily characterised by a restricted range of food, but more a lack of appetite which may results in small portion sizes. Selective eating is the term used by a number of authors that refers to eating a very restricted range of foods and is thought to be different to FAED as it is not necessarily associated with a significant emotional issue.

In the context of ongoing concerns regarding diagnostic difficulties in avoidant/restrictive childhood eating disorders, and prior to DSM 5, Bryant-Waugh and colleagues (Bryant-Waugh, Markham, Kreipe, & Walsh, 2010) suggested a classification system that could differentiate various subtypes of the disorder. (i.e. Great Ormond Street Criteria, Nicholls et al., 2000; Diagnostic Classification of Mental Health and Developmental Disorder of Infancy and Early Childhood; DC: 0-3R, 2005). The proposed classification system described three subtypes: 1) inadequate food intake, thought to include presentations based on co-morbid mood difficulties such as FEAD, 2) restricted range of intake; food avoidance based on sensory aversions to food and included selective eating and 3) food avoidance due to a specific fear or phobia.

By separating and re-defining the so-called childhood eating disorder subtypes, these alternative classification systems reflect a range of clinical presentations. Broadly speaking these different subtypes attempt to capture differing etiological emphasis
based on medical, functional, emotional/behavioural, or relational factors. The major benefit of differentiating the various sub-types lies in being able to target interventions more effectively. However, the problem may lie in the possible overlap between sub-types, with individuals having multiple factors playing a role in their condition, therefore the specified treatments may not be as efficacious as is hoped. In order for sub-types of eating disorders to be useful the sub-types, including selective eating, need to be well understood and defined. This is not the case currently.

Previous attempts to differentiate subtypes of childhood eating disorders have been impeded by a lack of well-defined and universally accepted overarching framework, from which the sub-types are formed. The DSM-5 has attempted to address this problem with the introduction of the ARFID criteria, and subsequently the issue of ARFID subtypes, such as selective eating is likely to become clearer with increased research in the area. Thus, the conceptualization of ARFID represents an important springboard from which research into sub-types, such as selective eating, can develop.

1.2.3. Avoidant/Restrictive Food Intake Disorder (ARFID)

The diagnostic category of ARFID, first described in the DSM-5 has largely rectified the problems associated with the feeding disorder of infancy and childhood diagnosis. ARFID attempts to capture the complexity of childhood eating disorders and acknowledges that multiple factors including medical, biological, psychosocial, economic and behavioural problems may affect a child’s eating. Whilst the ARFID diagnosis includes individuals who demonstrate disturbed eating that results in weight loss or inadequate growth, this is not an essential criterion, and there is no exclusion based on medical criteria. ARFID also applies to both adults and children. If the individual shows any one of the following indicators listed in Table 7, then they may qualify for a diagnosis of ARFID.
Table 7
Diagnostic Criteria for Avoidant/Restrictive Food Intake Disorder (ARFID)

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Indicators</th>
</tr>
</thead>
<tbody>
<tr>
<td>A significant disturbance in eating or feeding as manifested by persistent failure to meet appropriate nutritional and/or energy needs associated with at least one of the following:</td>
<td>• Significant weight loss (or for children failure to gain weight at expected rates)</td>
</tr>
<tr>
<td></td>
<td>• Significant nutritional deficiency</td>
</tr>
<tr>
<td></td>
<td>• Dependence on enteral feeding or oral supplements</td>
</tr>
<tr>
<td></td>
<td>• Marked interference with psychosocial functioning</td>
</tr>
</tbody>
</table>

Note. Adapted from the Diagnostic and Statistical Manual of Mental Disorders, 5th Edition. Copyright 2013 by the American Psychiatric Association.

Childhood eating problems cover a broad spectrum, ranging from mild presentations that do not result in compromise to health, to serious problems leading to malnutrition and the need for supplemental tube feeding and hospitalisation. The ARFID classification covers this range of feeding/eating problems. At the more complex and problematic end of the diagnostic spectrum are those children with severe feeding disorders typically associated with infancy and early childhood (0-5 years) and between 3-10% of these children may develop chronic feeding issues exceeding normal developmental variation (Sharp, Jaquess, Morton, & Hertzinger, 2010). These types of feeding problems tend to be associated with a number of negative medical and developmental outcomes, such as growth retardation, poor academic achievement, social difficulties, invasive medical procedures (e.g. placement of a feeding tube) or death (Kerwin, 1999). Feeding problems of this severity usually involve a complex interplay of biological, psychological, social and environmental factors. Complex medical histories and/or developmental difficulties often co-occur with severe feeding difficulties of this nature. A systematic literature review of feeding difficulties (Sharp et al., 2010), found that developmental concerns such as autism spectrum disorder, global developmental delay, and speech and language issues accounted for 86% of cases, and medical concerns were reported in 68% of the sample. Treatment for these children
usually involves a combination of medical and behavioural programs often delivered in inpatient or day patient settings. Sharp et al., (2010) also identified a small subgroup of children (10.1%) who developed normally (that is with no medical or biological conditions) but also experience severe feeding problems. The severe feeding/eating problems seen in these children were thought to be more a consequence of psychological problems, and treatment focused on addressing difficulties in the parent-child relationship. Other feeding and eating problems described by ARFID and seen in clinical settings include: lack of interest in, or appetite for food; severely restricted range of foods eaten, absent or delayed eating skills, and distress associated with eating (Williams, Hendy, Belousov, Riegel, & Harclerode, 2014).

There is mounting evidence supporting the ARFID diagnosis. The ARFID category merges feeding and eating disorders and opens the classification to all age groups, including adults. This is useful in that it allows investigation of the developmental continuities between feeding disorders described young children and eating disorders associated with adolescents and adults children. The ARFID classification also captures children who would have previously attracted an unspecified diagnostic category using the DSM-IV criteria. (Williams et al., 2014; Ornstein et al., 2013). With the introduction of ARFID, the number of unspecified eating disorders has declined dramatically (Zimmerman & Fisher, 2017). The improved specificity was highlighted by a study that examined the records of 309 patients seen for eating disorder evaluations and assigning patients diagnosis based on both the DSM-IV and DSM-5 criteria. A diagnosis for eating disorder unspecified (EDNOS) was assigned to 198 patients (64.6%). This number dropped dramatically using the DSM-5 criteria. All except four EDNOS patients were reclassified using DSM-5 diagnosis, including 60 patients (30%), now diagnosed with ARFID (Fisher, Gonzalez, & Malizio, 2015). This provides reassuring prima facie evidence that ARFID is a useful and valid
categorization. Proposals have been made to incorporate the ARFID diagnosis in the upcoming ICD-11 (Uher & Rutter, 2012). These authors argued that ARFID is a useful categorization of childhood eating problems as it describes the spectrum of feeding and eating disorders across the age range. They also suggested that “a single classification applied across age groups and sensitive to developmental and culturally specific manifestations would more accurately describe and reflect the continuity between child, adolescent and adult manifestations than the current system” (Uher & Rutter, 2012, p. 82). Kreipe and Palomaki (2012) similarly commented that ARFID refers to “food intake” and “eating” rather than “feeding” and therefore it can be applied eating problems of older children. This feature of ARFID is relevant as it has been shown that some types of feeding disturbance seen in young children can persist into adolescence and adulthood (Jacobi, Schmitz & Agras, 2008; Marchi & Cohen, 1990; Mascola, Bryson, Agras, & Stewart, 2010). The ARFID classification cites examples such as lack of interest in food; sensory avoidance, and fear based avoidance behaviour but also indicates that ARFID “is not limited” to these presentations. In doing so it is argued that ARFID successfully broadens the diagnostic classification.

1.2.4. The Relationship between ARFID and Selective Eating

As noted within the group of eating patterns subsumed within ARFID there appear to be variants of eating presentations including selective eating. A study by Fisher et al. (2014) which highlights the heterogeneity of ARFID conducted a retrospective case review across seven adolescent medical clinics. Patients (n=712) presented for initial evaluations for eating disorders over a one year period, and 98 (13.8%) met criteria for ARFID. Among these patients, 28.7% had selective eating since early childhood, 21.4% experienced generalised anxiety, 19.4% had gastrointestinal symptoms, and 13.2% had a history of vomiting or choking.
A number of authors have attempted to capture this heterogeneity in the form of various classification categories. Norris and colleagues (2017) have used subtypes outlined by Bryant-Waugh et al., (2010) and proposed three ARFID subtypes:

1). ARFID-limited intake: Characterised by low intake, lack of interest in eating, difficulties with the physical act of eating/feeding (e.g. small bites, prolonged duration to finish meals). These individuals had relative energy deficiency manifested by weight loss, medical compromise and or inadequate growth, or growth stunting.

2). ARFID-limited variety: Characterised by a history of long-standing feeding problems (e.g. selective eating), sensory and/or texture issues, aversions related to food items, and/or profound rigidity involving the act of eating (e.g. food items cannot touch each other on the plate)

3). ARFID-aversive: These individuals are thought to have a history of nutritional avoidance that occurred or evolved as a result of a specific anxiety, event or fear (e.g. fear of choking, pain or nausea)

According to these proposed subtypes, selective eating comes under the subtype of ARFID-limited variety. Norris et al., (2017) conducted a retrospective chart review of 77 patients presenting at a paediatric hospital setting and were able to classify all patients into the three subtypes.

Subsequent comparisons between subgroups in terms of BMI, length of illness, gender, and the presence of mood, anxiety, externalising, and behavioural disorders was conducted. Results found that, ARFID-limited variety had significantly longer duration of illness in comparison ARFID aversive, however ARFID aversive patients were admitted to tertiary care more frequently than ARFID-limited variety.
A study aimed at developing a questionnaire (Eating Disturbances in Youth Questionnaire) designed to elucidate the various subtypes and reported on a factor structure supporting the existence of distinct subgroups (Kurz, van Dyck, Dremmel, Munsch, Hilbert, 2015). Specifically these authors highlighted distinctions between selective eating, FAED and functional dysphagia, which may be conceptualised as ARFID-limited variety, ARFID-limited intake and ARFID-aversive respectively. Evidence for the existence of these proposed subtypes is developing. The assessment and psychological nature of ARFID subtypes would benefit from further research to better determine whether the identification may aid in clinical diagnosis and understanding of areas of developmental trajectory, prognosis, treatment and outcome.

1.2.5. Continuum Theory of Eating Disorders

As noted, part of the issue with diagnosis, identification and research into the field of avoidant/restrictive eating are the problems associated with differentiating; developmentally normal avoidant/restrictive eating patterns, sub-clinical presentations, and disordered eating patterns meeting diagnostic criteria. The continuum model suggests that eating behaviours may be best thought of as falling on a continuum of severity with those individuals who eat normally and are asymptomatic at one end of the continuum, whilst those diagnosed with ARFID and presenting in clinical settings or requiring hospitalisation at the other extreme. The remainder of the continuum consists of those individuals who have differing levels of eating restriction and related problems.

A review of the literature reveals a wide range if terminology to describe selective eating behaviours with samples drawn from community, sub-clinical and clinical samples. Given the potential for confusion regarding terminology, some definition of the terms used in this paper is warranted. Selective eating refers to those children experiencing symptoms as described above (Table 1). Avoidant restrictive intake disorder (ARFID) refers to those children who have symptoms consistent with
the DSM5 diagnosis (Table 7). Avoidant/restrictive eating is an umbrella term that describes a range of avoidant/restrictive eating patterns that might be seen to fall on a continuum of severity. This term covers what have been viewed as developmentally normal presentations of eating problems (such as food neophobia and picky eating), sub-clinical presentations (those individuals who have disordered eating, but not to the degree that would warrant a diagnosis), and ARFID and its subtypes (including selective eating). Finally, when referring to a specific paper, the terminology used will be that used by the study authors.

1.3. Background to Selective Eating

Selective eating is a widely recognized but little studied phenomenon. Research in the area is hampered by the lack of a clear definition and no associated reliable and valid assessment guidelines. As a result of the limited research in the area of selective eating, the current project is exploratory and focuses on investigating the broad nature of selective eating. The following introductory literature review regarding selective eating is drawn from a number of divergent but related areas across a substantial time frame, and in doing so draws from studies using a variety of terms from both clinical and non-clinical populations as well as community and clinical settings.

The most comprehensive and specific studies of selective eating to date are in the form of retrospective case studies. Although there are limitations to this method of research including vulnerability of the data to subjective interpretation and delayed recall, the case study approach is suited for hypothesis generation which can then be tested using more rigorous scientific methods. The findings from these retrospective case studies provide a useful clinical description across a range of areas of the problem (e.g. patient characteristics, demographics and age of onset, range of foods eaten, family history, co-morbidities and physical symptoms), and are an excellent starting point for the present study. One aim of this thesis is to explore and extend findings from the
Nicholls et al., (2001) and Timimi et al., (1997) studies using empirically based research. Hypotheses developed from these two studies will form the basis of the current research. The fact that case study analysis currently represents the highest quality research in selective eating is indicative of the preliminary nature of research in the field.

1.3.1. What is Selective Eating?

A large number of pre-school children will, at some time in the first five years of their life, experience restricted eating patterns characterised by rejection of specific foods, both familiar and unfamiliar, resulting in a restricted variety of consumed food. (Carruth, Zeigler, Gordon, & Barr, 2004; Equit et al., 2013). The precise incidence of feeding disturbances is unclear, mainly due to problems with definition and inconsistencies in assessment. Research indicates that the rates of “fussy”, “picky” or “selective eating” vary between 5% and 37% in infants and preschool children, (Carruth, Ziegler, Gordon, & Barr, 2004; Dovey, Staples, Gibson, & Halford, 2008; Dubois, Farmer, Girard, Peterson, & Tatone-Takuda 2007; Equit et al., 2013; Jacobi, Agras, Bryson, Hammer, & Lawrence, 2003; Micali et al., 2011; Tharner et al., 2014).

Feeding difficulties in young children are one of the most common behavioural disturbances reported by parents of young children (Sanders et al., 1993). Parents of children with restrictive eating patterns report that their children consume a limited variety of foods, will not accept new food, insist that food be prepared in specific ways, express strong likes and dislikes for food, and demonstrate more tantrums around meals (Mascola et al., 2010). It has been found that for the majority of these children, it is a passing phase that reduces with age (Cardona Cano et al., 2015; Mascola et al., 2010). However, it is also evident that for a significant number of children their avoidant/restrictive pattern of eating is more severe and may be longer lasting, extending into middle childhood (Jacobi et al., 2003; 2008; Marchi & Cohen 1990;
Mascola et al., 2010; Nicholls et al., 2001; Timimi et al., 1997). Picky eating is also one of the few risk factors for AN validated from longitudinal research (Jacobi et al., 2003; 2008.

1.3.2. The Relationship with Age and Selective Eating

Evidence suggests that restrictive eating patterns start in infancy. Nicholls et al. (2001) found that 60% of selective eaters who presented for treatment had shown feeding difficulties in infancy (with breast feeding and weaning), 93.8% had experienced problems in the pre-school years (when solid textures are introduced), and the pattern of restriction was evident in all of this sample by primary school (at age 5, when a broad range of food is introduced). Timimi et al., 1997 provided a descriptive profile of 33 cases of children aged between 4 and 14 years, seen in two clinics over a four year period. They found that in 85% of selective eaters (n=33) the onset of feeding problems was prior to 18 months of age. Typically, the children were described as having difficulties once finger foods were introduced, leading the child to refuse chewy or lumpy food. Four of the 33 children had difficulties during breast feeding. Two children started selective eating later in life following a reportedly traumatic incident, one after an endoscopy and the other after swallowing a coin.

Nicholls et al., (2001) suggested that for a diagnosis of selective eating, the child must be older than seven years. This is not to say that the condition manifests for the first time at this age; indeed, the authors stated that a normal range of foods must never have been eaten; however, the selective eating symptoms must have persisted past the age of seven. Whilst it is not clearly articulated in the paper, this age requirement for diagnosis suggests that prior to age seven selective eating patterns although evident are not considered problematic. This implies that symptoms of selective eating up until age seven may be considered developmentally normal, or part of a developmental phase that the child may grow out of, and only when the child is seven may the problem be seen as
problematic. Nicholls et al., (2001) further suggested that “the longer selective eating persists the more likely it is to be accompanied by abnormalities in other areas of development”, (p. 268). Whilst this logic can be understood, this type of age classification is problematic. Typically, when assisting children with eating disturbances or indeed any psychiatric issue, the recommendation is the earlier the intervention the better. If there are children who are showing selective eating patterns during early childhood, then it may be better to intervene at this point, before the problem becomes further entrenched. Under the proposed age criteria for selective eating, these children would not be eligible for treatment until aged seven. However, if wanting to intervene prior to age seven years, the challenge is how to differentiate those children whose selective eating does not persist (sub-clinical levels of selective eating) from those where symptoms do persist into middle childhood and adolescence (clinical levels of selective eating). It is presently not clear if there is a difference between these two groups of children, and how they present in early childhood might predict the course of the problem. Currently, we are some way from being able to answer this question; however, determining how to differentiate between normal and problematic levels of avoidant/restrictive eating is a central issue for this project, and indeed the field.

1.3.3. Range of Food Eaten by Selective Eaters

Nicholls et al., (2001) noted that a cardinal feature of selective eating was observed with “remarkable consistency” across individuals (p. 260): the majority of foods consumed by selective eaters were based on carbohydrate and/or dairy products. The authors reported that it was common for selective eaters to be brand specific in their food choices e.g. only McDonalds’ chips. Parents reported that their children would avoid not only vegetables and various healthy foods, but also common “junk” foods such as pizza, cake or flavoured ice cream. Timimi et al., (1997) reported that selective eaters tend to be meticulous about the presentation of food, insisting that their food be
of a particular brand and presented in a particular manner. Some children reportedly could not tolerate one food touching another and refused to eat any items of food where this had occurred. Texture can be important, with some children unable to move on from the stage of eating puréed foods to lumpy foods (Chatoor, 2009), and in some cases only cold or hot foods are accepted. Certain food odours, for example cooking meat, can be highly aversive to these children, to the point where they cannot tolerate some foods being cooked in their homes (Cermak et al., 2010). This consistent pattern of consumption in selective eating suggests that there may be a physiological or sensory basis for the individuals’ rejection of certain foods, and that it is not simply about the individual child refusing healthy or less tasty (i.e. low sugar; low salt) options. This is an important observation as children with selective eating may be labelled as misbehaved or oppositional, and parents of these children may be thought of as too permissive or not being in charge enough at meal times. Parents of these children report feeling embarrassed when their children refuse to eat while dining with others. Parents also are reluctant to seek advice as they can feel blamed for their child’s eating behaviour (Smith, Roux, Naidoo, & Venter, 2005).

1.3.4. Sensory Processing Issues

Many selective eaters are thought to experience sensory processing problems and the restricted range of food and types of food eaten may be the result of sensory aversions to certain foods. Food choice can be related to the appearance, smell, texture, taste and/or temperature of the food (Amerine, Pangborn, & Roessler, 2013). This pattern of eating may be related to sensory integration difficulties, specifically sensory over-responsivity which is often cited as a cause for picky eating (Cermak et al., 2010; Chatoor, 2009; Farrow & Coulthard, 2012; Field, Garland, & Williams, 2003). It has been suggested that sensory sensitivity may lead children to restrict their intake of food to preferred, tolerable, and manageable textures.
Smith et al., (2005) studied children aged 3-10 years with and without a sensory phenomenon called tactile defensiveness and compared their eating habits. Individuals who showed tactile defensiveness demonstrated a heightened sensory reaction to sensations involving touch, including those sensations in the mouth. The authors reported that children who had tactile defensiveness, as measured by a parent report on the Sensory Profile Questionnaire (Dunn, 1999), had significantly different eating habits and food choices than children who scored in the normal range. The children with tactile defensiveness were reported to have a fair to poor appetite, hesitated to eat unfamiliar foods, did not eat at other people’s houses, and refused certain foods because of smell and temperature. They were also resistant to eating vegetables, with overall vegetable consumption being half that of children without tactile defensiveness. Children with tactile defensiveness also were reported to gag and bite their inner lips and cheeks when eating. Furthermore, when compared with children who did not show tactile defensiveness, children with tactile defensiveness ate a limited selection of foods and had a pronounced aversion towards food textures, smells and temperatures of foods. Oral defensiveness is a term used to describe a sensory processing difficulty that results in avoidance of certain textures of food and avoidance of activities using the mouth in general. The pattern of avoidance is unique to each child, for instance some children will avoid soft foods, whereas others will avoid food with a rough texture (Foster, Grigor, Cheong, Yoo, Bronlund, & Morgenstern, 2011).

1.3.5. Physical Characteristics of Selective Eaters

A major health consequence of childhood eating disorders is the possibility of weight loss due to inadequate food intake. Despite the fact that these selective eaters eat a highly restricted range of foods, it is not clear whether this has a significant impact on their weight. Jocobi, Schmitz, & Agras (2008) found that there were no differences in the Body Mass Index (BMI) of picky and non-picky eaters, and both groups fell within
expected age ranges. Likewise Carruth et al., (1998) found there were no significant differences in growth parameters between picky and non-picky eaters. Nicholls et al., (2001) also found that the average weight of the selective eaters was at the 50th percentile with height also falling within the average range. Children with restricted eating severe enough to be treated in hospital feeding clinics may also show normal weight (Williams et al., 2005), perhaps as they eat mostly starches and high calorie food (Schreck, Williams, & Smith, 2004) and are frequently prepared special meals to compensate for their restrictive eating (Hendy, Williams, Reigel, & Candace, 2010).

Research using clinical samples has found that avoidant/restrictive eaters are more at risk of low weight. Ekstein, Laniado, and Glick, (2010) found that picky eaters referred to a paediatric feeding and nutrition clinic, especially those aged under three years, were at more likely to be underweight when compared with a healthy eating control group. Research on children meeting ARFID criteria and presenting in eating disorder clinic has also found results indicting problems with low weight. One study investigating the physical characteristics of ARFID (Fisher et al. 2014) found that selective eating was associated with a below average BMI, and they cautioned that those patients with ARFID should be assessed in a similar way as patients with AN because they can be at risk of the same medical complications. Similarly, Timimi et al., (1997) concluded a significant minority of selective eaters had poor growth or weight gain, and a population based study of preschool children (n=1498) found that in comparison to non-picky eaters, picky eaters were more than twice as likely to be underweight. (Carruth et al., 2004). Finally, in a population cohort study the eating behaviours of 4987 four year olds, as assessed using the Child Eating Behaviour Questionnaire, found that scales of Food Fussiness, Emotional Undereating and Satiety Responsiveness were predictive of low BMI levels (Jansen et al., 2012). Recent retrospective chart analysis of ARFID patients presenting with severe difficulties at tertiary level eating disorder
programs often need hospitalisation for malnutrition. Cooney et al. (2017) reported that 57.6% of ARFID patients (n=386) needed hospitalisation after assessment, and similarly Norris et al. (2014) found that one-third of ARFID patients required hospital admission as a result of medical instability due to low weight.

Hence, the physical picture of the selective or avoidant eater is mixed. Some research suggests that selective eaters may be vulnerable to weight loss in certain circumstances. It may be that more severe cases of ARFID are characterised by low weight. It is also possible that selective eaters may eat more high energy foods (such as carbohydrates) rather than vegetables and fruits, and therefore may not be prone to being underweight. In line with this possibility, current descriptions of selective eating, as defined ARFID, do not require weight loss (or a lack of weight gain) for a diagnosis to be made.

1.3.6. Co-Morbidity

1.3.6.1. Anxiety

There is broad support for the theory that anxiety is related to eating difficulties such as selective eating. Interest in the connection between anxiety and “food aversion” was empirically investigated back in 1945. Two investigations of the eating patterns of adult participants found that individuals defined as “neurotic” rejected a larger number of foods on a standardized list than normal controls (Gough, 1946; Wallen, 1945). The language is indicative of clinical descriptors of the time, with the term neurotic referring to “disorders of the nerves”. Even though these studies are very old, it is of value to highlight the research focus of these studies which represents the earliest empirical attempt to understand the problem.

Wallen (1945) administered a check-list of foods to “neurotics” and “normals” and asked them to indicate which foods they dislike so much that they would refuse to eat them. The food list was developed by an experimental process whereby a list of 145
foods thought to represent a range of commonly liked and disliked foods were initially administered to 545 college students. The students were asked to rate their aversion to the foods. From this group the foods representing 20% of the highest aversion scores and 20% of the lowest aversion scores were selected to make the final list.

This food aversion check-list was presented to normals (n=214) and neurotics (n=95), as assessed by psychiatric interview. The subjects were then asked to indicate which food they disliked so much that they would not eat it. The aversion score was simply the number of aversions checked. As noted the research found that neurotics had a higher aversion score. The theory behind the results was presented by Wallen (1945) as follows:

Since food habits are rooted in childhood, they probably do not escape the impact of forces which make an individual neurotic. In fact, they are probably in a favoured position to reflect family practices and attitudes, for the child regularly eats at home long after his social and intellectual life has broadened beyond it. And, although new likes and preferences may be acquired, attitudes such as hesitancy in tasting new dishes, caution in food preparation, haste in eating, or attachment to “mother’s cooking” probably operates well into adult years. If such attitudes were more firmly fixed in neurotics than in normals, adult neurotics should be atypical in the matter of food dislikes. (p. 77)

Further, based on supplementary observations, Wallen suggested that neurotics were more prone to have “disgusting” associations to disliked foods than normal controls, and that it was possible that neurotics have a tendency to produce unpleasant ideational content which may be in part responsible for the ease with which they form aversions. In his interpretation of the results, Wallen argued that food aversions are part
of a broader anxiety based condition or personality issue which is grounded in adverse
countdown experiences.

Smith and colleagues (Smith, Powell, & Ross, 1955) continued this line of
research investigating the relationship between manifest anxiety and food aversions.
Whereas Wallen (1945) had relied on clinical examination to determine neurotic status,
Smith and colleagues looked at the relationship between the aversion score garnered
from the check-list of foods used by Wallen, and scores on the Manifest Anxiety Scale
(Taylor, 1953). Results indicated that high manifest anxiety was positively correlated
with food aversions, such that high anxiety individuals had a greater number of food
aversions than low anxiety individuals.

These ideas are still circulating today, but surprisingly these early studies
represent some of the most robust experimental research on the topic of anxiety and its
analysis indicated that selective eating was associated with anxiety. Specifically, nine
out of the sample of 20 selective eating children demonstrated obsessional or ritualistic
behaviour and ten children demonstrated social avoidance. The authors noted that it
was difficult to ascertain if this social avoidance was a result of the eating difficulties or
represented a primary social skills deficit. In another retrospective case study of 33
children aged 4 to 14 years (Timimi et al., 1997) it was found that about one third of the
sample experienced obsessional thoughts or compulsive behaviour not related to food,
such as recurrent hand washing.

Farrow and Coulthard (2012) investigated the relationships between sensory
sensitivity, anxiety and selective eating in children. In order to assess the child’s level of
selective eating, scores on the Food Fussiness scale of the Child Eating Behaviour
Questionnaire (CEBQ; Wardle, Guthries, Sanderson, & Rappaport, 2001) were used.
Parents were also asked to complete the Spence Children’s Anxiety Scale for parents
(SCAS-P, Spence, 1998), and there was a significant positive relationship between these anxiety scores and the food fussiness scores. The authors suggested that fussy eating may be an artefact of more broad-based anxiety, as children who are generally anxious may be hesitant about entering new situations which may include situations of trying and/or eating new foods.

Retrospective case studies investigating presentations of ARFID in clinical settings have found by psychiatric interview that ARFID patients are more likely to have anxiety conditions (Cooney, Lieberman, Guimond, & Katzman, 2017; Fisher et al., 2014; Nicely, Lane-Loney, Masciulli, Hollenbeak, & Ornstein, 2014; Norris, Robinson, Obeid, Harrison, Spettigue, & Henderson, 2014), with higher rates of obsessive compulsive disorder (Fisher et al., 2014; Nicely et al., 2014) and generalised anxiety disorder (Cooney et al., 2017, Fisher et al., 2014; Nicely et al., 2014; Norris et al., 2014).

In summary there is emerging evidence to support the notion that anxiety is related to avoidant/restricted eating patterns. Recent studies investigating ARFID cases in clinical settings have consistently identified comorbid anxiety as an issue with many ARFID patients. Significantly, it is not clear whether the anxiety as measured in these studies relates to eating or whether it is representative of broader anxiety issues.

1.3.6.2. Developmental Difficulties and Medical Problems

Research indicates that feeding problems and specifically avoidant/restrictive eating patterns are more common in children with autism spectrum disorder (ASD) and global developmental delay than in normally developing children. In a comprehensive meta-analysis of 48 studies investigating the treatment of paediatric feeding disorders in early childhood, Sharp and colleagues (Sharp et al., 2010) found that for those children with severe feeding issues, developmental delay was evident in 53% of cases, and ASD was evident in 23.7% of cases. The authors further argued that the impact of these
eating patterns on physical health, cognitive functioning and behaviour is often overlooked in these children.

In a study with an older cohort, and with a focus on less severe eating issues, Schreck Williams and Smith (2004) investigated the differences between parental report of feeding problems in children with and without autism. Two hundred and ninety-eight children (aged 7-9.5yrs) in a control group were compared with 137 children with autism using the Children’s Eating Behaviour Inventory (Archer, Rosenbaum, & Streiner, 1991). These authors found that children with autism were more likely to demonstrate eating and mealtime problems and more specifically that children with autism tend to restrict their diet based on sensory qualities of food category and texture.

Bandini et al., (2010) compared “food selectivity” in children with ASD and typically developing children. Instead of relying on parent report of eating patterns, which is common in research in the area, this study incorporated a comprehensive assessment of food intake using a food frequency questionnaire and three day food diary. Data was collected from 53 children with ASD and 58 typically developing children aged 3-11 years. Results indicated that children with ASD exhibited more food refusal (41.7% vs. 18.9%) and ate a more limited range of food than typically developing children (19.0 different kinds of foods vs. 22.5). The authors concluded that food selectivity is more common in children with ASD’s than in typically developing children.

Williams et al., (2005) explored the nature of eating patterns and problems in children with and without developmental difficulties. They investigated three groups: Selective eaters who had autism; children with special needs without autism; and children without special needs. The study was a retrospective case analysis of 178 children referred to a feeding program for “food selectivity”. Children with ASD often insisted on using the same utensils, and having food prepared in a certain way. Children
with special needs had significantly more problems with spitting out food as well as oral motor difficulties (e.g. problems chewing and swallowing) than the other children. Children without ASD or special needs had more difficulties with anxiety or obsessive compulsive behaviours (as measured by parent interview) than the other children. The types of foods eaten by each group were similar and there were no differences in behaviours such as distress at meals and leaving the table early. This supports the notion that for those children without developmental issues, anxiety, and particularly obsessive styles seem to play a role.

Nicholls et al., (2001) in their case analysis of 20 children attending for treatment of restrictive eating problems found that four children had a history of language delay and two had dyspraxia. Individuals with dyspraxia have difficulties in planning and completing fine motor tasks, which can range from simple motor movements, such as waving goodbye, to more complex ones like brushing one’s teeth. These motor difficulties are thought to extend to chewing and swallowing, which can result in problems or adverse experiences with eating, which may lead to food avoidance. Likewise, language delays may also be related to oral motor delays which could impact on the process of chewing and swallowing. It is possible that some of these developmental issues may be subtle and difficult for parents to detect, and therefore the opportunity for early treatment may be missed.

Together with the apparent developmental difficulties associated with avoidant/restrictive eating, there is a body of research that indicates that these children often have co-morbid medical conditions. According to retrospective case analysis, selective eaters tend to have a history of gastrointestinal symptoms such as retching, vomiting, gagging and abdominal pain associated with eating (Nicholls et al., 2001; Timimi et al., 1997). These findings are replicated in cross sectional studies that have found that patients with ARFID demonstrate more gastrointestinal symptoms such as
reflux, constipation, diarrhoea, food allergies and lactose intolerance (Field, Garland, & Williams, 2003; Fisher et al., 2014). Non-gastrointestinal medical issues associated with avoidant/restrictive eating include pulmonary problems, endocrine disorder, cerebral palsy, seizure disorder and kidney disease (Williams et al., 2014). Whilst it is possible that some of the medical issues in children with feeding and eating problems may be associated with issues such as global developmental delay, the question remains as to the prevalence of medical issues not associated with developmental delay for those children with clinically significant levels of avoidant/restrictive eating.

Much of the research to date in this field has been based on case studies with small numbers, although there are a few empirically based studies with larger samples which indicate a strong association between selective eating and autism. There is also evidence to suggest a relationship between selective eating and some developmental conditions (such as dyspraxia, global developmental delay and oral motor delays), as well as with medical conditions particularly associated with the gastrointestinal tract. In addition for those children without developmental issues, it is appears that anxiety is a key factor.

### 1.3.6.3. Behavioural and Attentional Problems

There has been debate as to whether selective eating is best seen as a discrete eating disorder, or as a symptom of a more general pattern of child psychopathology (Nicholls et al., 2001). Research has found that avoidant/restrictive eating may be related to a variety of behavioural problems and not just eating disordered behaviours or mealtime behaviour. Jacobi et al., (2008) assessed the relationship between picky eaters, as defined by parental report, and scores on the Achenbach Child Behaviour Check-list (Achenbach, 1991). Picky eaters were reported to eat a more limited amount of food; required special preparation of food more often; had lower acceptance of new foods; and parents reported more worries about their child’s weight and more struggles around
food. However, beyond these food and eating differences picky eaters (n=76) aged 8-12yrs, were more likely than controls (n=334) to demonstrate higher levels of internalizing and externalizing behavioural problems. The authors concluded that the results did not support the concept that picky eating is exclusively associated with disordered eating behaviours such as dieting, binge eating and concern about weight, but rather that it was part of a more general pattern of childhood behavioural problems. Picky eaters in this sample were reported to demonstrate more symptoms of withdrawal, more somatic complaints, more symptoms of anxiety and depression and higher levels of aggression and delinquent behaviour.

Timimi et al., (1997) also detailed support for the suggestion that avoidant/restrictive eating might be part of a broader pattern of behavioural problems. In their retrospective analysis of 33 cases of selective eating they found that 25% reported sleeping difficulties, 20% had aggressive outbursts, and 40% had problems related to attendance at school and peer relationship issues. In a population based study Equit et al., (2013) questioned the parents on their children’s pattern of eating and a range of other factors. Children (n=1090) were classed as selective eaters if their parent answered often to at least one of three questions: “avoids certain foods” (53%), “only eats a narrow range of foods” (23%), and “shows unwillingness to try new foods” (26%). Results indicated that the parents of selective eaters endorsed items on a specifically developed questionnaire indicative of features of externalizing and oppositional behavioural problems in their child. On this basis the authors concluded that for a diagnosis of selective eating to be made, that emotional or behavioural difficulties must be present.

There is some evidence to suggest that avoidant/restrictive eating problems may be associated with attentional problems. Zucker and colleagues (Zucker et al., 2015) found that parents of selective eaters (n=917) aged between 2-5 years reported higher
levels of attentional problems as defined by responses to a structured diagnostic interview. Patients diagnosed with ARFID presenting at an eating disorder clinic were also found to have significantly higher levels of attentional problems when compared to patients with AN, and Pennell and colleagues (Pennell, Courturier, Grant, & Johnson, 2016) discuss two complex cases of ARFID with comorbid attention deficit hyperactivity disorder and issues associated with the exacerbation of restricted eating by stimulant medication treatment.

1.3.6.4. Anorexia Nervosa and Bulimia Nervosa

Two prospective studies have examined the degree to which picky eating in early childhood represents a risk for the subsequent onset of AN. In the first study (Marchi & Cohen, 1990) a sample of 659 children and their mothers were interviewed three times between 1 and 21 years of age. Parent reported problem eating behaviour such as pickiness, food avoidance, eating too little and eating too slowly were found to be relatively stable over a 10 year time span from early/middle childhood to late childhood/adolescence. The study also investigated the relationship between early childhood eating behaviours and the development of AN and BN (diagnosed via structured interview) in adolescence. Multiple regression analysis indicated that digestive problems in early childhood (β = 0.778, p < 0.01) and picky eating (β = 0.258, p < 0.05) were predictive of later elevated symptoms of AN. Also, problem mealtime behaviour and pica in early childhood were found to be significant risk factors for the development of BN in adolescence. In the second longitudinal study (Kotler, Cohen, Davies, Pine, & Walsh, 2001), children and their parents were interviewed at ages 6, 13, 16 and 22 years with the focus on six eating behaviours: 1) unpleasant meals; (2) struggles over eating; (3) amount eaten; (4) picky eating; (5) speed of eating; and (6) interest in food. Kotler et al., (2001) found that the occurrence of food avoidance behaviours and conflicted and unpleasant meals in childhood predicted the later
development of eating disorders. Nicholls & Viner (2009) also found an association with AN at age 30 with a history of feeding problems and undereating in childhood. These results were further supported by the results of cross-sectional case studies comparing anorexic patients and controls regarding pre-morbid feeding and gastrointestinal problems assessed retrospectively by semi-structured parent interview (Rastam, 1992). This research found that feeding and gastrointestinal problems in early childhood were more frequent in anorexic patients (90%) than in controls (55%).

Whilst these studies suggest that avoidant/restrictive eating in childhood may be a precursor for later eating disorder symptoms, the specificity for subsequent psychopathology has not been addressed. That is, it is possible that picky eating may be a symptom of a broader pattern of general and/or psychological problems in childhood, and it is this association which may be the risk factor associated with later onset eating disorders. Another longitudinal study (Agras, Bryson, Lawrence, Hammer, & Kraemer, 2007) of 134 children and their parents found that picky eating was negatively correlated with thin-body preoccupation such as desire to be thin, which are precursors to BN and binge eating. The authors concluded that the restrictive eating patterns associated with picky eating in early childhood may be a protective factor for subsequent binge eating.

The nature of avoidant/restrictive eating and how it develops through the lifespan is unclear, particularly with respect to how other psychological issues contribute. An important question is whether selective eating is in itself an eating disorder, or a symptom of other psychological issues. With the advent of the DSM-5 diagnosis of ARFID, the implication is that selective eating is a distinct syndrome, not necessarily associated with co-morbid psychological conditions.
1.4. Assessment Issues

Despite the high level of parental concern and apparent seriousness of the phenomenon, childhood avoidant/restrictive eating problems, until fairly recently, have been a neglected area of research. The introduction of ARFID diagnosis has provided much needed guidelines to promote the development of clearly defined cut-points for when apparently normal or low level avoidant/restrictive eating in early childhood becomes problematic, such as selective eating. Currently most research on ARFID has used retrospective chart review which has the benefit of comprehensive evaluation by a team of mental health professionals in order to diagnose ARFID (Nicholls, Lynn, & Viner, 2011; Pinhas et al., 2011; Eddy et al., 2015; Fisher et al., 2015). In the field of picky eating questionnaires have been used and developed to assess the construct however part of the challenge is that there is no standardized definition for picky eating, and there are a range of descriptions used in the research, highlighted in Table 8.

Consequently, there is wide variation in the methods used to assess picky eating. Studies have used items from a range of different standardised questionnaires, or researchers have developed their own questionnaires. The investigations usually use the parent as the main informant, however given the complex nature of childhood eating problems and the subjective nature of parent report, to rely solely on parent report in this way seems risky. The questions used range in complexity from a single question (e.g. “Is your child a picky eater?” Mascola et al., 2010) to multi-item questionnaires in which individual items are more complex (e.g. “My child is interested in tasting foods she/he has not tried before” Bucher et al., 2014). Responses are usually on a likert scale with between three and seven points.
Table 8
Definitions of Picky Eating

<table>
<thead>
<tr>
<th>Source</th>
<th>Definition</th>
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<tbody>
<tr>
<td>Dovey et al., 2008</td>
<td>Consumption of an inadequate variety of food through rejection of a substantial number of foods that are familiar as well as unfamiliar; this may include an element of food neophobia and can be extended to include the rejection of specific food textures.</td>
</tr>
<tr>
<td>Mascola, Bryson, &amp; Agras, 2010</td>
<td>Restricted intake of food, especially vegetables, and strong food preferences, leading parents to provide a different meal for the rest of the family.</td>
</tr>
<tr>
<td>Lumeng, 2005</td>
<td>Unwillingness to eat familiar foods or try new foods, severe enough to interfere with daily routines to an extent that is problematic to the parent, child, or parent-child relationship.</td>
</tr>
<tr>
<td>Hafstad, Abebe, Torgersen, &amp; von Soest, 2013</td>
<td>Consumption of an insufficient amount or inadequate variety of food through rejection of food items.</td>
</tr>
<tr>
<td>Horst, Deming, Lesniauska, Carr, Thomas, &amp; Reidy, 2016</td>
<td>Limited number of food items in the diet, unwillingness to try new foods, limited intake of vegetables and some other food groups, strong food preferences, and special preparation of food required.</td>
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Analysis of scoring scales has involved various strategies for categorisation, using mean or median scores, or dividing responses into subcategories for scoring. Even the method of analysis of the same scale can vary. For example, the Child Eating Behaviour Questionnaire (CEBQ: Wardle, Guthrie, Sanderson, & Rapoport, 2001) has often been used (e.g. Morrison, Power, Nicklas, & Hughes, 2013; Tharner et al., 2014) and has been analysed using latent profile analysis (Tharner et al., 2014) standard deviation of scores of scale scores (Jansen et al., 2012), or mean score (Hendy et al., 2010).

One study has demonstrated that two questionnaires (the Children’s Food Neophobia Scale: CFNS, Pliner, 1994; and the Behavioural Paediatrics Feeding Scale: BPFS, Crist & Napier-Phillips, 2001) can differentiate between cases of ARFID presenting at eating disorder clinics from a normative sample (Dovey, Aldridge, Martin, Wilken, & Meyer, 2016). This finding is significant as it represents an important step in using psychometric measures to identify clinical levels of avoidant/restrictive eating.
Thus, the identification of avoidant/restrictive eating in childhood has relied on either the use of wide range of parent report questionnaires analysed in varied formats or comprehensive psychiatric assessment as conducted in specialised eating disorder clinics as part of an initial assessment. In this context the field would benefit from further development of objective standardized assessment measures to address the issue of differentiation between developmentally normal levels of avoidant/restrictive eating and pathological levels. This will assist in the identification of ARFID and selective eating and will also facilitate research into the area.

1.5. Overall Summary

Avoidance/restrictive eating in childhood, including selective eating, appears to be associated with significant psychological difficulties such as anxiety, behavioural problems, medical issues and developmental concerns. In extreme cases selective eating can affect physical growth, and it may be associated with subsequent development of AN. The impact on parents, parent child relationships and overall family functioning can be profound. It is understood that childhood eating disorders such as selective eating are complex, and etiological theories underscore the importance of having a biopsychosocial understanding of the phenomenon. Treatment approaches have included behavioural modification for younger children, which has good empirical support particularly for feeding disorders and those children with developmental issues (for review see Sharp, Jaques, Morton & Hertzinger, 2010). For typically developing children who experience selective eating there is limited research into treatment options. Based on reported case studies the emphasis for treatment is on managing anxiety associated with the condition in combination with behavioural approaches and/or family based treatments. (Lask & Bryant-Waugh, 2013; Nicholls, et al., 2001; Timimi et al., 1997).
The development of accurate assessment and diagnosis of childhood eating disorders, such as selective eating, is in the early stages. There remain inconsistencies in the way avoidant/restrictive eating patterns in childhood are described and a general lack of clarity regarding the assessment of the issue which both clouds and distorts attempts to understand the problem. Confusion reigns in the literature regarding terminology, diagnosis and assessment. The variety and complexity of childhood eating disorders has likely contributed to this situation. The recent advent of DSM-5 and the ARFID diagnosis provides a sound springboard from which research and clinical practice can develop. The development of clear standardised assessment and detailed descriptions of the issue based on empirical research is vital for the field to move forward so as to inform the clinical interventions of avoidant/restrictive eating disorders, such as selective eating.

1.6. Aims and Organization of this Thesis

The majority of what is known about the nature of selective eating has been obtained through clinical experience and retrospective case review and not through evidence derived from large scale quantitatively based research with clinical or community samples. Hence, the aim of the present series of studies was to clarify and order knowledge about the little understood phenomenon of selective eating. Findings from this PhD will add to the debate regarding assessment and diagnosis of selective eating as seen in community settings, and will also provide comprehensive evaluation of the psychological elements of the problem.

Given the exploratory nature of this research, Study 1 of this project sought to assess the level of parental concern about selective eating in a community sample and the relationships between parent reported selective eating, gender and age. Given that many studies have relied on parent report to identify and measure aspects of selective eating our first step was to look at selective eating using this approach. By gathering
information regarding parent-perception of the problem a classification baseline was established against which an objective classification of dietary adequacy was developed in Studies 2 and 3.

In Study 2 the validity of parent report was tested by comparing parent report of selective eating with an objective assessment of child food intake. The main question was whether parent report of selective eating was associated with inadequate dietary intake. This was important as most research in the area has relied on parent report to identify the presence of selective eating yet there have been suggestions that parents may not necessarily make accurate assessments of problematic selective eating. In Study 3, the aim was to develop a dietetic assessment protocol that could be used to facilitate accurate diagnosis of selective eating on the basis of dietary adequacy. The challenge was to discriminate between problematic and non-problematic levels of selective eating by identifying at what point selective eating impacts on dietary adequacy. In doing so an objective diet based measure of selective eating was developed that may form part of the clinical assessment of the problem, and can form a solid base for ongoing research in the field.

The aim of Study 4 was to investigate the psychological characteristics of selective eaters and their families as it is thought that psychological factors may be implicated as both causes and consequences of selective eating. The final chapter summarizes the main findings of the thesis, and is followed by references and appendices.
Chapter 2. Study One: Parent-Perceived Prevalence, Age and Gender Effects of Selective Eating

2.1. Introduction
The lack of consistent terminology, limited assessment guidelines and only recently developed diagnostic criteria within the field of childhood eating problems has led to an absence of large scale studies, meaning that precise epidemiological data regarding selective eating are not available. Those studies that have attempted to measure prevalence, gender and age effects of the problem have used different methods, definitions and terminology to do so, resulting in inconsistent and incomparable results. As noted, a major difficulty in researching selective eating in children has been the vague terminology and absence of any structured diagnostic criteria. Consequently, there is significant overlap between categories of eating disorders of childhood and research has investigated the prevalence rates in related concepts including food neophobia (Koivisto-Hursti & Sjödén, 1997), picky/selective eating (Jacobi et al., 2003; 2008; Micali et al., 2011; Tharner et al., 2014) and ARFID (Eddy et al., 2015; Nicely et al., 2014; Van Tine et al., 2017). Given the substantial overlap between the various categories of childhood eating problems, there is merit in reviewing research in these areas. Therefore, the following literature review and introduction to Study 1, regarding the prevalence, gender and age effects of selective eating covers a range of related eating problems which are grouped under the term avoidant/restrictive eating.

2.1.1. Prevalence of Avoidant/Restrictive Eating in Childhood
Avoidant/restrictive eating in childhood, characterised by rejection of specific foods, is thought to be a common phenomenon in early childhood, but reported prevalence rates vary considerably from 5% (Tharner et al., 2014) to 37% (Equit et al., 2013). Studies investigating prevalence of avoidant/restrictive eating use a range of
research methods and assessment processes, with parent report the most common method used to identify the problem. There are a number of challenges inherent in determining the prevalence of avoidant/restrictive eating in childhood, that relate to the types of samples used (population based research; patients attending clinical programs; community samples), the assessment process (clinical interview, questionnaire response, medical measures), and which profession conducts the research (psychiatrists, dietitians, occupational therapists, psychologists). Many studies use parent report to identify eating problems, and it is possible that parent report may not be an accurate measure of avoidant/restrictive eating, and the prevalence rates referred to in these studies may be more accurately described as “parent-perceived prevalence” rates. With this caveat, the prevalence rates referred to in studies that use parents report reviewed below will referred to as parent-perceived prevalence rates.

In a population cohort sample of 917 children aged 2-5 years caregivers were interviewed about their child’s eating patterns as part of an epidemiologic study of preschool anxiety. Caregivers were administered structured diagnostic interviews (the Preschool Age Psychiatric Assessment) regarding the child's eating and responses (Zucker et al., 2015). Selective eating was reported by 20.3% of the community sample, with 17.7% reporting moderate selective eating (a restricted diet only) and another 3% reporting severe selective eating (restricted diet that limited ability to eat with others).

In another population based study Equit and colleagues (Equit et al., 2013) analysed the parent-perceived prevalence of eating problems in young children (excluding AN and BN). Parents of 1090 children aged between four and seven years of age completed a 25 item questionnaire developed by the authors to assess eating behaviour as well as anxious or oppositional behaviours. The questionnaire consisted of 25 items, with seven of these pertaining to developmental history, five to anxiety and behavioural issues and13 items assessing the eating patterns. Questions were rated on a three point scale
consisting of options *never, sometimes,* and *often.* Participants were classified as selective eaters based on frequency of a positive answer, that is selective eaters were found to have “problem probabilities” between 0.57 and 0.90, for the following three questions: 1) avoids certain foods (53%), 2) only eats a narrow range of foods (23%), and 3) shows unwillingness to try new foods (26%). The authors concluded that 34.1% of all children showed parent-perceived selective eating patterns. The study also concluded that 60.7% of children were parent-perceived normal eaters as defined by low frequencies of positive answers across items, with problem probabilities ranging from 0.00 to 0.07. The “weight worriers” were a smaller group (5%) of children who according to their parents demonstrated concern about weight and shape, but otherwise ate normally. The authors theorized that such high parent-perceived prevalence rates of selective eating may be inflated as it could include moderate or developmentally normal levels of selective eating.

Picky eating is a similar concept to selective eating in that it typically refers to those children who consume an inadequate variety of foods and may reject both familiar and unfamiliar foods (Dovey et al., 2008), with strong ideas regarding food preferences and presentation (Cooke, Wardle, & Gibson, 2003; Horst, Eldrige, & Reidy, 2016). Picky eating has been disparately measured in different papers, which adds to the confusion of what the concept really is. Some studies have assessed picky eating using the Child Feeding Questionnaire (Birch et al., 2001; Galloway, Fiorito, Lee, & Birch, 2005), some have simply asked the caregivers if they considered their child to be a picky eater (e.g. Jacobi et al., 2003; 2008), and others have designed their own measure (Kauer et al., 2002; Smith et al., 2005; Carruth et al., 2000; 2004).

In a population based study Micali et al. (2011) investigated the prevalence of parent-perceived picky eating in 1327 children aged 5-7yrs. The definition of picky eating was determined via parent report on a questionnaire designed by the researchers.
The 42 item questionnaire was a combination of items taken from the Childhood Eating Behaviour Questionnaire (CEBQ; Wardle, et al., 2001), the Children’s Eating Behaviour Inventory (CEBI; Archer et al., 1991), and the picky eating scale from the Stanford Feeding Questionnaire (Jacobi et al., 2008). This combined questionnaire was factor analysed and a Picky Eating factor was identified comprising four items from the picky eating scale on the Stanford Feeding Scale: “my child eats a limited variety of food” (loading = .83); “my child only eats food prepared in specific ways” (loading = .65); “my child has strong food likes and dislikes” (loading = .72); “my child accepts new food readily” (loading = -.80); and one item from the CEBI: “at dinner I let my child choose the foods he/she wants from what is served” (loading = .37). Parents responded to these questions using a five point Likert scale (never, rarely, sometimes, often, always), and to be classified as a picky eater all items had to be present at least “sometimes”. Based on this scale, 7.3% of parents indicated that their child was a picky eater, with the item “my child eats a limited variety of food” the most commonly endorsed (8.6%).

In a similar study investigating the diagnosis of fussy/picky eating and parent-perceived prevalence (Tharner et al., 2014), 4914 four-year-olds in a population based birth cohort were assessed using the CEBQ. A Latent Profile Analysis was used to identify eating behaviour profiles based on the CEBQ sub-scales. The sub-scales of the CEBQ represent two dimensions of eating patterns, i.e. food approach and food avoidance. The food approach dimension is comprised of four sub-scales: emotional overeating; food responsiveness; enjoyment of food; and, desire to drink. The food avoidance dimension is comprised of emotional under-eating; satiety responsiveness; food fussiness; and slowness in eating. A distinct “fussy eating” behaviour profile was identified in 5.6% of children and was characterised by a pattern of high scores on food avoidance items in combination with low scores on the food approach scales.
Carruth et al., (2004) attempted to measure the parent-perceived prevalence of picky eating in a large community sample. Picky eating was assessed via parental report in response to the single question of whether they considered their child to be a *very picky eater, somewhat picky eater, or not a picky eater*. Children described as *very picky* or *somewhat picky* were regarded as picky eaters. In this sample of 3022, parent-perceived prevalence rate, ranged from 19% to 50% across the age ranges (4-6mths: 19%; 7-8mths: 25% 9-11mths: 29%; 12-14mths: 35%; 15-18mths: 46%; 19-24mths: 50%).

McDermott et al., (2008), using data from a large birth cohort, found that 7.6% of parents considered their child to be an irregular eater. Utilising part of a semi-structured interview, the parents of 5122 children aged five years were asked about their child’s eating patterns via responses to a single multiple choice question. Results indicated that 27.8% of the sample reported that their child was *sometimes* an irregular eater and 7.6% of children were *often* irregular eaters.

In a series of studies, Jacobi and colleagues found that between the age of 3.5 to 5.5 years (n=120), 21% of children were classified as picky eaters (Jacobi et al., 2003), with 18% of children 8-12 years similarly identified. (Jacobi et al., 2008). In both of these studies the sample was community based and picky eaters were defined by parental response (yes/no) to the question “Is your child a picky eater?”

One study sought to determine the factor structure of a newly developed self-report screening measure Eating Disturbances in Youth Questionnaire (EDY-Q) for 1444 participants, and in doing so report on the distribution of the subtypes of ARFID in children aged 8-13 years (Kurz, Dyck, Dremmel, Munsch, & Hilbert, 2015). Three factors were identified in the EDY-Q which were Food Avoidance Emotional Disorder (FAED), Selective Eating and Functional Dysphagia (FD: fear of choking or swallowing). Overall 26.1% of the children reported symptoms of Selective Eating;
with FAED at 19.3%, and FD at 5.0%, and 2.3% of children reported symptoms in all three subtypes.

In summary parent-perceived prevalence estimates of avoidant/restrictive eating vary significantly between studies from 3% to 34.1%. The results of these studies are summarised in Table 9.

Table 9
Studies Investigating Parent-Perceived Prevalence of Avoidant/Restrictive Eating

<table>
<thead>
<tr>
<th>Study</th>
<th>Term used</th>
<th>Sample size</th>
<th>Age range</th>
<th>Assessment method</th>
<th>Prevalence (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Zucker et al., 2015</td>
<td>selective eating</td>
<td>917</td>
<td>2-5 years</td>
<td>interview</td>
<td>Severe: 3.0</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Moderate: 20.3</td>
</tr>
<tr>
<td>Kurz et al., 2015</td>
<td>ARFID</td>
<td>1444</td>
<td>8-13 years</td>
<td>EDY-Q</td>
<td>3.2</td>
</tr>
<tr>
<td>Equit et al., 2013</td>
<td>selective eating</td>
<td>1090</td>
<td>4-7 years</td>
<td>3 questions</td>
<td>34.1</td>
</tr>
<tr>
<td>Tharner et al., 2014</td>
<td>fussy/picky eating</td>
<td>4914</td>
<td>4 year olds</td>
<td>CEBQ Latent Profile Analysis</td>
<td>5.6</td>
</tr>
<tr>
<td>Jacobi et al., 2008</td>
<td>picky eating</td>
<td>120</td>
<td>8-12 years</td>
<td>single question</td>
<td>18</td>
</tr>
<tr>
<td>McDermott et al., 2008</td>
<td>irregular eating</td>
<td>5122</td>
<td>5 years</td>
<td>single question</td>
<td>7.6</td>
</tr>
<tr>
<td>Jacobi et al., 2003</td>
<td>picky eating</td>
<td>120</td>
<td>3.5-5.5 years</td>
<td>single question</td>
<td>21</td>
</tr>
</tbody>
</table>

The wide variation in parent-perceived prevalence estimates reflect differences between studies in how the concept is defined and measured. Studies have identified avoidant/restrictive eating using a variety of questionnaires. Several studies have operationalized restricted eating using a single question of the Child Feeding Questionnaire (CFQ) “Is your child a picky eater?” (e.g. Carruth et al., 2004; Jacobi et
al., 2003; Mascola et al., 2010). Other studies have used various questions from the Child Eating Behaviour Questionnaire (Tharner et al., 2014), and others have developed their own questionnaire (Equit et al., 2013; Micali et al., 2011; Kurz et al., 2015). In addition, the use of parent report to identify avoidant/restrictive eating, may be problematic due to issues with subjectivity. Parents often rate the level of their child’s behaviour problems differently to other informants, including teachers, the child or adolescent themselves, significant others, health professionals, laboratory observers, as well as biological indices (De Los Reyes, Goodman, Kliewer, & Reid-Quinones, 2008). Research investigating such discrepancies has focused on informant/parent factors or the characteristics of the child being rated. The types of child characteristics that can effect discrepancies between reporters have included age, gender, ethnicity, social desirability (the tendency to rate the psychopathology in a positive light), and perceived distress levels. Research focusing on parent factors has examined parent psychopathology, specifically depression, anxiety and stress as attributional bias (Chi & Hinshaw, 2002; Najman et al., 2000; Nelson, Hammen, Brennan, & Ullman, 2003; Treutler & Epkins, 2003). In light of these possible problems with parent report some studies have attempted to validate parent report as a measure of avoidant/restrictive eating, and this is explored further in Studies 2 and 3 which consider the assessment of selective eating in detail.

Alternative methods to parent report have been used to measure prevalence and include self-report and clinical assessment. Kurz and colleagues (Kurz, Van Dyck, Dremmel, Munsch, & Hilbert, 2015) sought to determine the distribution of ARFID in middle childhood, using the screening instrument, Eating Disturbances in Youth-Questionnaire. A total of 1,444 8- to 13-year-old children were screened in regular schools (3rd to 6th grade) in Switzerland using the self-report measure. Results indicated that 3.2% reported features of ARFID in the self-rating.
The incidence of early onset eating disorders was investigated whereby British paediatricians and psychiatrists were surveyed on a monthly basis for 14 months for the details of cases of eating disorders (Nicholls, Lynn, & Viner, 2011). Case definition was based on DSM-IV and ICD-10 criteria, the incidence of early onset eating disorders was reported as 3.01 cases per 100,000 of which 19% (0.57 cases per 100,000) lacked body image concerns or fear of weight gain suggesting the possibility of an ARFID diagnosis. Similarly, a Canadian national surveillance study (2003-2005), surveyed 2,453 paediatricians monthly over a two year period (Pinhas et al., 2011). Results suggested that the incidence of early onset eating disorders in 5 – 12 year olds was 2.6 cases per 100,000 people. In this sample 26.7% of cases failed to endorse fears of getting fat or gaining weight. It is noteworthy that the methodology of these surveillance studies is such that they would identify only severe cases reaching secondary care. A latent class analysis of these three studies can be found in Pinhas et al., (Pinhas, Nicholls, Crosby, Morris, Lynn, & Madden, 2017) in which 25-34% of each sample showed a non-fat phobic presentation, a sub-type of ARFID.

One study has reported on the prevalence rates of ARFID in a paediatric population of presentations to a gastroenterology clinic (Eddy et al., 2015). Researchers examined 2,231 consecutive new referrals using retrospective case review. Patients were 8-18 years old and 1.5% (33 cases) were classified as ARFID. There were very few cases of other eating disorders (three of AN; two of BN; and one of binge eating disorder). Other studies have reported in the prevalence rates of ARFID within eating disorder clinics, all using the method of retrospective case review. In one study the review of the records of 309 patients found that 19.4% met criteria for ARFID (Fisher et al., 2015). Six clinics conducted a similar study and found that 14% of 215 adolescent patients presenting for an initial assessment received a diagnosis of ARFID (Ornstein et al., 2013). Another multi-institution study found that 13.8% of the 712 eating disorder
cases met criteria for ARFID (Fisher et al., 2014), and yet another study of this kind found that only 5% of all eating disordered patients met criteria for ARFID (Norris et al., 2014). These studies indicate that ARFID is a problem of significance in terms of their rates of presentation at treatment centres, however there remains wide variation in estimates of prevalence (5-19.4%) which likely reflect differences between clinics in areas such as intake criteria and how ARFID criteria are interpreted. Whilst these studies provide a good starting point as to the prevalence of ARFID presentations in clinical populations prospective surveillance studies with clear definitions of ARFID are needed to look at the epidemiology of ARFID in both clinic and community settings.

2.1.2. Avoidant/Restrictive Eating and the Effect of Age.

Little is known about the extent to which avoidant/restrictive eating behaviours change over time. The idea that children will outgrow avoidant/restrictive eating in childhood is often cited (Cardona Cano et al., 2015; Mascola et al., 2010), but this has not been clearly empirically established via longitudinal studies. It is also suggested that there is a significant minority of children whose restrictive eating patterns start in infancy and extend into middle childhood with a range of consequent social and psychological difficulties (Mascola et al., 2010; Nicholls, Christie, Randall, & Lask, 2001; Zucker et al., 2015). It is important to investigate how avoidant/restrictive eating presents at different ages to understand the stability and course of the disorder.

To investigate picky eating across the age range, Mascola and colleagues (2010) prospectively examined a cohort (n=120) of children aged 2-11 years to determine incidence, point prevalence and characteristics of picky eating over time. In this study parents were asked the question “is your child a picky eater?” at intervals between age 2 to 7, and then again at 9.5 and 11 years old. Parents responded to the question “Is your child a selective eater?” and responses were ranked on a 5-point likert scale ranging from 1 (never) to 5 (always). To be categorised as a selective eater a score of at least 4
had to be endorsed. Results indicated that at any given age from 3-11 years, between 13% and 22% of the children were reported to be picky eaters. The parent-perceived incidence of picky eating declined from 13% at 2 yrs. of age to 2% of the sample at 11 years of age, levelling off at about 3% after six years of age. Over half (58%) of all picky eaters recovered over a two year period irrespective of age of onset, but 42% remained picky eaters for more than two years. Van Tine and colleagues (Van Tine et al., 2017) extended this study by following up the participants of the previous study (Mascola et al., 2010) study and asking them about their eating patterns at age 23 years. Sixty two of the original 120 participants agreed to provide self-report measure of selective eating status (Yes/No) as well as the presence of eating behaviours associated with selective eating (based on questions “has strong likes and dislikes”; eats a limited variety of foods”; “is reluctant to try new foods”; and “prefers food to be prepared in a particular way”) using a 5-point likert scale ranging from 1 (never) to 5 (always). Of the 61 young adults followed up from childhood, 28% were identified as selective eaters at age 23 years, and selective eating behaviours reported during adulthood were similar to those endorsed by parents during childhood. This pattern of results suggests that whilst there is a significant minority of cases that continue to show stable patterns of selective eating into adulthood, the majority of cases show less selective eating behaviours with increasing age. Interestingly some new onset selective eating cases were reported during adolescence by 30% of the selective eating sample, suggesting that for some participants there was an increase in selective eating with age.

A population based longitudinal study of child development looked at rates of parent observation of picky eating in 1498 children aged 2.5 to 4.5 years (Dubois et al., 2007). The aim of the research was to analyse the relationship between social factors, parent perceptions of their child’s eating behaviours and body weight in the preschool years. Questionnaires were completed at 2.5, 3.5 and 4.5 years of age. For this study
Picky eaters were identified via parent report on three questions indicating that their child *always* ate a different meal to other family members, that they *often* refused to eat a meal prepared by their carer, and that they *often* refused to eat on all three questions. Results indicated that over the preschool years between 14% and 17% were identified by parents as picky eaters at some time during the study, but only 5% were reported by parents to be picky eaters across all three age intervals. This pattern of results suggests that for the majority of children the parent-perceived picky eating did not last for longer than 18 months. This pattern of results may indicate, similar to Mascola et al., (2010), as outlined above, that avoidant/restrictive eating is a time limited phenomenon, which decreases with time.

A cohort study (Cardona Cano et al., 2015) investigated the trajectory of picky eating in 4018 children aged between 1.5 and 6 years. Picky eating was assessed by maternal report based on questions from the CBCL at 1.5 years, three years and six years of age. Specifically, mothers were asked to indicate whether their child “does not eat well” and “refuses to eat” on a three point scale. The authors concluded that the prevalence of picky eating was 26.5% at 1.5 years, 27.5% at age three years, and at six years of age the prevalence declined to 13.2%. According to parents almost two thirds of the picky eaters remitted within three years. The authors concluded that picky eating in the preschool years is transient and may be seen as part of normal development. However, a substantial group of children (4.2%) were perceived to experience persistent picky eating. In addition, 4% start to be picky after the preschool period, and it was suggested that late onset picky eating may be a more persistent phenomenon.

Jacobi et al., (2008) was also interested in the course of picky eating and on the basis of the question “Is your child a picky eater?” compared children in 8-12 year age group with previous studies using the same methodology with younger children. Results indicated that 18% of children from a community sample (n=426) were
classified as picky eaters which was reported as a similar parent-perceived prevalence rates to younger age groups (3-5yrs). This research also found that eating behaviours typically associated with picky eating in young children such as “limited number of foods”, “requires special food preparation”, “struggles about food” and “inhibited eating”, were correlates of picky eating in older children. Although this research was not longitudinal, on the basis of these results the authors concluded that the phenomenon of picky eating was a stable construct evident throughout childhood.

This is consistent with the findings of Marchi and Cohen (1990) who assessed picky eating behaviour from early childhood to adolescence, and found that children showing picky eating in early childhood tended to show similar problems in middle childhood and adolescence. In this study (n=800) four eating behaviours were assessed via parent report at three age points. Families were interviewed once in three different age ranges; 1-10 years; 9-18, and 12-20 years. For the purposes of prevalence estimates, pickiness was defined by the parent report of at least often (given response options of “hardly ever”, “sometimes”, “often”, “very often”) on at least three of the following four behaviours: “doesn’t eat enough”; “is often or very often choosey about food”; “usually eats slowly” and “is usually not interested in food”. Results indicated that at any given age picky eating was quite common and consistent at all three ages: 29% (1-10 years); 28% (9-18 years) and 27% (12-20 years).

A retrospective case study analysis (n=20) of children presenting with selective eating at Great Ormond Hospital examined patient characteristics including age of onset (Nicholls et al., 2001). This study found that 60% showed feeding difficulties in infancy (breast feeding and weaning), 93.8% in the pre-school years and 100% by primary school age. These figures highlight the possible course of the problem whereby it increases with age up until primary school years, with a sharp jump between infancy and pre-school years. Similarly, Carruth et al. (2004) found that feeding difficulty
characterised by picky eating increased markedly from birth to age two with 19% reported to have feeding problems between the age of four months and six months to 50% between 19 and 24 months.

In an Australian birth cohort study McDermott et al., (2008) investigated the parent-perceived prevalence of irregular eating in age in pre-school children. The parents of 5122 children aged six months to five years were asked about their child’s eating patterns via responses to a single multiple choice question. Feeding difficulties at 6 months and eating problems at five years were correlated. Of six month old infants only 6% often had a problem at five years, and conversely if parents reported that their child often had a feeding problem at 6 months, 49% also sometimes or often were identified as having an eating problem at five years. Based in this the authors concluded that irregular eating showed stability from 6 months to five years of age.

The results of these studies are presented in Table 10 and highlight the variation in results. Some studies suggest there is a degree of stability across the age span and others indicate that the issue decreases with age. The variation in parent-perceived age effects rates may be due to a number of reasons. Sampling differences, whereby lower prevalence rates were obtained in prospective studies using a cohort recruited at infancy and being assessed as part of a population based study, whereas the higher parent-perceived prevalence rates were most often obtained when respondents were recruited to be part of a study on picky eating. It is possible that those participants responding to recruitment on a study of picky eating may be more worried or interested about this issue; therefore, this sample may not representative of a community sample. Also variation in the age ranges used (i.e. 4mnths-2yrs; 2yrs-17yrs; 3.5yrs-12yrs), will possibly yield different trends in the effects of age on avoidant/restrictive eating.
Table 10
Summary of Longitudinal Studies Investigating Parent-Perceived Age Effect of Avoidant/Restrictive Eating

<table>
<thead>
<tr>
<th>Study</th>
<th>Term used</th>
<th>Sample size</th>
<th>Age range</th>
<th>Assessment method</th>
<th>Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Van Tine et al., 2017</td>
<td>selective eating</td>
<td>61</td>
<td>2-23 yrs</td>
<td>single question</td>
<td>mixed results: cases can show stable/ increase/ decreases with age</td>
</tr>
<tr>
<td>Mascola et al., 2010</td>
<td>picky eating</td>
<td>120</td>
<td>2-11 yrs</td>
<td>single question</td>
<td>decreases with age</td>
</tr>
<tr>
<td>Dubois et al., 2007</td>
<td>picky eating</td>
<td>1498</td>
<td>2.5-4.5 yrs</td>
<td>3 questions</td>
<td>decreases with age</td>
</tr>
<tr>
<td>Cardona Cano et al., 2015</td>
<td>picky eating</td>
<td>4018</td>
<td>1.5-6 yrs</td>
<td>single question</td>
<td>decreases with age</td>
</tr>
<tr>
<td>Marchi &amp; Cohen, 1990</td>
<td>picky eating</td>
<td>800</td>
<td>1-20 yrs</td>
<td>3 questions</td>
<td>decreases with age</td>
</tr>
<tr>
<td>McDermott et al., 2008</td>
<td>irregular eating</td>
<td>5122</td>
<td>6 mth-5 yrs</td>
<td>single question</td>
<td>stable construct</td>
</tr>
<tr>
<td>Jacobi et al., 2008</td>
<td>picky eating</td>
<td>426</td>
<td>3.5-12 yrs</td>
<td>single question</td>
<td>stable construct</td>
</tr>
<tr>
<td>Carruth et al., 2012</td>
<td>picky eating</td>
<td>3022</td>
<td>4 mth-2 yrs</td>
<td>single question</td>
<td>increases with age</td>
</tr>
<tr>
<td>Koivisto &amp; Sjödén, 1997</td>
<td>food neophobia</td>
<td>370</td>
<td>2-17 yrs</td>
<td>food neophobia scale</td>
<td>stable construct from 2-11, then decrease from 14 yr</td>
</tr>
</tbody>
</table>

There is a large body of research investigating the effect of age in a related area of avoidant/restrictive eating, referred to as “food neophobia”. Food neophobia is a term that has been used to describe an unwillingness to try new foods, or literally a fear of new foods. Food neophobia has been shown to be strongly related to eating a restricted range of new foods (Cooke et al., 2003; Dovey et al., 2008; Falciglia, Couch, Gribble, Pabst, & Frank, 2000). Whilst picky eating and food neophobia both refer to those individuals who eat a narrow range of foods, some researchers differentiate food neophobia from picky or selective eating on the basis that food neophobia is an
unwillingness to eat novel foods, whilst picky eating is an unwillingness to eat many already familiar foods (Rigal, Chabanet, Issanchou, & Monnery-Patris, 2012). However, only one study has looked at the relationship between the two concepts (Finistrella et al., 2012). In this study individuals were identified as food neophobic using the Food Neophobia Scale (Pliner & Hobden, 1992) and picky eaters were identified using the Child Eating Behaviour Questionnaire (Wardle et al., 2001), both common measures of these constructs. Each group was then compared in terms of parental food consumption; child weight status; child food intake; early feeding patterns and socioeconomic status, and no significant differences were found. Hence there appears to be an overlap between the tendency to reject novel foods and the tendency to reject familiar foods. Similarly, Wardle and colleagues (2001) proposed that “food fussiness” was a broader concept encompassing both picky and neophobic behaviours. On this basis, food neophobia would seem to be a highly relevant concept when studying selective eating. For example, it is of note that food neophobia is generally understood as a normal developmental variant that persists throughout life. The idea that a certain level of restrictive eating is normal, particularly in childhood, is accepted and well understood in the food neophobia literature.

Food neophobia has been described as an adaptive personality trait (Milton, 1993), that is highly heritable based on the results of twin studies (Cooke, Haworth, & Wardle, 2007). Food neophobia is thought to possibility protect children from eating poisonous food during early childhood (Pliner, Pelchat, & Grabski, 1993). It has been described as the “omnivores dilemma” (Rozin, 1982), a process thought to be an evolutionary beneficial survival mechanism to assist children not to eat potentially hazardous foods. The theory states that as a child starts walking, at around age 1-2yrs, and therefore roams further from parental monitoring the child develops a natural aversion to bitter or new foods in in order to avoid ingesting toxic chemicals (Pliner, et
Food neophobia aids this avoidance behaviour through the child naturally rejecting potential food that they have not experienced. Presentation of a novel food item of any kind may initiate a fear (or avoidance) response within the individual. Food neophobia is thought to be an age dependent state, which with proper instruction is most often discarded as the child develops. Much of the literature in this field investigates the development of children’s food preferences in the context of culture, food presentation, exposure, and parent factors (For a review see Savage, Fisher, & Birch, 2007).

The Food Neophobia Scale (see Table 11) was developed in the early 1990’s to assess levels of food neophobia in the general population (Pliner, 1994; Pliner & Hobden, 1992), and has been used extensively. Various versions of the scale are used as self-report and parental report, and the scale is thought to be applicable to children as young as seven years old. This scale has been shown to have satisfactory internal and test-retest reliabilities and criterion validity, correlating with neophobic behaviour in several laboratory situations (Hobden & Pliner, 1995; Pliner, 1994). Researchers using the Food Neophobia Scale have shown that expression of food neophobia decreases with age (Koivisto & Sjödén, 1996), with most authors reporting that, from a low baseline in infancy, rates of food neophobia increase sharply, reaching a peak between 2 and 6 years old (Adessi et al., 2005; Cashdan, 1994; Cooke et al., 2003, Carruth & Skinner, 2000). Kovisto-Hursti and Sjödén (1997) found that there were no age differences between children aged 6-11 years, but that levels decreased markedly at age 14-15 years. Beyond this levels of food neophobia remain stable throughout adulthood.
Table 1
The Food Neophobia Scale

1. My child is constantly sampling new and different foods.
3. My child doesn’t know what a food is, s/he will not eat it.
4. My child likes foods from different countries.
5. Ethnic foods look too weird to eat.
6. At parties, my child will try a new food.
7. My child is afraid to eat things s/he has never had before.
8. My child is very particular about the foods s/he will eat.
9. I (my child) will eat almost anything.
10. I (my child) like(s) to try new ethnic restaurants.


Food neophobia is most often described as a normal variation, picky eating has been described as both problematic and normal, and selective eating has most often been considered problematic. This reflects a major issue in comparing and integrating research from different fields and once again differentiating normal from problematic eating.

2.1.3. Gender and Avoidant/Restrictive Eating

The evidence relating to the relationship between gender and avoidant/restrictive eating is mixed. Equit et al. (2013) found that boys were more often represented in the selective eating group (53.4%). Conversely, in a longitudinal study of over 800 children (Marchi & Cohen, 1990), the authors found that picky eating was more common in girls at all ages (age range from 1 to adolescence).

More commonly, studies have found no relationship between gender and avoidant/restrictive eating. Dubois et al., (2007) recruited 1498 preschool aged children and found that the rate of picky eaters was the same for boys and girls. Similarly, in another study of picky eating in the same age group, Jacobi et al., (2003) found that there was no significant gender effect (n= 135), and Carruth et al., (2004) looked at a large sample (n=3022) of two years old parent identified picky eaters and found no
significant gender relationship. In a study investigating “choosiness” in primary school aged children, levels of eating difficulty were not related to gender (Rydell, Dahl, & Sundelin, 1995), and in a community sample (n=426) of older children aged 8-12 years there was no significant difference between the prevalence of pickiness in boys and girls (Jacobi et al., 2008). Finally a longitudinal study investigating picky eaters from infancy to 11 years Mascola et al., (2010) found no gender relationship. In relation to food neophobia some studies have found differences (e.g. women more neophobic; Frank & van der Klaauw, 1994) and others have not (e.g. Koivisto-Hursti & Sjödén, 1997). A large Finnish study found food neophobia to be higher in men than women (Tuorila, Lahteenmaki, Pobjalainen, & Lotti, 2001), however it has also been found that there are no gender differences in young adults (Nordin, Broman, Garvill, & Nyroos, 2004). So these results are mixed regarding the relationship between gender and this type of avoidant/restrictive eating, and studies investigating this are presented in Table 12.

Whilst the relationship between gender and selective eating is varied in community samples, as described above, studies consistently demonstrate that in clinical samples, ARFID patients are more likely to be male (Fisher et al., 2014; Nicely, Lane-Loney, Masciulli, Hollenbeak, & Ornstein, 2014; Norris, Robinson, Obeid, Harrison, Spettigue, & Henderson, 2014). Two factors may account for this pattern of results. Firstly, the ARFID sample is taken from eating disorder clinics and therefore are likely to be more severe cases than those in the community. This suggests more severe cases may have a different gender relationship. This may be explained by high rate of individuals with ARFID also experiencing ASD (Sharp et al., 2010), and the robust finding that ASD is more commonly associated with males (Biao, 2014).
Table 12
Summary of Studies Investigating the Association Between Gender and Avoidant/Restrictive Eating

<table>
<thead>
<tr>
<th>Study</th>
<th>Term used</th>
<th>Sample size</th>
<th>Age range</th>
<th>Finding</th>
</tr>
</thead>
<tbody>
<tr>
<td>Equit et al., 2013</td>
<td>selective Eating</td>
<td>1090</td>
<td>4-7 yrs</td>
<td>Male</td>
</tr>
<tr>
<td>Marchi &amp; Cohen, 1990</td>
<td>picky eating</td>
<td>800</td>
<td>1-13 yrs</td>
<td>Female</td>
</tr>
<tr>
<td>Dubois et al., 2007</td>
<td>picky eating</td>
<td>1498</td>
<td>Preschool</td>
<td>No relationship</td>
</tr>
<tr>
<td>Jacobi et al., 2003; 2008</td>
<td>picky eating</td>
<td>135</td>
<td>Preschool</td>
<td>No relationship</td>
</tr>
<tr>
<td>Carruth et al., 2004</td>
<td>picky eating</td>
<td>3022</td>
<td>2 yrs</td>
<td>No relationship</td>
</tr>
<tr>
<td>Rydell et al., 1995</td>
<td>choosey eating</td>
<td>426</td>
<td>8-12 yrs</td>
<td>No relationship</td>
</tr>
<tr>
<td>Mascola et al., 2010</td>
<td>picky eating</td>
<td>120</td>
<td>Infancy-11 yrs</td>
<td>No relationship</td>
</tr>
<tr>
<td>Fisher et al., 2014</td>
<td>ARFID</td>
<td>712</td>
<td>8-18 yrs</td>
<td>Male</td>
</tr>
<tr>
<td>Nicely et al., 2014</td>
<td>ARFID</td>
<td>173</td>
<td>7-17 yrs</td>
<td>Male</td>
</tr>
<tr>
<td>Norris et al., 2014</td>
<td>ARFID</td>
<td>205</td>
<td>13-15 yrs</td>
<td>Male</td>
</tr>
</tbody>
</table>

And secondly, parent report was relied on to identify cases of avoidant/restrictive eating in the community which may have resulted in less consistency and validity than ARFID cases identified by professional assessment which is presumably more comprehensive than parent report.

2.1.4. Summary

There are two broad but related areas of research in the field of avoidant/restrictive eating problems. Firstly, those studies that investigate eating
problems in the community with children who may or may not be seeking treatment. These studies rely on parent report to identify the presence of an avoidant/restrictive eating problem. Even though the studies described above labelled the issue differently (i.e. selective eating, picky eating, fussy eating and food neophobia), many used similar methods (i.e. parent report) to identify the avoidant/restrictive eater. This review demonstrates that rates of parent-perceived levels of their child’s avoidant/restrictive eating is highly variable, ranging from 3% to 34%. Secondly, with the advent of ARFID categorisation, studies have investigated the prevalence rates of ARFID presentations at treatment clinics, as defined by clinical evaluation. These studies have also reported wide variation in the number of ARFID cases presenting for treatment (5-19.4%) and likely reflects differences in clinic intake and interpretation and assessment of ARFID criteria. The relationship between gender and avoidant/restrictive eating is unclear, particularly when using community samples and relying on parent report. However in studies that use clinic samples there is a consistent finding that males more likely to experience avoidant/restrictive eating. Such a wide range of prevalence and confusion over the role of gender may indicate problems in measuring the construct, with assessment compromised by the variability of definitions, the use of clinic based versus community samples and the variation in assessments used.

It is plausible that the food neophobia/picky eating and selective eating may be best viewed as a continuum with food neophobia and/or picky eating falling towards normal levels of avoidant/restricted eating seen in childhood, and ARFID and subtype selective eating, describing the clinical end of the continuum. If so, the differences between the constructs may be more a matter of degree, with the challenge being how to differentiate between normal and pathological eating behaviour. It is possible that normal or less severe presentations of restrictive eating have a different course and gender effect when compared to severe presentations. Children with less severe
presentations may experience a shorter duration of the problem, whereas children with problematic levels of the problem may experience the issue for many years. Therefore, if there is to be continued reliance on parent-report of the issue it may be important to distinguish between parent perception of moderate and extreme levels of problem eating as it may serve to differentiate between normal childhood development and the pathological. It is possible that parents who report moderate levels of problem eating may be observing developmentally normal levels of avoidant/restrictive eating behaviour.

2.1.5. Differentiating between Developmentally Normal and Pathological Levels of Avoidant/Restrictive Eating.

Given the wide variation in the literature regarding prevalence and the effect of age and gender it may be important to investigate whether different severity levels of avoidant/restrictive eating result in different age and gender effects. One study has attempted to differentiate severe from less severe presentations of selective eating to determine whether this results in different presentations of the issue (Zucker et al., 2015). This study examined the relationship between different severity levels of problem eating and concurrent psychiatric symptoms to determine risk factors for the emergence of later psychiatric symptoms. Findings were intended to guide health care providers to recognize when selective eating is a problem worthy of intervention. Level of severity was determined by parent interview, based on responses to questions in relation to whether the child ate a restricted range of food and the degree that the food selectivity impaired functioning. Children were coded *normal* if there was no restricted intake, *moderate* if the child ate only within the range of his/her preferred food and *severe* if eating with others was difficult due to the extreme limitation in range of food eaten. The study found that both moderate and severe levels of selective eating were associated with symptoms of anxiety, depression, ADHD, together with impairment in
family functioning. However, that the severity of psychopathological symptoms worsened as selective eating became more severe. The authors noted a possible limitation in using parent report, however emphasised the importance of identifying problematic levels of avoidant/restrictive eating in its early stages.

2.1.6. Overview of Study One

Given the exploratory nature of this project, a useful starting point was to determine the parent-perceived prevalence, age and gender distribution of selective eating in an Australian community sample. Previous studies have relied on parent report to identify and measure aspects of selective eating and Study 1 was designed to determine the prevalence of selective eating using this approach. This provided an initial snapshot of the issue within an Australian context. In addition, parent report was categorised into different levels of severity (low, average, moderate and extreme) in an attempt to differentiate developmentally normal levels of the selective eating from more problematic levels and the relationship between parent-perceived severity levels and prevalence, age and gender was calculated. By gathering information regarding parent-perception of the problem a classification baseline was also established against which an objective classification of dietary adequacy was compared in a subsequent study. In order to add to the understanding of how selective eating was related to age and gender, the current study looked at children aged 1-12 years in a community setting.

Study 1 investigated (a) The prevalence and severity of parent reported selective eating, (b) The prevalence and severity of parent reported selective eating across different age groups and, (c) parent reported selective eating and the relationship with gender at different severity levels. In doing so, this enabled an investigation of the extent of parental concern about the nature of selective eating in community settings and the degree to which gender and age of offspring was related to these concerns.
2.2. **Method**

2.2.1. **Participants**

The parents of 524 children rated their child’s eating behaviours using the CEBQ. Children were aged 1-12 years of age, 48% were female and the average age was 7.7 yrs. The sample was community based and there were no specific exclusion criteria. Ethics approval was granted by the University of Western Australia Human Research Ethics Committee.

2.2.2. **Procedure**

Information about the research project was mailed to the principals of 12 primary schools and co-coordinators of three day care centres. A follow up phone call resulted in 10 schools and three day care centres consenting to be part of the project. Questionnaires were given to students by teachers to take home for parents and caregivers to complete. Copies of the questionnaire and information sheets are provided in Appendix A. This process resulted in 5136 questionnaires being sent home to parents, and 524 of those were returned (10.65% return rate).

2.2.3. **Measures**

To assess parental perception of selective eating, the CEBQ (Wardle et al., 2001) was utilised. This is a multi-dimensional, parent-report questionnaire that was initially designed to capture eating style in relation to obesity risk. The CEBQ has established internal validity and good test-retest reliability in community samples (Sparks & Radnitz, 2012; Carnell & Wardle, 2007; Tharner et al., 2014), with internal reliability coefficients (Cronbach’s alpha) ranging from .74 to .89 (Tharner et al., 2014). The CEBQ is a 35 item questionnaire that assesses seven dimensions of eating behaviour in children. This measure has four food approach scales and three food avoidance scales. Of the seven scales in the CEBQ, one was thought to be most relevant to the current research on selective eating: the Food Fussiness (FF) Scale. Scores on this scale have
been found to be associated with consumption of variety of foods (Hendy et al., 2010) and has been used in a number of studies on picky/fussy eating (Bucher, Siegrist, & van der Horst, 2013; Caton et al., 2014; Gregory, Paxton, & Brozovic, 2010; Haycraft, Farrow, Meyer, Powell, & Blisset, 2011; Jansen et al., 2012; Morrison et al., 2013; Tharner et al., 2014; Van der Horst, 2012). The CEBQ has been validated for children from the age of 1 to 13 years of age (Behar et al., 2017; Cao, Svensson, Marcus, Zhang, Sobko et al., 2012; Santos, Ho-Urriola, Gonzalez, 2011; Viana, Sinde, & Saxon, 2008). The FF scale on the CEBQ is comprised of six questions (see Table 13). Parents rated each item on a 5-point scale (1 = never, 2 = rarely; 3 = sometimes; 4 = often; 5 = always). FF Scale scores are calculated by adding item scores (items 1-3 were reverse scored) with higher scores reflecting higher levels of parent-perception of restricted or fussy eating.

Table 13

Food Fussiness items on the CEBQ

<p>| | |</p>
<table>
<thead>
<tr>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>My child enjoys tasting new foods.</td>
</tr>
<tr>
<td>2.</td>
<td>My child enjoys a wide variety of foods.</td>
</tr>
<tr>
<td>3.</td>
<td>My child is interested in tasting foods s/he hasn’t tasted before.</td>
</tr>
<tr>
<td>5.</td>
<td>My child decides that s/he doesn’t like food even without tasting it.</td>
</tr>
<tr>
<td>6.</td>
<td>My child is difficult to please with meals.</td>
</tr>
</tbody>
</table>


2.2.3.1. Developing Cut-off Scores for the CEBQ

The CEBQ yields continuous data, so to determine the relationship between prevalence and severity of parent reported selective eating, cut-points were needed to define categories of severity. Differentiating FF scale scores in this manner was achieved via two methods; statistical analysis and clinical judgement. Statistical
analysis firstly involved the assessment of whether the data distribution of FF scores met normality assumptions and secondly the development of percentile ranks and standard deviation scores. Descriptive statistics were identified for the sample (n=505) which included generation of a normal curve with a mean of 18.02 and standard deviation of 5.329 (see Figure 1).

Data for the FF Score appeared normal via visual inspection, and skewness and kurtosis were within range at .182 and -.648 respectively. This analysis indicates that the data for the FF Score is normally distributed. Percentile ranks for FF Scores were developed and are presented in Table 14. Another method to determine a cut off score is to use the $2\sigma$ rule (Singh, 2006), which asserts that a cut off value that indicates a significant difference from the average is $\bar{x} \pm 2\sigma$. A cut off score identifying extreme levels of parent report was based on the $2\sigma$ rule, which in this sample equated to an FF score of 28.6. Since FF scores can only be expressed as whole numbers, this equated to FF scores of $\geq 29$. This value was consistent with the percentile rank of 95. These two statistical methods indicated that an FF score of 95, is an appropriate criterion score by which to label parents as observing their child demonstrating restrictive eating patterns at much higher than average levels. Scores in this range were labelled extreme.

Clinical interpretation of questionnaire responses supported this categorization, whereby if parents had extreme scores, it meant that parents had responses were likely to be in the always category. Scores at the 90th percentile were labelled high, which indicated that parents most often responded in the often category. Moderate levels of parent-perceived selective eating were defined as percentile ranks of 75 to 90, which equated to FF scores on the CEBQ ranging from 22 to 25, and is equivalent to scores being at least one standard deviation above the mean. To obtain a moderate classification parents reported, on average, the behaviour occurring often. Scores across
Figure 1. Normal distribution curve, mean and standard deviation for the FF Score.

Table 14

<table>
<thead>
<tr>
<th>% Rank</th>
<th>FF Score</th>
<th>FF Range</th>
<th>Classification</th>
</tr>
</thead>
<tbody>
<tr>
<td>95</td>
<td>29</td>
<td>29-30</td>
<td>Extremely High</td>
</tr>
<tr>
<td>90</td>
<td>26</td>
<td>26-28</td>
<td>High</td>
</tr>
<tr>
<td>75</td>
<td>22</td>
<td>22-25</td>
<td>Moderate</td>
</tr>
<tr>
<td>50</td>
<td>17</td>
<td>17-21</td>
<td>Average</td>
</tr>
<tr>
<td>25</td>
<td>14</td>
<td>14-16</td>
<td>Low</td>
</tr>
<tr>
<td>10</td>
<td>11</td>
<td>11-13</td>
<td>Very low</td>
</tr>
<tr>
<td>5</td>
<td>9</td>
<td>≥10</td>
<td>Extremely Low</td>
</tr>
</tbody>
</table>

the low, very low and extremely categories were collapsed into a low category and captured the bottom 25th percentile of the sample, and reflected an average parent response of rarely to questions indicative of selective eating.
2.3. **Results**

2.3.1. **Statistical analysis**

Prior to analysis, data were inspected for non-normality in each group using visual inspection of histograms, skewness and kurtosis statistics, and normality tests, specifically Shapiro-Wilk test for $n < 50$ and Kolmogorov-Smirnov test for $n \geq 50$ and outliers. Data was normal, evidenced by skewness and kurtosis cut-offs which for both age groups were $< 3$ (Tabachnick & Fidell, 2007). Parametric tests (t-tests) were run, but a lack of normality (skew and kurtosis $> 3$) in the distribution of scores made it necessary to use non-parametric tests.

Each variable was examined for the presence of univariate outliers ($z \geq |3.29|$) (Tabachnick & Fidell, 2007), and two cases were omitted. Thirty-one participants did not record a gender, resulting in 491 valid cases and 17 cases did not report a valid age score reducing the number of cases to 505. Age groupings were generated using SPSS, based on typical age categories in child psychology literature: early childhood (0-6 years); middle childhood (7-12 years), and are also used in the literature regarding avoidant/restrictive eating (e.g. Jacobi et al., 2003; Mascola et al., 2010).

2.3.2. **Parent-Perceived Prevalence**

Parent-perceived prevalence was calculated using the $2\sigma$ rule of two standard deviation scores above the mean on the CEBQ, which in this sample equated to an FF score of $\geq 29$. This resulted in a parent-perceived prevalence rate of 6.72% of extreme levels of selective eating.

2.3.3. **Age and Parent-Perceived Prevalence**

A small but significant correlation was found between age and FF Score, $r = -0.1$, $p = .018$. 
2.3.4. Age and Severity Level of Parent-Perceived Prevalence

The proportion of parents who perceived selective eating occurring at different levels of severity was determined across two age groups, and these data is presented in Table 15. The difference in proportions between age groups was significant $\chi^2 (3) = 9.39$, $p < 0.025$. Post hoc analysis of standardised residuals indicated that the difference between the age groups was within the average category of selective eating, with significantly more children in the 0-6 year age group being classified within this range (2.1). No other cells produced a significant result ($< 1.96$).

Table 15

<table>
<thead>
<tr>
<th>Severity of Problem Eating</th>
<th>Age</th>
<th>Low ($n = 227$)</th>
<th>Average ($n = 130$)</th>
<th>Moderate ($n = 85$)</th>
<th>High/Extreme ($n = 63$)</th>
</tr>
</thead>
<tbody>
<tr>
<td>0-6 years ($n=190$)</td>
<td></td>
<td>37.4</td>
<td>33.1</td>
<td>18.9</td>
<td>10.5</td>
</tr>
<tr>
<td>7-12 years ($n=315$)</td>
<td></td>
<td>49.2</td>
<td>21.6</td>
<td>16.2</td>
<td>13.0</td>
</tr>
</tbody>
</table>

2.3.5. Gender and Parent-Perceived Prevalence

An independent-samples t-test was conducted to compare FF scores for males and females. No significant differences on parent reported FF scores were found between males ($M=18.08$, $SD= 5.88$) and females ($M=17.76$, $SD=5.88$); $t (137) = 1.479$, $p = 0.141$. The proportion of males and females classified at different levels of severity was determined and these data is presented in Table 16. The difference in proportions between males and females was not significant $\chi^2 (3) = 6.04$, $p < 0.110$. There was no significant association found between the FF scores for males and females and age.
Table 16
Frequency (%) of Males and Females at Different Severity Levels of Selective Eating

<table>
<thead>
<tr>
<th>Gender</th>
<th>Severity Level</th>
<th>Low n=219</th>
<th>Average n=133</th>
<th>Moderate n=77</th>
<th>High/Extreme n=62</th>
</tr>
</thead>
<tbody>
<tr>
<td>Males</td>
<td></td>
<td>41.9</td>
<td>30.8</td>
<td>13.5</td>
<td>13.8</td>
</tr>
<tr>
<td></td>
<td></td>
<td>n=109</td>
<td>n=80</td>
<td>n=35</td>
<td>n=36</td>
</tr>
<tr>
<td>Females</td>
<td></td>
<td>47.7</td>
<td>22.9</td>
<td>18.2</td>
<td>11.2</td>
</tr>
<tr>
<td></td>
<td></td>
<td>n=110</td>
<td>n=53</td>
<td>n=42</td>
<td>n=26</td>
</tr>
</tbody>
</table>

2.4. Discussion

Parent-perceived prevalence of selective eating was 6.72%. This is consistent with prevalence rates reported in previous studies (Tharner et al., 2014: 5.6%; Micali et al., 2011: 7.6%; McDermott et al., 2008: 7.5%). The current study included the assessment of selective eating across the age range from infancy through to 12 years which allowed for investigation of the impact of age on the patterns of parent report across childhood. However the proportion at the severe end of the spectrum increased slightly with age, suggesting that over time it may become easier to distinguish problematic selective eating from developmentally normal selective eating.

Analysis of the proportions of different levels of severity of problem eating across age indicated that there was a significant difference between the two age groups (0-6yrs and 7-12yrs). However post hoc analysis indicated that the difference was due only to higher numbers of younger children within the average range of eating. This pattern of results did not lend itself easily to interpretations regarding the relationship between age and severity of selective eating. The results of this study did not support the hypothesis that the frequency with which children are reported to demonstrate selective eating varied with age and severity. More broadly, the hypothesis that those children whose parents report moderate levels of the problem experience a shorter
duration of the problem, in contrast with children reported to experience severe levels of the problem who may experience enduring problems with eating, were not supported by the current study.

No differences were found in selective eating between males and females. Previous research using community samples has found mixed results regarding the presence of a relationship between gender selective eating. One hypothesis explored in the current study was that inconsistent gender effects of previous research were the result of problems in varied assessment methods and specifically the differentiation between developmentally normal and pathological levels of the problem. The current study addressed this hypothesis of inadequate differentiation of problematic and non-problematic levels of eating leading to mixed results, by assessing the severity of eating problem, and relationship of gender at low, average, moderate and high severity levels. However no significant relationship between gender and severity level of eating problems were found at a community level. This result is consistent with the majority of studies conducted primarily with picky eaters in community samples which also found no gender effects (Curruth et al., 2004; Dubois et al., 2007; Jacobi, 2003; 2008; Mascola et al., 2010; Rydell et al., 1995). This is in contrast to the findings that there tend to be males evident in clinical samples (Fisher et al., 2014; Nicely et al., 2014; Norris et al., 2014). As noted, the higher prevalence of males in clinical samples may be associated with higher representation of individuals experiencing ASD and ARFID presenting in clinical settings, and the higher prevalence of males in ASD. However differences in gender prevalence between community and clinical settings is also found in Attention Deficit Hyperactivity Disorder. In representative population-based studies, the male-to-female ratio of ADHD is approximately 3:1 (Barkley, 2006; Gaub & Carlson, 1997), whereas in clinical samples, the male-to-female ratio is mostly between 5:1 and 9:1 (Gaub & Carlson, 1997; Gershon, 2002; Lahey et al., 1994;
These numbers suggest that far more boys than girls receive treatment for ADHD compared with the ratio found in community based samples. This remarkable difference is mostly explained by differences in the expression of the disorder among boys and girls. Studies suggest that girls with ADHD show fewer behavioural and conduct problems and are less impulsive than boys with ADHD (Berry, Shaywitz, & Shaywitz, 1985; Hartung, Milich, Lynam, & Martin, 2002; Newcorn et al., 2001). This reasoning can apply to selective eating, whereby boys with ARFID may show more behavioural difficulties than girls therefore increasing the likelihood that parents of boys seeking treatment in clinical settings, or as suggested by Bruchmüller, Margraf, & Schneider, (2012) that clinicians are more likely to assign the diagnosis if there are co-morbid difficulties evident.

Major limitations to this study include the validity of the measure used to identify the condition and the lack of tested correlation between parental perception of the problem and actual presence of the condition. This study used the CEBQ, with study specific generated norms and cut off scores, to identify different severity levels of selective eating. The CEBQ has often been used to describe patterns of selective eating (Bucher, et al., 2013; Caton et al., 2014; Gregory, et al, 2010; Haycraft et al., 2011; Jansen et al., 2012; Morrison et al., 2013; Van der Horst, 2012), and has been associated with a reduced variety of food intake (Hendy et al., 2010, Tharner et al., 2014), but it has not been validated as a measure of selective eating. Therefore findings based on using the CEBQ to examine prevalence rates and the relationship between age, gender and selective eating need to be considered with caution. Currently there is limited research into questionnaires that can effectively identify selective eaters.

As well as possible limitations to the questionnaire validity, it may not be wise to use parent report at the sole indicator of the presence of selective eating. To date research into the concept of selective eating including selective eating has been
primarily a parentally perceived concept; however, it is may be that parent report may be mediated by a number of factors that influence their perception of the problem. Most research into child and adolescent psychiatric difficulties cautions against using parents as the only source to assess the presence of childhood psychological difficulties, and recommend multiple sources of assessment, and that relying on parent report impacts significantly on the assessment and classification of problems (Achenbach, 2006; De Los Reyes & Kazdin, 2005). Relying on parent report to assess and classify child psychopathology is not recommended, mainly due to the discrepancies evident between parent report and other informant (e.g. teachers, the child, peers mental health professionals) reports (Achenbach, 2006; De Los Reyes & Kazdin, 2005). A key element here is the need to develop an assessment process, not purely reliant on parent report, which can differentiate between normal and pathological levels of the problem, which is addressed in subsequent studies in this project.

The response rate for returning questionnaire was low at 10.65%, and consequently response bias needs to be considered. It is possible that all the questionnaires did not make it home to parents in the first place, which may have also effected response rates. However if the questionnaire did make it into the parents hands, it may be that the sample of parents who returned the questionnaire were more interested or more concerned about their child’s eating patterns, and therefore it is possible that respondent’s observations and scores were elevated. Using this sample, results may be inflated suggesting that the rates of parent-perceived prevalence in the community may be lower than those found in this study. Recruitment factors such as no direct mailing, no return envelope, no direct connection or relationship with parents, and no capacity to conduct telephone reminders may have negatively affected response rates. It is difficult to ascertain the impact of such a low response rate. Many factors may be involved; however, it indicates that the results need to be interpreted with caution.

3.1.  Introduction

The assessment of selective eating has been plagued by vague and inconsistent terminology and assessment methods. Research on selective eating has relied on parent report to identify clinical levels of restricted eating in childhood, however there is some variability in the literature regarding whether parents’ report of eating and feeding problems are representative intake. The variability in parents’ report of suggests that parent factors should also be considered when looking at children’s’ eating patterns. In order to develop consistent and valid assessment of selective eating it is useful to firstly consider and review the literature in relation to the validity of parent report both in general and in context of avoidant/restrictive eating in children.

3.1.1.  Factors Affecting Validity of Parent Report

Many studies have identified selective or avoidant/restricted eating via parent report; sometimes on the basis of a single question e.g. “is your child a picky eater?” (Equit et al., 2013; Jacobi et al., 2008; Mascola et al., 2010). There are problems with relying on parental report in this way. Relying solely on parent report of child psychopathology has been found to have a significant impact on the assessment, classification and treatment of child psychopathology. Informant (often parents, but can be siblings, teachers or peers) discrepancies refers to differences and similarities between informant ratings of child psychopathology under varying circumstances (e.g. level of agreement among informants ratings; disagreements between informant ratings), and informant discrepancies have been identified in common methods of clinical assessment (e.g. rating scales; structured interviews) which researchers and practitioners use to assess abnormal behaviour in children and adolescents (De Los
Reyes & Kazdin, 2005). Such discrepancies call into question the validity of parent report on child psychopathology. The presence of discrepancies between parents and children in their ratings of childhood psychopathology has been recognised for decades (Achenbach, 2006; Achenbach, McConaughy, & Howell, 1987), and was described by De Los Reyes and Kazdin (2005) as “one of the most robust findings in clinical child research” (p. 483). The reason for the discrepancy is less well understood. Extensive attention has been given to examining the moderators and correlates of informant discrepancies (see Achenbach et al., 1987; Duhig, Renk, Epstein, & Phares, 2000; De Los Reyes & Kazdin, 2005). This attention has largely focused on examining relations between informant factors or the characteristics of the child being rated. The types of child characteristics investigated have included age, gender, ethnicity, social desirability (the tendency to rate the psychopathology in a positive light), and perceived distress levels. Research focusing on parent factors has examined parent psychopathology, specifically depression, anxiety and stress as attributional bias, and these factors are reviewed below.

3.1.1.1. Parental Stress, Depression and Anxiety and Attributional Bias

Several studies have reported a positive relationship between maternal levels of depression and discrepancies in ratings on a number of emotional and behavioural problems in children and adolescents across both internalizing (e.g. anxiety and depression) and externalizing (hyperactivity, aggression) problems (Chi & Henshaw, 2002; Chilcoat & Breslau, 1997; Najman, et al., 2000; Youngstrom, Izard, & Ackerman, 1999). Similarly, experimental evidence suggests that maternal anxiety may bias mother’s ratings of child psychopathology and influence discrepancies among the ratings of mothers and other informants (Affrunti & Woodruff-Borden, 2015). A number of studies have found a positive relationship between parental anxiety and informant discrepancy on both internalizing and externalizing problems in youth.
Both self-rated parental stress and parent-reported levels of child stress have also been shown to contribute to informant discrepancies (Kolko & Kazdin, 1993; Youngstrom, Loeber & Southamer-Loeber, 2001).

One theory behind informant discrepancies and how parent psychopathology may influence outcomes is the depression-distortion hypothesis (Richters & Pelligrini, 1989). This theory suggests that parent perspective is affected by negative mood states because parents may recall negative information as opposed to positive or neutral information, thereby tending to view the situation more negatively, or over report child adjustment difficulties more so than those informants who do not experience stress, anxiety or depression (Field, 1992; Geller & Johnston, 1995; Griest, Wells, & Forehand, 1979; Johnston & Short, 1993). Treutler and Epkins (2003) examined whether parent symptoms of depression contributed to parent report of child behaviour as well as discrepancies between mother-child, father-child, and mother-father reports. Parent symptomology contributed to mother-father discrepancies regarding internalizing and externalizing problems, indicating that differences between caregivers’ reports were a function of caregiver symptoms. Chi and Hinshaw (2002) investigated the depression-distortion hypothesis by looking at the effects of parent depression on cross-informant discrepancies in reports of childhood behaviour problems with children experiencing attentional problems. Overall parent depression predicted negative bias in their reports of their child’s attentional problems, general behaviour and their own parenting style. Further, increases in parent symptoms of depression were associated with parent reports of negative parenting practices, but not with indicators based on laboratory observations of parent-child interactions, suggesting possible depression-distortion effects. These studies question the validity of parent report of child behaviours when carers experience
depression has been questioned, and caution has been called for with regard to pathologizing child behaviour on the basis of parent report if caregiver depression is not accounted for (Breslau, Davis, & Prabucki, 1988; Garber et al., 1991; Nelson, et al., 2003).

If the depression-distortion theory is applied to parent report of selective eating, it is possible that parents with depression may overestimate the scale of the problem. Anecdotal information that suggests parents of selective eaters do experience significant levels of stress. In two retrospective case studies, both which looked at various child and family characteristics associated with those children presenting to eating disorder clinics, it was found that parents often presented with “a degree of subjective distress” (Nicholls et al., 2001, pg. 267), and helplessness in the face of high levels of child resistance to eating (Timimi et al., 1997). Timimi and her colleagues (1997) also suggest that mothers of selective eaters may be prone to emotional difficulties, particularly depression and anxiety and noted a high proportion of depression amongst parents of selective eaters. Bryant-Waugh, Maskham, Kreipe, and Walsh, (2010) also found that there can be high levels of conflict around meals between parents and children, and they highlighted the impact that this ongoing conflict may have on the parent-child relationship, particularly in terms of increased stress levels.

The association between parental anxiety and children’s feeding has been well documented, with mothers of young children receiving treatment for feeding problems showed elevated levels of anxiety (Jones & Bryant-Waugh, 2013). This result has also been found in non-clinical samples where caregiver depression and anxiety is associated with the existence and continuation of feeding problems in early childhood (Coulthard & Harris, 2003; Hellin & Waller, 1992; Micali, Siminoff, Stahl, & Treasure, 2011), suggesting that parents with elevated levels of anxiety and/or depression may report more problematic feeding patterns in their child.
Harvey, Bryant-Waugh and Watkins (2015) looked at the validity of parent report in a non-clinical population by comparing nutritional intake to parent report and in addition, investigated whether parent anxiety impacted the accuracy of parent report. Sixty-one parents of children aged two to seven years old completed the Behavioural Pediatric Feeding Assessment Scale as well as a food diary detailing their child’s intake, which was analysed using CompEAT nutritional software. Results indicated that parental anxiety independently predicted whether parent report of feeding problems matched the child’s intake. Specifically, parents whose reports did not correspond with their child’s intake had higher anxiety.

In addition, there may be some parents who experience distorted cognitions about food, such as those individuals with eating disorders, which may influence how they perceive their child’s eating (Patel, Wheatcroft, Park, & Stein, 2002). This research indicated that mothers with eating disorders are more likely to be intrusive at mealtimes, less likely to breastfeed, use food for non-nutritive purposes, and express negative comments towards their children at meal times.

In summary, it is well understood that parents often rate the level of their child’s behaviour problems differently to other informants, including teachers, the child or adolescent themselves, significant others, health professionals, laboratory observers, as well as biological indices (De Los Reyes et al., 2008). It is clear in that it is unwise to rely on report from once source when assessing childhood psychological problems, and gathering information from a variety of sources in the assessment of child behaviour increases the reliability and validity of assessment (Bögels & van Melick, 2004; Renk & Phares, 2004).

3.1.1.2. Parent Perception of Dietary Quality

In a review of the literature Adamo and Brett (2014) concluded that “many complex and integrated factors” (pg. 990) can influence parent perception of childhood
diet and listed factors such as: parental knowledge, awareness and beliefs; perception of child health and weight; information sources used for decisions; parental style and practices; family dynamics and structure; socio-economic factors; child food preferences; media; and parent peers and social environment. These authors indicated that “Overall it can be concluded that maternal perceptions of their child’s diet may not always correlate with reality and may stem from limited nutritional knowledge of healthy foods and appropriate quantities for children” (pg. 981). Adamo and Brett (2014) cite a study that has directly compared the maternal perception of child’s diet quality with the actual quality of the child’s diet (Kourlaba, Kondaki, Grammatikaki, Roma-Giannikou, & Masios, 2009). Results of this large scale study (n=1759) of Greek children aged 2-5 years, indicated that 83% of mothers overestimated the quality of their child’s diet. The general perception in this field of research is that unhealthy eating habits amongst children are widespread (Veugelers, Fitzgerald, & Johnson, 2005; Garriguet, 2007; Pabayo, Spence, Casey, & Story, 2012; Colapinto, Fitzgerald, Taper, & Veugelers, 2007), and that parents habitually perceive their child’s diet to be healthier than it actually is. (Adamo & Brett, 2014; Adamo et al., 2010).

Much of the research investigating the accuracy of parent perception of dietary quality comes from the perspective of reducing obesity or assisting parents to make healthy choices for their children. To our knowledge no studies have investigated the issue from the other end of the spectrum, which considers whether parents may also underestimate the quality of their child’s diet. That is, parents perceiving that their child’s diet is of poor quality when it actually is nutritionally adequate. The possibility that parents perceive their child’s diet to be worse than it actually is, is relevant to selective eating as it is possible that parents may perceive their child to have an eating problem, when they actually don’t. It is possible that the same factors that lead to overestimations of dietary quality such as a lack of knowledge, perception of child
health and weight; parental style and practices; family dynamics and structure; socio-economic factors; and child food preferences, may also result in underestimations of dietary quality.

3.1.2. Validation of Parent Report for Avoidant/Restrictive Eaters

Given the potential problems with parent report and the propensity to use it as a measure of avoidant/restricted eating, studies have attempted to validate parent report of avoidant/restrictive eating problems by comparing parent report to objective measures of the problem.

Studies have found that picky eating has a negative impact on dietary intake. Picky eaters as identified by parent report have been repeatedly found to eat fewer fruits and vegetables and overall lower energy intake when compared to the recommended daily intake (Cooke, Carnell, & Wardell, 2006; Dubois et al., 2006; Horodynski, Strommel, Brophy Herb, Xie, & Weatherspoon, 2011; Kim et al., 2005; Volger et al., 2013). However, it is important to include a group of non-picky eaters for comparison, as both picky and non-picky eaters may have a low intakes of certain foods, and the following studies have used this design.

Carruth and colleagues, (1998) measured the food intake for picky eaters using a food recall method. Picky eaters were identified by parent responses to the question “Is your child a picky eater?”, and responses were coded as yes, no, or refusal. The interviewer did not define the term picky eater, rather the caregiver perception was used to define picky eating. The study compared parent report of 74 participants using two day food records and one 24 hour food recall. The children were aged between 24 and 36 months, and their food intake was measured twice during this period. The Variety Index for Toddlers (Cox, Skinner, Carruth, Moran, & Houck, 1997) was used to measure nutritional levels. Using this method foods consumed in amounts less than one half of a recommended serving size (as recommended by the food guide pyramid and at
a serving adapted for two-year-olds) and foods with little nutritional value were excluded from nutritional calculations. Also if servings of a food group exceeded the minimum recommended number of servings per day, nutrition scores for that group were truncated. This prevented high intakes of one food group from compensating for an inadequate number of servings from other food groups. As well as measuring nutritional levels, the range of foods eaten was also measured. In order to measure range of food eaten, The Diversity Score defined the total number of different foods consumed over three days, and any amount of food consumed was counted. This measure was in addition to the Variety Score noted above which measured the nutritional content of the food. In addition to assessment of Variety Scores and Diversity Scores, nutrient analysis were performed via computer software and nutrient amounts were compared to recommended daily allowances for children aged one to three years. Results indicated that toddlers perceived by their parent as a picky eater had significantly lower Variety and Diversity Scores than non-picky eaters and on this basis the authors concluded that parent report is a valid measure of picky eating. Specifically, Carruth and colleagues (1998) asserted “These results validate the mothers’ observations about the limited number of acceptable foods eaten by their toddlers and the concerns expressed by the mothers” (p. 183). However, the research also indicated that there was no significant difference in nutrient intake, as measured by the Nutritionist IV Software analysis, between picky and non-picky eaters and further the study did not indicate whether either group, picky eaters or non-picky eaters, exhibited a nutritionally compromised diet. This suggests that whilst parent-identified picky eaters might eat a smaller range of food, picky eaters may not be nutritionally compromised to a clinical level. That is, that whilst the picky eaters as identified by their parents were eating less variety than their non-picky eating counterparts, they were not showing any nutritional differences. This is significant as the presence on nutritional
deficiency is a core element of ARFID, and therefore based on these results it is unlikely that these children would attract a diagnosis of ARFID or selective eating.

Tharner et al., (2014) set out to validate parent report by comparing it with food intake for both fussy and non-fussy eaters. These authors conducted a comprehensive analysis of parent responses on the CEBQ, by using a latent profile analysis. They found a distinct fussy eating profile, and indicated that this was related to food intake. The eating patterns identified by the profile showed that, at 14 months of age, fussy eaters ate less wholegrain products, vegetables, fish and meat than non-fussy children. Fussy and non-fussy eaters ate similar amounts of dairy and fruit and refined whole grain products such as cereals. Although the fussy eaters ate less variety than non-fussy eaters, the authors did not report if the food intake of fussy eaters was nutritionally deficient. Similarly, Taylor, Northstone, Wernimont, & Emmett (2016) assessment the nutritional status of parent reported picky eaters via a three day food diary and found that picky eaters are less fish, meat and vegetables, and higher rates of sugary foods and drinks than non-picky eaters, however this did not result in significant nutritional compromise for the picky eaters.

Some researchers have taken the approach of validating parent report by comparing it to laboratory or home feeding situations. As part of a longitudinal study, Jacobi et al., (2003) compared parental report of picky eating to a laboratory feeding situation and standardized home feeding situation for 135 participants. In this study, parent reported picky or non-picky eating was defined by a response to the question, "Is your child a picky eater?" coded on a five point scale (never, rarely, sometimes, often and always) at both four and five years old. Child eating behaviour was assessed in the laboratory at a lunch meal at 3.5 and 5.5 years of age. For the laboratory lunch the child was brought to the laboratory by a parent, who was instructed to help the child as he or she would at home. A buffet laid out in a standard format and totalling approximately
5000 kcal. allowed for adequate variety and choice of lunch foods. Parents were asked not to feed their child for at least 2 hours prior to the laboratory meal. Eating behaviour was coded by an assistant who observed through a one way screen. Among the eating behaviours collated were total bites, bite rate, number of sips, number of pauses, and total active eating time. In addition, 24 hour food intake was assessed twice during weekdays in a standardized home feeding when the children were 3.5 and 5.5 years old. In this process a cooler containing a variety of foods and drinks was delivered to the participant’s home, and parents were instructed to feed their child only from the cooler. Similar to the laboratory sessions, the child’s food preferences were taken into account in preparing the cooler. The coolers were picked up the next day, and contents of the cooler examined. Objective behavioural measures of pickiness were assessed by the 24 hour caloric intake; variety of food was assessed using the total number of foods eaten as well as the total number of food groups eaten (including: dairy; fruit; vegetables; breads and grains; meats and other proteins; sweets and condiments). Results indicated that picky eaters ate significantly less foods than non-picky eaters ($F_{1,131} = 4.1, p = .046$). Picky boys ate fewer vegetables ($F_{1,131} = 5.6, p = .019$), and picky girls decreased their caloric intake between the age of 3.5 and 5.5 by more than 200 calories, whilst non-picky girls increased their intake by 100 calories. On the other hand both picky and non-picky boys increased their caloric intake by 100-200 calories between the 3.5 and 5.5 years old. There was no difference noted for measures of meal duration and number of bites. On this basis, the authors reported that using objective laboratory based measured it was found that parentally reported pickiness is associated with a lower number, and lower variety of foods consumed and concluded that parent reports of picky eating is associated with a “consistent pattern of inhibited and selective eating” (pg. 76). However, in terms of assessing or diagnosing an eating problem, the issue remains that whilst parent-identified picky eaters ate fewer foods and had lower variety,
closer examination of the data indicated that picky eaters ate on average one less food than non-picky eaters, and that this was mainly contributed to by the finding that picky boys ate less vegetables than non-picky eaters. It is not clear from these data if the “pickiness” was associated with nutritional deficiency, or even whether the lower levels of food and variety were outside recommended ranges. Whilst this may have been a statistically significant result it is possible that the difference between the intake of picky and non-picky eaters was not nutritionally significant.

Cardona Cano et al., (2015) compared picky eaters and non-picky eaters on objective measures of dietary adequacy. Whilst this study did not specifically address the question of the validity of parent report, the study design lends itself to some conclusions on the issue. In this study picky and non-picky eaters were compared on parent completed Food Frequency Questionnaires (FFQ’s). A FFQ assesses children’s food intake based on the frequency and type of food consumed in the previous four weeks. The food items in this study were classified into 12 different food groups: refined grain products, wholegrain products, dairy products, formula, pasta/rice/potatoes, vegetables, fruit, fish/seafood, meat, confectionary, savoury snacks, and composite dishes. The item scores were combined to indicate variety and total number of foods consumed, as well as total caloric intake. Picky eaters as defined by two questions on the Child Behaviour Checklist differed significantly on variability of food intake from non-picky eaters in a number of food groups measured at the age of 14 months. Picky eaters ate fewer whole grain products, rice, pasta, meat fish and vegetables. No difference was found on refined grain products, dairy, formula, fruit, savoury snacks, and composite dishes. Picky eaters also ate a lower total number of foods. However, it was not clear if the noted differences between the groups meant that picky eaters ate a nutritionally deficient diet, and conversely whether the non-picky eaters ate a nutritionally adequate diet.

A recent study set out to differentiate children with ARFID from normal eaters using parent report on two questionnaires (Dovey et al., 2016). The aim of the study was to
test the validity of the questionnaires in differentiating ARFID cases from a normative sample, but in using parent report questionnaires, the issue of the validity of parent report is addressed. In this study, a sample of 101 community based participants (parents) were directed to complete questionnaires on their child’s eating behaviours (Child Food Neophobia Scale; Behavioural Paediatric Feeding Assessment Scale) to form a normative sample. A further sample of 28 parents of children diagnosed with ARFID from a specialist feeding disorder service were embedded into the normative sample. All of the children with ARFID met criteria via their dependence on oral liquid supplements in order to achieve sufficient caloric intake. Results indicated that both questionnaires were able to differentiate ARFID cases from normal eaters. The authors found that certain questions and scales, rather than whole questionnaires were good indicators of ARFID, and that item analysis would be required to determine which questions are important to screen for ARFID. So whilst some refinements were recommended it appeared that parents were able to accurately differentiate a clinical sample of avoidant/restrictive eaters from a normative one. An acknowledged limitation to this study was the use what appears to be severe cases of ARFID whereby the children (aged 2-5) were dependant on oral liquid supplements to achieve sufficient caloric intake. In this study, all ARFID cases were referred to a national specialist feeding service following unsuccessful attempts to improve their food intake within local hospital services. So whilst parent report was able to discriminate between this ARFID group and normal eaters, it may be that parents have more trouble identifying less severe forms of ARFID that don’t require tertiary treatment services.

In summary, studies have compared parent report of picky eating to objective measures of diet (food recall report, food frequency questionnaire and a laboratory meal), and all reported that picky eaters ate less variety when compared with non-picky eaters, however, the degree of nutritional impairment found was insignificant or was not
reported on. That is, even though these children identified by their parents as picky/fussy eaters ate a less variety of foods than non-picky subjects, their nutritional status was not significantly affected. Therefore, whilst these children are eating a less varied diet than their same age counterparts, they may not qualify for a diagnosis of ARFID based on the criteria of nutritional deficiency. If it is the case that picky eaters are eating a nutritionally adequate diet it may be important not to pathologise their eating pattern, indeed Taylor et al., (2016) commented that “emphasis should be placed on allaying parental concern about picky eaters being prone to inadequate nutrient intakes” (pg. 1647). Labelling picky eaters as having a problem when they are not nutritionally compromised may be an issue at a number of levels including increasing parental anxiety, which may serve to exacerbate or maintain the problem, result in family conflict and/or low self-esteem for the child. Conversely there is emerging evidence to suggest that parents can identify more severe forms of ARFID, as defined by the criteria of dependence on oral supplements, however it is currently unknown if parents can accurately identify less severe presentations of ARFID. It may be that with further refinement of existing questionnaires, in the context of ARFID criteria that parent report measures will be able to identify the full range of ARFID presentations including selective eating.

3.1.3. Summary and Rationale for Study 2.

A review of the literature indicates that there are problems with the validity of parent report of avoidant/restrictive eating as an indicator of nutritional deficiency, particularly in community settings. This is important as it may indicate parent report is not a valid indicator of ARFID and selective eating, given that one of the criteria of ARFID is the presence of nutritional deficiency in the context of selective eating patterns. In this study, the ARFID criteria of nutritional deficiency was used as the gold standard to which parent report was compared in order to determine the relationship
between parent report of selective eating and nutritional deficiency. The criteria of nutritional deficiency is a useful the reference point because it can capture the full range of severity of ARFID presentations, including those children in community settings who benefit from outpatient support to more severe presentations whereby the child is losing weight, needs hospitalisation, or requires oral supplements to maintain energy intake. It is also relatively easy to assess. Thus, the aim of Study 2 was to explore the validity of parent report by investigating the relationship between parent report of selective eating and nutritional deficiency in their child. Parent report was gathered by responses on the CEBQ and was compared with dietitian assessment of three day food diaries and rating of diet adequacy/inadequacy. Information was also gathered on the range of food eaten (food variety) by counting how many different foods were consumed by the child, and the relationship between dietary adequacy/inadequacy and food variety was explored. The respective value of food variety and parent report in predicting whether a child’s diet was assessed as adequate or inadequate was also calculated.

3.2. Method

3.2.1. Participants

Parents (n=102) from a community sample participated in the study. There was a range of parent-perceived restrictive and non-restrictive eaters in the sample. The age range was 1 year to 12 years, with an average of 8.5 years, and 55% of the sample was male. There were no specific exclusion criteria. Ethics approval was granted by the University of Western Australia Human Research Ethics Committee.

3.2.2. Procedure

The 524 participants of Study 1 (recruited via local schools and day care centres) were also asked to participate in Study 2. One hundred and four individuals agreed to participate which represented 18.9% response rate. Participants were sent letters containing an information sheet and a three day food diary. The food diary was
designed to allow for detailed recording of food intake over three days. It was suggested in instructions to the participants that ideally the three days should include one weekend day. The instructions also included examples of the level of detail regarding description of food intake. There was also room for comments in order to explain any unusual situations or events that had impacted on their child’s eating (e.g. birthday parties).

Please see Appendix A and B for the information sent to participants, which included a food diary, information sheet and FF Scale of the CEBQ questionnaire. In response to participation in the study, subjects were offered a raffle ticket in a draw to win a $100 voucher to a retail outlet of their choice. In addition, they were offered feedback regarding their child’s eating patterns, specifically regarding level of fussiness and also nutritional content. The food diaries were returned by reply paid envelope.

3.2.3. Measures

3.2.3.1. Dietitian Ratings of Nutritional Levels

In order to assess nutritional status, diaries were reviewed by clinical dietitians employed a local children’s hospital. Two senior dietitians, with an average of 10 years’ experience, conducted the research. They had worked in a variety of settings but were employed at the time on an eating disorders program (which assessed and treated conditions including AN and BN, but not subtypes associated with ARFID). The dietitians independently assessed the quality of food intake as reported in the food diaries using their clinical knowledge, and were blind to parent reports of selective eating. The dietitians assessed the quality of nutritional status reflected in the food diaries which were classified into two groups: adequate and deficient. To assess the food diaries a set of pre-established criteria was used based on factors such as food group representation, overall energy intake, nutritional and mineral representation, and meal spacing.
3.2.3.2. Child Eating Behaviour Questionnaire (FF Score)

In order to assess parental perception of their child’s selective eating patterns, six questions from CEBQ (Wardle et al., 2001), specifically the Food Fussiness Scale (FF scale), were included on the back of the food diary for the parents to complete. The CEBQ has established internal validity and good test-retest reliability in community samples (Sparks & Radnitz, 2012; Carnell & Wardle 2007), with internal reliability coefficients (Chronbach’s alpha) ranging from .72 to .91. The CEBQ is a 35-item questionnaire that assesses seven dimensions of eating behaviour in children. Similar cut off scores to those used in Study 1 were used to identify those parents who rated their child as experiencing high (FF score = 26-30), average (FF score = 17-25); and low levels (FF score = 0-16) of selective eating.

3.2.3.3. Range of Food Eaten: Variety Rating

The range of foods eaten can be measured in terms of how many different foods are eaten. Different foods were defined based on criteria used in the Healthy Eating Index-2005 (HEI-2005; Guenther et al., 2005). The HEI-2005 is comprehensive and valid measure of diet quality that assesses conformance to federal dietary guidance in the USA (Guenther, Reedy, Krebs-Smith, & Reeve, 2008). The HEI-2005 is an adequate tool concerning the evaluation of diet quality, and has demonstrated moderate predictive ability in relation to chronic diseases and health determinants (Kourlabà & Panagiotakos, 2009). Using the HEI-2005 guidelines dietary variety was assessed by totalling the number of different foods an individual ate across the three days in amounts sufficient to contribute to at least one half of a serving in a food group. This number was referred to as the Variety Rating. Appendix E includes details on the coding structure used, as adapted from the HEI-2005, to compute the number of different foods, and some coding examples are presented in Table 17.
Food mixtures were broken down to their constituent components, and an individual had to consume at least half of the recommended daily serving of that food for it to count. For example, a person might consume a recommended serving of raisins (½ cup) in one sitting, or a person may consume a raisin muffin in the morning and have a scone containing raisins in the afternoon. As long as the person ate at least one half of a recommended serving (¼ cup) across the day, he or she would get credit for eating the raisins.

Another conversion assumption used was that food mixtures containing two or more components from the same food group, such as mixed vegetables, were allocated to the two or more variety codes of the components that were present. Thus, a mixture containing carrots, corn, peas, and beans would count towards all four variety areas. However, the person must consume at least half of a serving of each to count towards the total.

Table 17
*Healthy Eating Index-2005 Coding Recommendations to Differentiate Between Foods*

<table>
<thead>
<tr>
<th>Code</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>a)</td>
<td>Foods that differed only by method of preparation were grouped together and counted as one type of food. For example, baked, fried, or boiled potatoes were counted once.</td>
</tr>
<tr>
<td>b)</td>
<td>Different types of the same food were grouped separately. For example: each type of fish – mackerel, tuna, and trout - was counted as a different type of food. This was based on the level of difference noted in areas of taste and nutritional value.</td>
</tr>
<tr>
<td>c)</td>
<td>Different forms of the same meat (e.g. roast beef and steak) were coded the same; organ meat and ham were two exceptions whereby ham was considered different to pork cuts and different organs (e.g. liver, kidney, heart) of the cow are considered different.</td>
</tr>
<tr>
<td>d)</td>
<td>Most cheeses had the same code; the exception was cottage cheese.</td>
</tr>
<tr>
<td>e)</td>
<td>Ready to eat cereals were assigned codes based on the main grain in the cereal. Those made from different grains received different codes.</td>
</tr>
</tbody>
</table>

*Note: Adapted from Healthy Eating Index – 2005, Guenther et al., 2005.*
The suggestions outlined above made by the HEI-2005 represent the only guidelines available that attempt to differentiate between foods for the purpose of assessing variety, and were followed when possible. However not all foods were covered in sufficient detail to classify them and additional classifications were required as the research progressed. An additional category was developed whereby foods that had no nutritional content aside from sugar and fat were coded as *extras*. For example ice cream was coded as an extra and not as a dairy based food. Other examples of extras included: Mayonnaise, butter, oil, pastries, cakes, fruit bars, curry puffs, pretzels, hot chips/wedges, crackers (Jatz, Ritz, rice crackers), meat pies; muffins; and “yogos”. A number of foods were also categorized as an extra plus a type of food group. For example a meat pie was considered to be ½ a serve of protein and one serve of extra and a pizza bun was categorised as one serve of cereal and one serve of extra. A serving of juice was considered equivalent to a serving of fruit, but a fruit bar was considered an extra food. Other examples of this type of categorization were: Milo (one serve dairy plus one serve extra); Cheese burger (one serve protein, one serve cereal, one serve extra); pikelets (one serve cereal, one serve extra); scones (one serve cereal, one serve extra); Coco Pops/Fruit Loops (one serve of cereal, one serve of extra). Fruit juices were considered a fruit, and different flavoured juices were coded differently. Finally different flavoured yoghurt were coded as the same type of food.

Consensus was needed between the dietitians rating the diaries in order for the classifications and coding decisions to be made. This was achieved via discussion at the planning stage of the project, but further discussion was held as the process developed and questions about coding arose. Other examples and further detail regarding food coding are provided in Appendix E.
3.3. **Results**

Prior to analysis, data were inspected for non-normality in each group using visual inspection of histograms, skewness and kurtosis statistics, and normality tests, specifically Shapiro-Wilk test for \( n < 50 \) and Kolmogorov-Smirnov test for \( n \geq 50 \) and outliers. The FF scores were normally distributed, evidenced by skewness and kurtosis cut-offs both of which were \(<3\) (Tabachnick & Fidell, 2007). For two cases the dietitians differed on their categorisation of adequate and inadequate and these cases were omitted, reducing the number of subjects to 102. The percentage of parents who reported selective eating in each category and ratings of nutritional adequacy/inadequacy are reported in Table 18.

<table>
<thead>
<tr>
<th>FF Score</th>
<th>n</th>
<th>Deficient (%)</th>
<th>Adequate (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>High</td>
<td>9</td>
<td>33</td>
<td>66</td>
</tr>
<tr>
<td>(FF = 26-30)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Average</td>
<td>53</td>
<td>13</td>
<td>87</td>
</tr>
<tr>
<td>(FF = 17-25)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Low</td>
<td>40</td>
<td>10</td>
<td>90</td>
</tr>
<tr>
<td>(FF = 0 – 16)</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Assessment of parent report of selective eating indicated that 8.8% (9 out of 102 subjects) of parents reported at least high levels of restricted eating (FF score of \( \geq 26 \)) on the Food Fussiness Scale of CEBQ. When parent report was compared to dietitian rating of nutritional levels, 33% of these parents had children who were also assessed as having inadequate levels of nutrition. A logistic regression analysis was conducted to predict classification of adequate of inadequate diet using parent report and variety...
rating as predictors. The omnibus $\chi^2$ was significant, and the Hosmer & Lemeshow tests were non-significant (.808), indicating there was a good fit. The Cox & Snell McFadden pseudo $R^2 = .452$. Step zero indicated an 81% classification success compared to Step 1, which had a 92.6% overall correct classification, indicating an overall better model of prediction. A test of the full model was statistically significant ($\chi^2(8) = 28.72, p < .001$), and the model was a good fit. The model indicated a moderate relationship between variety rating and parent report (Nagelkerke’s $R^2 = .728$). Prediction success overall was 92.6% (96.1% for Adequate and 77.8% for Deficient). Only variety rating made a significant contribution to the model ($p < .001$) providing 57.4% of variance in to the total model whilst parent report (FF Score) was not a significant predictor ($Wald = .803$).

3.4. Discussion

The majority of studies into avoidant/restricted eating in childhood have used parent report as the indicator of the presence of problem eating. Although one study has found that parent report can differentiate normal eaters from severe cases of ARFID as defined by the dependence on oral supplements to maintain caloric intake (Dovey et al., 2016), most research using community based samples does not clearly indicate whether parents can identify nutritional deficiency. In order to address the validity of parent report, the current study set out to see if parents can identify selective eating patterns associated with nutritional deficiency in a community sample, thereby potentially validating parent report as a measure across the full range of severity of selective eating.

This study found that parent report of selective eating in a community sample was a poor indicator of nutritional deficiency. Results showed that 8.6% of parents described their child as having high levels of selective eating, and of these parents, only 33% had children with nutritional compromise. This result suggests that parent report of selective eating was a poor indicator of nutritional inadequacy of their child’s diet.
Logistic regression further supported this conclusion finding that parent report was not found to reliably distinguish between adequate and inadequate diets.

It is possible that these parents, in underestimating the quality of their child’s diet, are unnecessarily concerned about their child’s eating patterns. This is important as parental stress or worry about their child’s nutritional status may impact negatively on the feeding or mealtime situation, either by increasing tension and negativity in the relationship between parent and child (Cooper, Whelan, Woolgar, Morrell, & Murray, 2004; Lindberg, Bohlin, Hagekull, & Palmerus, 1996; Stein, Woolley, Cooper & Fairburn, 1994) or resulting in certain meal time interactions (e.g. negativity, controlling, and coercive parenting practices), which may serve to maintain restrictive eating patterns (Wardle, Carnell, & Cooke, 2005).

In addition, whilst the majority of children whose parents who reported low levels of selective eating had adequate diets (90%), there were also a significant minority of parents (10%) whose children had deficient diets. Similarly, for parents who indicated that their child had average levels of selective eating, 13% had a nutritionally deficient diet. In these instances, the parent potentially overestimated the quality of their child’s diet. This result reflects previous research indicating that there is a tendency for parents to perceive their child’s diet to be healthier than it actually is (Adamo & Brett, 2014). The relevance of this finding to the present study is that it serves to underscore the difficulties that parents may have in accurately assessing the nutritional value of their child’s diet in general, both in terms of overestimating or underestimating the quality of their child’s diet.

An alternative explanation for why parents report of selective eating did not distinguish between adequate and inadequate diets may lie in the measure (CEBQ), used to assess parent report. It is possible that parents are good assessors of selective eating behaviours but the CEBQ, and the associated study specific generation of norms
and cut off scores lacked specificity, in that a significant percentage of children identified by parent reported CEBQ scores as non-problematic had inadequate diets.

In this study the Food Fussiness (FF) scale of CEBQ was used, which is one of seven scales on the questionnaire. This questionnaire has been used in a number of studies on picky eating, and various elements of the questionnaire have been used dependant on the study focus. Two studies used three (Gregory, Paxton, & Brozovic, 2010) or four scales (Caton et al., 2014), some studies used the whole scale (Haycraft, Farrow, Meyer, Powell, & Blisset, 2011; Morrison et al., 2013; Jansen et al., 2012; Tharner et al., 2014), and other studies utilised only the FF scale (Bucher, Siegrist, & van der Horst, 2013; Hendy et al., 2010; Van der Horst, 2012). However these studies used the CEBQ as a descriptor of avoidant/restrictive child eating patterns, sometimes related to reduced variety of intake (e.g. Tharner et al., 2014), but not necessarily indicative or related to dietary inadequacy. The questionnaire was not originally designed to be used as a measure of selective eating, and these results provide evidence of why it should not be used as such.

With the advent of ARFID classification, research has started to investigate questionnaires used to assess the condition. Dovey et al., (2016) reported that parent report using the Behavioural Paediatric Feeding Assessment Scale was sufficiently specific and sensitive to differentiate between severe forms of ARFID and normal eaters, but added that further refinement of the questionnaire would be beneficial. The development of standardised, validated, questionnaires for ARFID and its sub-types is a new field of research, and one that can greatly assist in the identification of selective eating, and thereby facilitate research and guide treatment interventions.

Whilst parent report on the CEBQ was found to be a poor predictor of nutritional adequacy of diet in this study, the variety rating or the number of different foods eaten was found to be strong predictor of nutritional adequacy. This finding opens the door for the development of an objective measure of the problem, much
needed in the field. Such a measure may also provide scope to differentiate between normal and pathological levels of the problem. This potential is addressed in Study 3 of this project.

A limitation of this research is that parents were not asked to describe the nutritional quality of their child’s diet, only whether they observed avoidant/restricted eating patterns. It is possible that parents identified selective eating patterns, but are unconcerned about it. Future studies investigating the validity of parent report of avoidant/restrictive eating would benefit from incorporating this element of parent report in the design. Despite this omission, given that nutritional adequacy is a key indicator of ARFID, this result casts doubt on the validity of parent report to identify cases of ARFID and selective eating in community settings, and highlights the need for objective measures to support parent report.

This study also found that there were a significant minority of children (2.8%) of this community sample experiencing selective eating as identified by parent report, to the degree that may warrant a diagnosis of ARFID and selective eating. This is a significant number of children who will benefit from further investigation and understanding of the issue which is addressed in Study 4 of this project. However in order to achieve this, the next step was to develop an objective, accurate measure of selective eating, which is addressed in Study 3, outlined below.
4.1. Introduction

Research into the area of ARFID and selective eating is in the early stages, and a main issue to be addressed, if the area is to progress, is the lack of clear assessment and definition of the phenomenon. This raises questions associated with the assessment and diagnosis of ARFID and selective eating which are addressed in this chapter. Study 2 highlights problems associated with using parent report to assess selective eating and the need for objective assessment guidelines to assist in the identification of selective eating. We begin with a review of the literature on the assessment and diagnosis of ARFID and selective eating. In this context, a rationale is presented to develop a dietary assessment protocol capable of reliable identification of individuals experiencing selective eating.

4.1.1. The Assessment and Diagnosis of ARFID and Selective Eating

The accurate assessment of ARFID and selective eating is crucial for ongoing research in the area and to meet clinical needs. As noted, up until the publication of the DSM-5 and the introduction of the category of ARFID, eating problems such as selective eating fell into a diagnostically grey area. This diagnostic ambiguity stifled research into the area, but with the advent of DSM-5 and ARFID there is renewed vigour in the field with a primary task being that of identifying reliable and valid assessment processes. Consequently, there is now a need to operationalize key diagnostic criteria for ARFID. As noted, for a DSM-5 diagnosis of ARFID (and the sub-type of selective eating), an individual must show a persistent failure in meeting nutritional/energy needs that manifests in at least one of the following ARFID
diagnostic criteria: 1) weight loss; 2) dependence on tube or oral supplements; 3) nutritional deficiency, and 4) psychosocial impairment.

Like many other diagnostic categories, the specifics of how this is assessed and measured is not included in the criteria. This lack of specificity means the diagnosis remains highly reliant on clinical judgement as to what constitutes nutritional deficiency, and the results from Study 1 and 2 suggest that parent report of selective eating does not necessarily mean that their child’s diet is nutritionally adequate. Hence there is a need for objective guidelines to facilitate more consistent and accurate judgments of eating and related behaviours. This project focuses on developing an objective measure of selective eating, in the context of ARFID, and this begins with a discussion about how to operationalize and measure the ARFID diagnostic criteria.

4.1.1.1. Operationalization of ARFID Criteria

4.1.1.1.1. Criterion One: Significant Weight Loss

Weight loss criteria are often used to assess eating disorders as weight loss is often associated with malnutrition, which is a key indicator of physical problems associated with inadequate food intake. Weight status is typically measured in terms of BMI or percentage of weight for height measures. Currently there are some inconsistencies as how BMI is used as a marker for an eating disorder. In ICD 10 the criterion for weight loss is body weight is at least 15% below that expected (either lost or never achieved), or BMI is 17.5 or less. Similarly, in the DSM IV the weight marker was a body weight of less than 85% of that expected, but in DSM-5 the term “significantly low body weight” is used and further that the low weight must be in response to “restriction of energy intake relative to requirements”. Significantly low weight is defined as less than minimally normal (adults) and less than minimally expected (children and adolescents) in the context of age, sex development and physical health. This new phrasing allows the clinician’s judgment to enter the picture as
opposed to adhering to a rigid percentage of ideal or expected body weight as a
criterion.

According to the World Health Organization, levels of BMI reflect different levels
of malnutrition. Please see Table 19.

Table 19

<table>
<thead>
<tr>
<th>BMI</th>
<th>Malnutrition</th>
</tr>
</thead>
<tbody>
<tr>
<td>18.5-24.9</td>
<td>Well-nourished</td>
</tr>
<tr>
<td>17-18.4</td>
<td>Low malnourished</td>
</tr>
<tr>
<td>16-16.9</td>
<td>Moderately malnourished</td>
</tr>
<tr>
<td>&lt;16</td>
<td>Highly malnourished</td>
</tr>
</tbody>
</table>

Although this categorisation flows from a clean, precise mathematical calculation,
the concept of malnutrition is inexact and can be subjective. The diagnosis of
malnutrition is a complicated, multi-factorial clinical determination that requires more
than simply finding a low BMI. Malnutrition assessment can include physical
examination, anthropometric measurement and laboratory analysis (Inmaculada, 2012).

Whilst there may be some variation in exactly how weight for height measures
indicate significantly low weight, there are accepted guidelines available to clinicians
which are based on researched criteria that assess levels of malnutrition. A commonly
used BMI cut off for adults with eating disorders is 17.5 and for children is 85% of
expected weight for height (Nicholls, Wells, Singhal, & Stanhope, 2002). However it
has been argued that body composition measures are unsuitable for children due to the
confounding effects of growth and pubertal status (Wells, 2001). It is for these reasons
that BMI measures are considered adequate only as a screening tool for eating disorders
(American Psychiatric Association, 2000). Despite these limitations, body composition measures such as BMI are considered appropriate as part of an assessment for eating disorders, in particular as an operationalized measure of significantly low weight, in response to restriction of energy intake relative to requirements and are commonly used as such.

4.1.1.2. Criterion Two: Dependence on Tube Feeding or Oral Supplements

The second criterion; dependence on tube or oral supplements, is also relatively clear to operationalize in terms of simply observing and identifying which children receive tube feeding or oral supplements. Williams et al., (2014) investigated how this criterion was operationalized, specifically looking at oral supplements, and clarified that whilst vitamins are given to account for dietary deficiencies and calorie boosting powders are used to increase weight gain, they are not considered supplements as they were not required to sustain adequate intake. If the supplements are used in addition to an existing adequate diet, then they are not considered as oral supplements in the context of this criteria. Alternatively, if the child’s health is significantly compromised without the supplements, then they are considered required to sustain adequate intake and would therefore meet this criterion.

4.1.1.3. Criterion Three: Nutritional Deficiency

The DSM-5 states that nutritional deficiency can be measured by physical examination and laboratory testing, but no further details are provided. Presumably physical examination would identify physical difficulties resulting from nutritional deficiency, and laboratory testing would include aspects such as blood tests or bone density assessments. However, Williams et al., (2014) used physical examination and laboratory tests to determine nutritional status in a sample of 422 children with feeding disorders, and only three cases were identified with nutritional deficiency. It is possible
that the tests used were not adequate or that the tests were appropriate but that few children with feeding disorders experienced nutritional deficiency. The authors decided not to complete the medical examination for other participants as it was thought to be too costly and not indicated in the majority of cases.

The DSM-5 also suggests that nutritional deficiency can be determined by measuring dietary intake using food record methods such as a food diary or food frequency questionnaires. This method may be more practical and applicable for both clinical and research purposes. The advantages of food records is that they can be applied across the age range and they are relatively easy to administer. Analysis of food records by trained dietitians or nutritionists using clinical skills and/or relevant software can allow assessment of nutritional status, and thereby assess the criterion of nutritional deficiency.

4.1.1.1.4. Criterion Four: Psychosocial Impairment

The fourth criterion for ARFID is “marked interference in psychosocial functioning”. The DSM-5 suggests that this criterion refers to the “inability to participate in normal social activities, such as eating with others, or to sustain relationships as a result of the disturbance” (American Psychiatric Association, 2013, pg. 335). This suggests that children with ARFID may be at risk of impaired social functioning but it is unclear if this is a result of the restricted eating or if it is part of a co-morbid or etiological process. It is plausible that restricted eating patterns may impact on an older child’s comfort when eating in a social settings and result in some anxiety, thereby leading so possible social inhibition and withdrawal. In addition, whilst there is some evidence to suggest that feeding and eating problems of this kind are associated with social difficulties for children (Nicholls et al. 2001; Timimi et al., 1997), the nature and degree of such issues is not well documented.
For younger children the presence of psychosocial impairment needs to be seen in the context of a transactional model whereby feeding difficulties interact with caregiver characteristics. Jones and Bryant-Waugh (2013) reviewed literature regarding the relationship between maternal mental health and feeding difficulties and concluded that an amplifying transactional (Sameroff, 2009) process may account for the links between maternal psychopathology and feeding problems; that is through a feedback process, maladaptive infant behaviour (such as food refusal) arising from earlier maternal dysfunction, contributes to later maternal psychopathology or vice versa. This conceptualisation locates the development and maintenance of the feeding problem within the relationship rather than attributing it to mother or child (Davies, Berlin, Sato, Fischer, Arvedson, Satter, Silverman, & Rudolph, 2006). Attachment theory offers a framework within which to understand the complexities of the relationship between child feeding problems and maternal psychopathology, but a range of child-related, social and environmental factors need to be considered. Jones and Bryant-Waugh argue that increased understanding of the factors that can impact on the psychosocial world of the young child, including the caregiver-child relationship, will improve treatment specificity, but also note that at present that there are limitations in the current evidence base.

Some research has looked at the level of social impairment of picky eating adults. Based on clinical reports that have indicated the social consequences of adult picky eating (Marcontrell, Laster, & Johnson, 2003), Wildes and colleagues (Wildes, Zucker, & Marcus, 2012) developed short questionnaire which asked participants to rate to three items on a five point likert scale (rarely or never to all of the time) to the questions: (1) “Do you get anxious about social situations because you will be expected to eat?”; (2) “Do you avoid social situations that involve food?”; and (3) “Do you lie to
avoid eating in social situations?” Although the scale was brief reliability analysis indicated that it had good internal consistency (α = .87).

The ARFID criterion of psychosocial impairment is important as it highlights that a level of impairment to the individual and their social context is important to diagnose the disorder. A developmental framework contends that the psychosocial aspects of a young child will be different to adolescents and adults, with varying factors to consider. More understanding of the transactional nature of parent-child relationships associated with feeding problems into childhood would benefit our understanding of the psychosocial impact. In addition, a further research into psychosocial impact on family and the young person as they grow is warranted.

4.1.1.2. Implications for this Study

In developing an assessment measure for ARFID and selective eating, the first task is to operationalize the criteria. In addition, it is important to determine which criteria might best apply to the range of presentations evident in selective eating. Operationalized measures for the first two criteria of ARFID (significant weight loss; dependence on tube feeding and oral supplements) have been developed and are accepted in the field as adequate. However, the first two ARFID criteria appear to refer those children with severe feeding issues and are less applicable for the apparently large number of children who do not require tube feeding and/or have not experienced weight loss. Williams et al., (2014) found that of 422 children, (with an average age of 4 years old) accepted to a child feeding disorder clinic 19.7% met criteria of weight loss (or failure to gain weight) and 37.7% needed tube feeding or oral supplements. These results indicate that the majority of children referred to a feeding disorder clinic were not characterised by weight loss or dependence on oral or tube feeding. In addition, the second criteria describing a reliance on tube feeding and/or supplements appears to
apply mainly to younger children with severe feeding disorders that require medical intervention. The diagnosis of ARFID in these cases can be relatively clear.

The fourth criterion of “interference in psychosocial functioning” is relevant across the age range. The assessment of this criterion would vary significantly with age. During early childhood a number of parent-child factors may interact which can influence or be associated with a disturbance in the relationship or attachment pattern may need to be assessed. For older children and adolescents social impairment due to restrictive eating can refer to the person experiencing anxiety, withdrawing or restricting social activities as a result of their restricted eating (for example avoidance of social events such as parties or school camps). Whilst these factors are highly relevant to the understanding of the development, maintenance and impact of ARFID, there is currently limited literature in this area.

The third criterion of “nutritional deficiency” when assessed by medical procedures such as physical exam and laboratory assessments (e.g. blood tests) may be of relevance for those children who are experiencing more severe food restriction, but may not capture the large number of children who experience problematic restricted eating, but not to the degree that results in medical compromise. Alternatively, using food records to identify nutritional deficiency has a number of advantages. Food records are practical and easy to administer both individually and for large samples. Food records can be administered across the age range from infancy to adulthood and can also capture the range of presentations from severe (i.e. requiring medical intervention) to less severe. It is important that the assessment method can apply to the less severe category, which refers to those children and adults with clinically significant eating issues not requiring tube feeding or resulting in weight loss, as there are a large number of children in this category (Williams et al., 2014).
Food records are routinely used to assess diet adequacy (Gibson, 2005), so it follows that this method is applicable to assessing the relationship between food variety and nutritional deficiency. The food record method can also potentially differentiate between normal and pathological levels of restrictive eating. Given the high importance of being able to operationalize the newly conceived ARFID diagnosis, the assessment of nutritional deficiency via the use of food records seemed to be a promising method of assessment as it is applicable across a broad range of presentations, whereas other criteria have more narrow applications. Given these advantages the assessment and related operationalization of the third criterion, nutritional deficiency using food records, warranted further examination, and represents the focus of Study 3 of this project.

In conclusion, the operationalization of ARFID criteria of nutritional deficiency using food records appears useful and feasible. This type of assessment is applicable across the age range, and will cover both severe and less severe presentations and also potentially differentiate between normal and pathological levels of restricted eating. Consequently, Study 3 of this project focused on developing an assessment protocol that measured nutritional deficiency using food reports. In order to reliably assess if individuals meet the ARFID diagnostic criterion of nutritional deficiency, an assessment protocol needed to be developed that measured food intake and specifically food variety in terms of nutritional status.

4.2. Nutritional Assessment

In order to diagnose ARFID using the criterion of nutritional deficiency, an assessment protocol is needed to measure food intake in terms of nutritional sufficiency or deficiency. In addition to being able to operationalise the ARFID nutritional deficiency criteria, we were also interested in developing an assessment protocol for selective eating. To assess selective eating not only must nutritional deficiency be
present, but the issue of range of intake also needed to be considered. All current definitions of selective eating focus on the consumption of a restricted range of foods (Nicholls et al., 2000; Lask & Bryant-Waugh, 2000; 2007). Parent report of selective eating generally stems from a perception that the range of food eaten by their child is insufficient but there has been relatively little study of the nutritional status of diets in the restricted range. Thus, in order to diagnose selective eating, the food record assessment needed to cover the elements of: 1) the level of nutritional deficiency in combination with; 2) the range of foods eaten. This has implications for both diagnosis of ARFID and the definition of selective eating.

This chapter outlines the measures and methods currently used to assess nutritional deficiency and range/variety of foods and serves as an introduction to Study 3.

4.2.1.1. Nutritional Assessment in ARFID and Selective Eating

There is abundant information on guidelines regarding adequate nutrition (for a summary see Gibson, 2005) and nutritional assessment systems use a range of methods including dietary intake, laboratory tests, anthropometric tests, and clinical observations as shown in Table 19.

Whilst the assessment of nutritional status can be complex and detailed, initial stages of nutritional assessment, particularly at an individual level, most commonly occurs via dietary assessment methods. In this approach comparisons are made between the individuals food intake (as measured by food records) and standardised nutrient reference levels. Nutrient intakes of individuals (and groups) are often evaluated by direct comparisons with corresponding nutrient recommendations for an individual of the same sex, age and physiological state from a specific country (Gibson, 2005). The standard set of recommendations, such as the Australian Guide to Healthy Eating (2015) reflects scientific consensus from a number of sources regarding the nutrient
requirements of individuals and provides the statutory basis for federal nutrition education efforts. The recommended nutrient intake, or an arbitrary proportion of the recommended nutrient intake, can be used as a cut off value, and the percentage of individuals with intakes below the cut off value can be determined. Clinical dietitians or nutritionists assess food diaries to determine nutritional adequacy of an individual’s diet while taking into account factors such as the individual’s age, gender and country of residence. Assessment of nutritional status can be made at individual or population levels using a range of measures as outlined in Table 20.

Table 20
Assessment of the Development of Nutritional Deficiency

<table>
<thead>
<tr>
<th>Assessment Method</th>
<th>Type of Nutritional Deficiency</th>
</tr>
</thead>
<tbody>
<tr>
<td>Dietary</td>
<td>Dietary inadequacy</td>
</tr>
<tr>
<td>Biochemical</td>
<td>Decreased levels in reserved tissue store</td>
</tr>
<tr>
<td>Biochemical</td>
<td>Decreased levels in body fluids</td>
</tr>
<tr>
<td>Anthropometric/ Biochemical</td>
<td>Decreased functional levels in tissue</td>
</tr>
<tr>
<td>Biochemical/ Molecular</td>
<td>Decreased activity of nutrient dependent-enzyme or mRNA for some proteins</td>
</tr>
<tr>
<td>Behavioural/ Physiological</td>
<td>Functional change</td>
</tr>
<tr>
<td>Clinical</td>
<td>Clinical symptoms</td>
</tr>
<tr>
<td>Clinical</td>
<td>Anatomical signs</td>
</tr>
</tbody>
</table>


For the purposes of this study we focused on a nutritional assessment based on the dietary assessment methods, as opposed to anthropometric measures (e.g. weight and growth), or biochemical measures (e.g. protein or iron status). We focused on dietary assessment methods in order to assess nutritional status as this was the least intrusive
for participants, and represented a good starting point for this exploratory study. Methods of dietary assessment used to measure nutrition are reviewed and summarised below.

4.2.1.1.1 Nutritional Assessment Methods

There are two types of assessments used as part of a dietary assessment of ARFID and/or selective eating: 1) Observational measures such as laboratory feeding situations and home based feeding assessment and, (2) food intake reports.

4.2.1.1.1 Observational Measures

Child feeding and eating behaviour can be directly observed in the laboratory or in the home, and observational methods have been applied in the field of picky eating and infant feeding disorders. In these studies researchers assess elements of the eating environment such as parent-child reciprocity (Chatoor, et al., 1988; 2000), social communication between parent and child (Hagekull, Bohlin, & Rydell, 2000), infant sucking behaviours (Jacobi et al., 2003), and dyadic conflict (Stein et al., 1994). For example, Adamson, Morawska and Sanders (2013) used observational measures to assess the effectiveness of a family behavioural intervention on mealtime behaviours in children aged one years to six years. The focus of the study was to assess changes in problem eating behaviour evident during meals and observation focused on behaviours labelled as “child positive” (e.g. eating), “child negative” (e.g. non-compliance), parent positive (e.g. praise) and parent negative (e.g. negative contact).

Jacobi, et al., (2003) used an observational assessment to investigate not only mealtime behaviours but also food intake. These researchers assessed child eating behaviour at a lunch meal, when the children were 3.5 and 5.5 years of age. In this procedure, a buffet was presented in a laboratory in a standard format, totalling approximately 5000 Kcal, that allowed for “adequate variety and choice of lunch foods” (pg. 79). Buffet content was designed with some guidance from the parents as to their
child’s food preferences and allergies. The parent was instructed not to feed the child prior to bringing them in for the meal and was also asked to assist the child to eat in the laboratory as they would eat at home. Eating behaviour was observed through a one-way window and eating behaviour such as total bites, bite rate, number of sips, number of pauses and total eating time were recorded. In addition, caloric and nutritional intake were calculated by weighing food items before and after the meal. However, even though these researchers measured caloric and nutritional intake it was not used in the final analysis. Only two behavioural measures of “pickiness” were used from the laboratory lunch situation which were meal duration and number of bites per minute.

Overall it appears that observational based assessment of childhood eating is more suited to investigating parent and/or child behaviours rather than food intake. Some researchers suggest direct observation of eating is not suited to assess individual dietary intake as it is subject to bias, as participants may alter their usual intake when being observed (Australasian Child and Adolescent Obesity Research Network, 2016). In a search of the literature no studies could be found that used observational assessment as a measure of quality of food intake.

4.2.1.1.2. Food Records

Assessment of nutritional deficiency is at the core of the assessment of ARFID and more specifically, selective eating. However, the choice of food record impacts differently in terms of cost, technical expertise and respondent time (Magarey et al., 2011). In addition, special consideration needs to be made for assessment of child and adolescent food intake as there are added complications when parents are the reporters (Burrows et al., 2012). Dietary intake measurement is complex and all carry threats to validity and reliability (Gibson, 2005). Selection of the most appropriate dietary assessment tool depends on many factors, including type of information needed (e.g. nutrient analysis or total food intake), level of accuracy required, research constraints
(e.g. money, time staff, respondent characteristics) and suitability of the method given the study design. The following section outlines various methods to assess food intake, detailing advantages and disadvantages and concludes with the rationale for the assessment method chosen for this research.

4.2.1.1.3. Weighed Food Records

Weighed food records involve an individual or an investigator weighing each item of food and drink prior to consumption and after consumption. Weighed food records have good validity for assessing total energy intake for children (Davies & Coward, 1994; Livingstone et al., 1992). In this method, a detailed description of the food and its weight is recorded in a specially designed booklet. Usually a space is left to record any leftovers so that the precise weight of food eaten can be calculated. Weighed records are typically kept for 3, 4, 5 or 7 days. The 7-day weighed record can be used as the “gold standard” against which less detailed and time-consuming methods can be compared (Gibson, 2005). The disadvantages of weighed food records is that they are expensive and labour intensive for both participant and researcher.

4.2.1.1.4. Twenty-Four Hour Recall

In this method, a trained interviewer asks the respondent to remember in detail all the food and drink they consumed during a period of time in the recent past, often the previous 24 hours (Gibson, 2005). As a retrospective method, it relies on an accurate memory of intake, reliability of the respondent not to under/misreport, and an ability to estimate portion size. This may be helped by the interviewer prompting the respondent to remember eating and drinking episodes over discrete time periods, or linking to day time activities (e.g. arriving at work). In addition, the interviewer may use prompts (e.g. “how big was the serve?”) to assist the respondent to estimate portion sizes of the items consumed. The interviewer records the dietary information which at the end is checked by the respondent for omission/errors and is then coded for analysis.
A limitation of this method is that recording consumption for a single day may not be representative of a person’s intake due to day-to-day variation. A review of studies investigating the validity of dietary assessment methods in children, (Burrows, Martin, & Collins, 2010) indicated that respondents, both parents and children, tended to over-report their intake using 24 hour recall methods (Montgomery et al., 2005; Reilly, Montgomery, Jackson, MacRitchie, & Armstrong, 2001; Waling & Larsson, 2008). Another disadvantage is the need for trained interviewers.

4.2.1.1.5. Estimated Food Records or Food Diaries

Estimated food records are similar to the weighed food record method except that the quantification of the foods and drink is estimated rather than weighed. This estimation can be carried out using household measures such as cups or spoons; and can be aided by food photographs and food models. The participant is asked to record, in as much detail as possible, all food and beverage intake over a certain period (e.g. three or seven days). The investigator converts these estimates into approximate weights and portion sizes that are then used to estimate food and nutrient intake. Whilst this method is useful as there is low burden on the respondent, one main issue with this method is the documented substantial error rates in estimating accurate portion sizes (Willett, 1998).

4.2.1.1.6 Food Frequency Questionnaires (FFQ) and Semi-Quantitative FFQs

At its simplest, the Food Frequency Questionnaire consists of a list of foods and a selection of options relating to the frequency of consumption of each of the foods listed (Gibson, 2005). These types of measures are in a questionnaire format an there are different types with varied objectives. FFQs are designed to collect dietary information from large numbers of individuals (100 individuals or more) and are normally self-administered, though interviewer administered and telephone interview
are possible modifications (Haraldsdottir et al., 2001). FFQs normally ask about intake within a given time frame (e.g. in the past 2-3 months, 1 year or longer) and therefore aim to capture habitual intake. The length of the food list can vary depending on the nutrients or foods of interest. If a range of different nutrients and energy values are required, the list of foods may be upwards of 150 foods. Many FFQs also collect information about portion size in addition to frequency of consumption. These may be referred to as semi-quantitative FFQs. FFQs are frequently used to gather information on large samples (Burrows et al., 2010) but are known to commonly over-report dietary intake, and there are difficulties implicit in calculating the absolute nutrient intake (Cade, Thompson, Burley, & Warm, 2002).

4.2.1.1.2. Implications for this Study

Each method of dietary assessment has merits and drawbacks, and usefulness of each method depends on what is being studied. The purpose of the current study was to assess overall food intake in terms of range and nutritional value and therefore reports on total intake were required. The weighed food diaries were ruled impractical given the substantial respondent burden, which was not considered appropriate in a community sample where motivation may be low. Similarly, the 24 hour recall was also deemed to be impractical for use in a large scale community survey given the substantial burden placed on the respondent and researcher as individual interviews are used to collect the data. Food Frequency Questionnaires are quick and easy to collect and are practical for large scale studies but do not provide an assessment of total food intake, which would preclude assessment of nutritional adequacy required for the current study. In addition, comparisons between FFQs and food diaries suggest that food diaries are a more valid and reliable indicator of food and nutrient intake (Day, McKeown, Wong, Welch, & Bingham, 2001; Karvetti & Knuts, 1992). Despite the noted difficulties that individuals have in estimating portion sizes (Willet, 1998), seven-day food diaries have been found
to be closely associated with weighed food records across the same period (Bingham et al., 1994), and therefore are considered an adequate measure of food intake. Another study found a strong correlation between nutrient analysis of three-day food diaries and nine-day food diaries and on this basis concluded that three-day food diaries are a good option for large scale epidemiological studies (Yoon, Kim, Hwang, Ahn, Shim, & Kim, 2010). Given these considerations a three-day food diary was considered to be an appropriate assessment tool to measure food intake for the purposes of the current study. Three-day food diaries have been effectively used in a number of studies which aim to assess nutritional intake (e.g. Block, Hartman, & Naughton, 1990; Goodwin, Goodwin, & Garry, 1983; Kennedy, Ohls, Carlson, & Fleming, 1995). A three-day food diary has relatively low respondent burden and assessment of the diaries by qualified dietitians was within the scope of the project. Importantly, information gathered from a food diary not only allowed for assessment nutritional status of the individual but also of the range of food eaten.

4.2.1.1.3. Assessment of Dietary Range

Selective eating refers consumption of a restricted range of foods, but little attention has been paid to the relationship between nutritional adequacy and the range of food consumed. The assumption of many public health education campaigns is that dietary variety is beneficial, and that good variety will ensure an adequate intake of essential nutrients and hence promote good health (National Health and Medical Research Council, 2013).

Dietary variety has been found to be related to both growth and nutritional status (Ruel, 2003) and even simple measures of food variety, such as number of food groups consumed over a 24-hour period, have been found to be good indicators of micro-nutrient adequacy (Arimond & Ruel, 2004; Steyn, Nel, Nantel, Kennedy, & Labadarios, 2006). However, it is difficult to determine when a dietary range becomes
nutritionally deficient. Whilst it is broadly recommended that an individual should eat a wide range of food there is no one recommended method or cut off in order to determine what constitutes an adequate range. One of the main issues is that food variety is considered to be a broad and simple measure of diet, and therefore does not capture the complexities of an individual’s nutritional status. However, when considering selective eating a key aspect is that the person’s diet should have a restricted range of foods. So the question remains as to what levels of dietary variety result in nutritional deficiency? It is not clear how dietary variety should be assessed or how dietary variety relates to sufficiency. Williams et al., (2014) operationalized the nutritional deficiency criterion by suggesting that if a child ate just 10 different foods or less on at least a monthly basis, then they met the criterion of nutritional deficiency. However, whilst the choice of 10 foods or less may be reasonable in terms of indicating low variety, the authors conceded that selection of the figure was a conservative or stringent estimate of food variety so as not to include children who had developmentally normal levels of picky eating. In addition, no research basis or rationale was provided for the choice of 10 foods or less. Therefore, opting for an apparently strict criterion of 10 foods or less may result in excessive number of false negatives, meaning that some children may have been inappropriately excluded from gaining the ARFID diagnosis. William et al., (2014) concede that “It is difficult to determine when a limited diet is too limited” (p 14), and the establishments of cut off points to determine the food range needed for dietary sufficiency remains problematic. However, the use of food diaries or other food reports may have value in enabling the collection of data on food consumption. These data might then form the basis for decisions on what patterns and breadth of food consumption is likely to be problematic.
Nevertheless, recommendations regarding adequate measures of food variety exist, and all are based on the assessment of reported food intake. Authors from different areas have suggested variety guidelines, and these are presented below.

4.2.1.1.3.1. The Sequential-Oral-Sensory (SOS) Guidelines

The Sequential-Oral-Sensory (SOS) approach is a well-known intervention program for children with feeding difficulties and poor growth (Toomey, 2014). The SOS program has recommended two guidelines that can assist in determining what constitutes adequate range in a person’s diet, primarily based on clinical experience. Firstly, they suggest that “problem feeders” restrict the range of foods they eat by refusing to eat entire categories of food texture or nutrition group (e.g. hard foods, meats, vegetables, soft cubes). The SOS program website also suggests that if a child eats less than 20 different foods then they would be considered a problem feeder (http://www.sosapproach-conferences.com/articles/picky-eaters-vs-problem-feeders). However, Toomey (2014) did not outline what constituted a different food, so this would need some clarification and operationalization for research purposes. For example, are hot chips considered to be a different food to roast potatoes?

4.2.1.1.3.2. Greater Ormond St Hospital Criteria

Nicholls et al., (2001) suggest that eating ten foods or less would constitute a selective eating problem. The authors did not clearly articulate how this number was decided upon, but it appeared to be based on retrospective case analysis of problem eaters referred to an eating disorders clinic, which found that the average number of foods eaten was six, with a range of 4-13 ($n=20$). The authors acknowledge that the suggestion of ten foods represented an initial attempt at defining the problem more specifically, with the aim to assist further research and understanding of the issue. It is important to empirically investigate whether the recommendation that 10 foods or less constitutes problematic or nutritionally deficient levels of food intake. Williams et al.,
(2014) in their discussion of the operationalization of ARFID criteria also adopted the idea that 10 foods or less as an indicator of nutritional deficiency, but as indicated no rationale was provided for the choice of this cut point.

4.2.1.3.3. Healthy Eating Index - 2005

The Healthy Eating Index (HEI – 2005; Guenther et al., 2005) is a scoring metric that can be used to determine the quality of dietary intake and is based on the US Dietary Guidelines for Americans. The HEI-2005 outlined a system by which foods can be classified as “different”, thus aiding the assessment of variety of food intake. This is important as the suggestions about how to define range rely on counting the number of different foods an individual eats. For example, the SOS program indicates that 20 foods or less is significant whilst Nicholls et al., (2001) propose that 10 foods or less is clinically relevant. Neither of these recommendations were accompanied with guidelines to determine how different foods are defined.

The HEI-2005 details how foods are defined as different. For example, most cheeses were considered to be the same food, and the exception was cottage cheese which was coded differently. Other examples include all white breads being given the same code whereas sweet rolls and pasta received different codes (please see Appendix E for a full list of how foods were differentiated). The HEI-2005 also offered guidelines regarding what constitutes adequate variety in an individual’s diet. The index of the HEI-2005 that assesses variety or range of foods eaten is known as the Variety Index. In this index a person receives the highest score of 10 if 16 different foods or more are eaten over a three-day period. If less than six foods are eaten over a three-day period the individual will receive a score of 0 (the lowest score), which is considered problematic. The authors do not outline details of research to support the variety thresholds they suggest, and provide no data on the nutritional status of these different levels of food variety consumed.
4.2.1.3.4. **Dietary Diversity Scores and Food Variety Scores**

Simple indicators reflecting overall diet quality for children are needed in public health settings, so that they can be used for large, population based studies. Measures of dietary diversity and dietary variety are considered valuable in this context in that they are relatively simple have been shown to be associated with nutrient adequacy and nutritional status (Arimond & Ruel, 2004). Given that designing a simple and easy-to-use indicator reflective of the nutrient adequacy of a diet has become a priority for many working in the field of public health nutrition, Steyn et al., (2006) investigated whether two different measures: 1) Food Variety Scores (FVS); and (2) Dietary Diversity Scores (DDS) were good indicators of nutrient adequacy. Specifically, they were interested in whether FVS’s and DDS’s were good indicators of nutrient adequacy of the diet of South African children aged one to eight years old. To achieve this, the FVS and DDS were compared to a nutritional measure. FVS was calculated by tallying the number of different food items consumed over a 24-hour period, from a possible total of 45 items. DDS was defined as the number of different food groups consumed over a 24-hour period, from a total of nine possible food groups. Food groups included: (1) cereals, roots and tubers; (2) vitamin-A-rich fruits and vegetables; (3) other fruit; (4) other vegetables; (5) legumes and nuts; (6) meat poultry and fish; (7) fats and oils; (8) diary; and (9) eggs. Both the FVS and the DDS were compared with a nutritional measure which was described as a Nutrient Score. The Nutrient Score was based on the calculation of a nutrient adequacy ratio for each of the 11 micro-nutrients (vitamins A, B-6, B-12, and C, niacin, thiamine, riboflavin, foliate, calcium, iron and zinc) and energy and protein determined from food records. The Nutrient Score was calculated as the intake of a nutrient divided by the recommended intake for that nutrient using World Health Organisation recommendations. Finally, the DDS and FVS cut-off points optimising sensitivity and specificity and positive predictive values for the Nutrient
Score were determined. Results indicated that a DDS of ≤4 (food groups), which had a specificity rating of 75% and sensitivity rating of 70%, was deemed “most appropriate”, and FVS of ≤6 (food items), with a specificity of 65% and sensitivity of 82%, were the best indicators of nutritional deficiency. It is important to highlight that these authors were interested in developing simple and quick indicators of the micronutrient adequacy of the diet, and the suggested guidelines such as those described in the Healthy Eating Index may provide a more comprehensive estimate of dietary variety.

4.2.1.1.3.5. Summary

While it is recommended in the diet and nutrition fields that it is important to eat an adequate variety or of foods, the guidelines about what constitutes adequate variety is not clear. Most guidelines have focused on the number of different foods that need to be present in order to be nutritionally adequate. The recommended minimum number of different foods varies with suggestions of: six (Steyn et al., 2006; HEI-2005), 10 (Great Ormond St criteria) and 20 (SOS program guidelines). Only one study (Steyn et al., 2006) attempted to validate measures of food variety by comparing the variety or diversity score with a nutritional assessment, whilst other recommendations appear to be based on clinical judgement. The majority of variety indicators focused on the number of different foods, one guideline also focused on what food groups are represented (Dietary Diversity Score; Styen et al., 2006) and concluded that the foods need also to be spread across the food groups in order to be nutritionally adequate.

4.2.1.2. Rationale for Study Three

In order for research and treatment of childhood eating problems to progress, there is a need for a validated objective assessment protocol that can differentiate between nutritionally problematic and non-problematic levels of restricted eating. Accurate assessment will address the possibility of false positives (treating children as if they have a problem with eating, when in fact they don’t) and false negatives.
(dismissing those children who do exhibit nutritionally problematic levels of restricted eating), and thereby assist in the treatment for this condition.

One of the main aims of this thesis was to develop an assessment protocol that could be used to assess the ARFID criteria relating to nutritional deficiency. This criterion was chosen as it was the most relevant to the population we were interested in identifying, that is children of all ages with selective eating, and is applicable across the full range of presentation from the severe (requiring medical intervention) to the less severe levels of the problem.

To assess whether an individual may meet ARFID criteria relating to nutritional deficiency and how this relates to selective eating, two elements need to be considered: 1) nutritional adequacy/deficiency; and 2) range/variety of intake. Nutritional deficiency is a diagnostic criterion that can classify an individual as experiencing ARFID, and this in combination with eating a restricted variety of foods can further classify as a selective eater. However, there is limited research on the connection between nutritional deficiency and dietary variety so it is difficult to be clear as to what constitutes problematic food intake. For example, an individual may be a restrictive eater, with a demonstrated restricted diet, but it may not be to the degree that impacts on nutritional status. Indeed, in the two studies detailed earlier (Carruth et al., 1998; Jacobi et al., 2003), it was reported that picky eaters were found to eat a restricted range of foods when compared to non-picky eaters, but the authors acknowledged that this restricted range of consumption was not associated with nutritional impairment. To enable better discrimination between problematic and non-problematic levels of restricted eating we need to better understand the relationship between dietary variety and nutritional deficiency.
4.2.1.3. Sensitivity and Specificity

To develop criterion validity the measure must predict or relate to an established and accepted behavioural criterion (Tabachnick & Fidell, 2007). Sensitivity and specificity are two important properties used to provide evidence for criterion validity of diagnostic tests and measurements. The sensitivity and specificity of a test or measure is derived by comparing the test results with a gold standard that serves as the criterion. A measure with high sensitivity rate indicates that the measure will be able to identify most people who actually have the problem and therefore will have a low rate of false negatives. When the most important issue is “not missing” a positive case (e.g. in the case of diagnosing cancer), the test needs to be highly sensitive. One problem with high tests that have high sensitivity is that the test may also identify those individuals who do not have the problem (high false positive rate). Tests with high sensitivity are often used as screening tests, in which positive findings simply indicate the need for more testing. If a highly sensitive test does not indicate the presence of the disorder, then the diagnosis can be ruled out with confidence. Whilst measures with high sensitivity are used for accurately ruling out those people without a disorder, tests with high specificity are best used for ruling in a disorder. Tests with high specificity have a high probability of a negative test given that the patient is not in fact ill (McPartland, Reichow, & Volkmar, 2012).

It is not uncommon to find that sensitivity and specificity of a particular measure are inversely related, although this does not have to be the case. The ideal clinical test has both high sensitivity and high specificity, but it will depend on the purpose of the assessment. For research purposes, particularly if there are large numbers of subjects, a test with high specificity will be advantageous. That is, the test will accurately rule in selective eating, such that those cases identified by the measure have a very high likelihood of having the condition. This will result in a more pure sample of selective
eaters with whom to conduct research. Alternatively, if the test was used for clinical purposes, it will need high sensitivity, to decrease the rate of false negatives. In this way, the test may be used as a screening device, to identify the highest number of potential selective eaters, with whom further assessment can be conducted in order to confirm the diagnosis.

4.2.1.3.1. The “Gold Standard” in Nutritional Assessment

Another important element of deriving sensitivity and specificity values and developing criterion validity is how well the gold standard or criterion captures the disorder being investigated. There is no well-established gold standard for nutritional assessment for children, and there have been calls to develop and validate dietary assessment methods for large epidemiological studies of children and adolescents (Potischman, Cohen, & Picciano, 2006; Watson, Collins, Sibbritt, Dibley, & Garg, 2009). A review of 17 validation studies between 1982 and 2003 was completed as part of the National Child Study in USA (National Institute on Child Health and Development, Final Report; 2004) and is a useful starting point to understand reference measures or gold standards used in nutritional assessment. The broad aim of the study was to examine the effects of environmental influences on the health and development of more than 100,000 children from birth to 21 years. The review examined studies of at least 100 participants who were mainly healthy and contained summary tables of studies (https://epi.grants.cancer.gov/past-initiatives/assess_wc/review/about/) in which the criterion validity is evaluated by comparisons with measurements obtained from a reference method. The reference methods varied by study and target group, and included biological markers, direct observation of intake and established dietary assessment methods such as food diaries/records. Biomarkers of intake and direct observation are considered good validity measures as they are independent of measures of food intake. For example, the doubly labelled water (DLW) method is a biomarker.
that has been widely used to develop validity of dietary status (Ainslie, Reilly, & Westerterp, 2003; Burrows et al., 2010; Livingstone & Black, 2003). DLW measures metabolic rate, which is achieved by administering a dose of doubly labelled water, and then measuring the elimination rates of deuterium and O-18 in the participant over time through the regular sampling of heavy isotope concentrations in the body water (by sampling saliva, urine, or blood). Other biomarkers include heart rate monitoring, assessment of basal metabolic rate, urine assessment for urea, sodium, potassium and creatinine. Although the DLW biomarker is often used as a reference measure, it is limited to validating total energy intake. The DLW method results in a good measure for factors such as fat intake which has implications for the field of obesity, but may not pick up on the overall nutritional adequacy of a diet. This highlights a potential issue associated with reliance on certain biomarkers to validate dietary quality, if the biomarkers identify only very specific elements of the diet. For example, in studies in obesity the DLW biomarker is relevant, but in studies that may for example, be interested in the uptake of fruit and vegetables, biomarkers such as carotene, lycopene and folate levels in blood analysis would be more useful. (Souverein et al., 2015). Blood analysis can also detect the presence of fatty acids that will indicate levels of fat intake (Bell, MacKindlay, Dick, & Younger, 2011).

Therefore, biomarkers can assess aspects nutritional adequacy but also tend to have a specific focus, which is advantageous for those studies interested in measuring specific elements of a diet. As the current study sought to assess dietary adequacy more broadly, the assessment method used needed to be able to measure a broad range of nutritional elements, and biomarkers may not be able to achieve this. Williams et al., 2014 found that biomarkers were not a sensitive measure of nutritional deficiency in feeding disorders. The other issue with using biomarkers as the gold standard is having access to the laboratory techniques in order to conduct the assessments, as well as a
need for direct access to participants to obtain or administer the biomarkers, which was beyond the scope of this study. So, for the current study biomarkers were ruled out as a validation reference measure for reasons of cost and availability of the scientific analysis, no direct access to participants, and high specificity of biomarkers. The current study sought to establish dietary cut points that might be useful as a screen for dietary/nutritional problems in a community setting.

Another technique that is used as a reference measure or gold standard in dietetic assessment is direct observation of intake (e.g. Edmunds & Ziebland, 2002; Zive et al., 2002). In this method participant eating patterns are observed, often in naturalistic settings (e.g. at school) and compared with reported intake via other methods such as food records or questionnaires. The primary focus of direct observation as a reference measure is to ascertain the accuracy of self-report or recall measures such as food diaries (e.g. Baxter et al., 2003). Whilst observational measure can lead to accurate measures of reported intake, this method requires substantial research time per assessment which can be difficult with high numbers of research participants.

Food diaries have been found to be more accurate measures of dietary intake than 24 hour recall methods and FFQ’s (Bingham et al., 1997; Crawford, Obarzanek, Morrison, & Sabry, 1994; McPherson, Hoelscher, Alexander, Scanlon, & Serdula, 2000), and have been used to validate other measures of dietary assessment (Block et al., 1990; Block, Woods, Potosky, & Clifford, 1990; Klipstein-Grobusch et al., 1998; Sasaki, Yanagibori, & Amano, 1998).

Another question to consider once the data has been gathered is what process is used to analyse the food record. There are two main approaches; analysis by experts and computerised analysis of food records (Gibson, 2005). Expert review of food records involves comparison of reported food intake with recommended daily intakes
with respect to food groups and macro and micro-nutrients. In relation to computerised analysis of good records, there are many different types of computer programs that assess different elements of the diet. The main element of computerized analysis is that the database contains information of what nutrients a food contains, therefore once foods from the food record are entered into the system an analysis of the micro and macronutrients can be automatically conducted. Whilst these systems allow for specific and accurate analysis of nutrients in a person’s diet, there can be significant differences between various databases (Guillard et al., 1993), and researchers need to have access to the appropriate software. The area of digital analysis and recording of dietary data is growing and although these methods saved considerable time over hand computation, the time demands on the interviewer and analytic staff are still considerable (Raats, Scheett, Johnson, & Jahns, 2015). In the current study, consensual expert analysis was the method used for dietary assessment.

Therefore, for this project the gold standard was considered to be a dietary assessment conducted by two experienced dietitians, based on a three day food diary. Specifically, the dietitians were asked to rate the diaries as adequate or inadequate in nutrition based in their clinical knowledge when interpreting food diaries and in making comparisons of reported food intake to recommended dietary guidelines for Australians (Australian Guide to Healthy Eating, 2015). In making their assessment the dietitians reported using elements such as macro and micronutrient intake, overall energy intake, meal spacing and food group variety.

4.2.1.4. *Rationale and Hypothesis for Study Three*

In order to diagnose ARFID subtype selective eating using the nutritional deficiency criterion the most applicable dietary assessment method was via a food record, and a three-day food diary was used. To assess nutritional adequacy, the individual’s recorded food intake over the three days was assessed by clinical dietitians.
Whilst the dietary assessment of nutritional status is has many different, often used approaches, the assessment of dietary variety is not clearly articulated.

Recommendations regarding the number and variety of different foods that should be eaten to achieve nutritional sufficiency include ≥6 different foods HRI-2005; Steyn et al., 2006); ≥10 different foods (Nicholls et al., 2001; Williams et al., 2014); and ≥20 different foods (http://www.sosapproach-conferences.com). These recommendations are not consistent, are based on varied assessment methods and assumptions as to what constitutes an unhealthy range of intake and aside from Steyn et al., (2005) report little data to support recommended thresholds/cut-points. Study 3 asks the question: Which of these dietary range recommendations is associated with inadequate nutrition, and therefore indicative of selective eating?

The aim of Study 3 was to develop a better understanding of the relationship between nutritional deficiency and variety of food eaten, with the goal of developing guidelines, or suggested cut-off values as to what level of food variety is indicative of a nutritionally deficient diet. The development of food variety cut off value indicative of nutritional deficiency will assist in the identification of children meeting selective eating diagnostic criteria. In order to achieve this, the nutritional assessment conducted by clinical dieticians via food diaries was considered to be a gold standard of nutritional assessment to which measures of dietary variety are compared.

4.3. Method

4.3.1. Participants

The data in Study 2 was also used in Study 3. Parents were asked to complete a food diary (n=102) with a range of restrictive and non-restrictive eaters in the sample. There was a range of restrictive and non-restrictive eaters in the sample. The age range was 1 year to 12 years, with an average of 8.5 years, and 55% of the sample was male.
There were no specific exclusion criteria. Ethics approval was granted by the University of Western Australia Human Research Ethics Committee.

4.3.2. Procedure

The procedure for recruitment of participants for this study is outlined in Study 2.

4.3.3. Measures

Three Day Food Diary

A three day food diary was selected as the method in order to report on the nutritional intake of participants. A copy of the diary sent to participants is in Appendix C.

Dietitian Ratings of Nutrition

In order to assess nutritional status, diaries were reviewed by clinical dietitians employed at a local children’s hospital. The two senior dietitians (with average 10 years’ experience) were employed at the time on an eating disorders program (which assessed and treated conditions including AN and BN, but not conditions associated with ARFID). The dietitians assessed the quality of food intake, using a set of pre-established criteria adapted from “Dietary Guidelines for American 2015-2020” (https://health.gov/dietaryguidelines/2015/guidelines/). The dietitians assessed all foods and beverages consumed and recorded intake was rated according to standard recommendations regarding food group representation, variety of fruit/legume/protein intake, and levels of fats, trans fat, added sugars and sodium. The dietitians were asked to classify the quality of nutrition evident in the food diaries which were classified into two groups of either adequate or deficient.

Missing Food Score

In the SOS treatment program (http://www.sosapproach-conferences.com) for problem feeders, one recommended indication of a problematic level of restricted eating
is the refusal to eat entire categories of food based on either texture or nutrition group. Food texture is defined as those properties of a food that are sensed by touch in the mouth and with the hands. Words to describe food texture include soft or hard, mushy or crunchy, or smooth or lumpy. Therefore, according to the SOS program individuals who refuse the full range of a certain texture of foods, e.g. lumpy foods, would be described as a problem feeder/eater. Nutrition group refers to the one of the five food groups, which in Australia includes 1. Diary, 2. Meat/fish/eggs/nuts, 3. Vegetables/legumes/beans, 4. Fruit, and 5. Grains. Therefore, according to the SOS program, if a child was missing an entire food group they would be identified as problem eaters/feeders. In the current study the food diaries were analysed specifically in terms of the presence or absence of entire nutrition or texture groups, and coded accordingly as Missing or Not Missing scores.

**Variety Rating**

4.3.3.1. Range of Food Eaten: Variety Rating

Principles for the assessment of variety of intake (Variety Rating; VR) that were used in Study 2 were also used in this study.

4.4. Results

4.4.1. Sensitivity and Specificity Analysis

In order to develop a test by which to assess selective eating a food variety measure had to be developed to reflect nutritional deficiency. The recommended food measures identified from previous research were based around the number of foods eaten (e.g. 6, 10 or 20 different foods) or the complete absence of food from a particular food texture or nutritional group. The gold standard or criterion against which these measures were compared was the nutritional adequacy of the three-day food records as assessed by a dietitian. Two dietitians rated 104 diaries and categorised them as adequate or deficient, and inter-rater reliability between the dietitians was high at 98%.
The Cohen’s kappa is a statistically significant .932 (p<.001), which represents strong level of agreement between the dietitian ratings.

The dietitians differed in their rating (i.e. one rated the diary as inadequate and other as adequate) for two cases, so these cases were omitted from the analysis. This process found that 20 individuals or approximately 19% of the sample were rated as having an inadequate diet. Sensitivity and specificity ratings (expressed as a percentage) for the different Variety Scores to predict the dietitian ratings of nutritional adequacy were calculated using the formula outlined in Figure 2. Results of the analysis are presented in Table 21 and Figure 3. Table 21 shows the sensitivity, specificity, positive and negative predictive values and accuracy ratings when compared with dietitian assessments. This analysis was conducted for a range of Variety Ratings (6-23) as these reflected recommendations in the literature (i.e. ≤ 6 foods, ≤ 10 foods, ≤ 20 foods) as well as assessing the predictive value of a missing texture or food group. The aim was to see which Variety Rating or whether the Missing Food Score test best captured results of the dietetic assessment (adequate diet or deficient diet).

Significantly, no subjects in this sample had food Variety Scores < 12, and therefore recommended cut-points of ≤ 10 foods (Nicholls et al., 2001; Williams et al., 2014), and ≤ 6 foods (Healthy Eating Index, 2005; Steyn et al., 2006), could not be included in the analysis.
Figure 2. Formula used to calculate Sensitivity, Specificity, Positive Predictive Value (PPV), Negative Predictive Value (NPV), and Accuracy Values (Buderer, 1996)

<table>
<thead>
<tr>
<th>Sn</th>
<th>Sp</th>
<th>PPV</th>
<th>NPV</th>
<th>ACC</th>
</tr>
</thead>
<tbody>
<tr>
<td>≤ 16</td>
<td>0.30</td>
<td>0.995</td>
<td>0.92</td>
<td>0.61</td>
</tr>
<tr>
<td>≤ 17</td>
<td>0.40</td>
<td>0.995</td>
<td>0.99</td>
<td>0.87</td>
</tr>
<tr>
<td>≤ 18</td>
<td>0.40</td>
<td>0.99</td>
<td>0.99</td>
<td>0.87</td>
</tr>
<tr>
<td>≤ 19</td>
<td>0.77</td>
<td>0.99</td>
<td>0.93</td>
<td>0.94</td>
</tr>
<tr>
<td>≤ 20</td>
<td>0.83</td>
<td>0.94</td>
<td>0.77</td>
<td>0.95</td>
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<tr>
<td>≤ 21</td>
<td>0.87</td>
<td>0.92</td>
<td>0.73</td>
<td>0.97</td>
</tr>
<tr>
<td>≤ 22</td>
<td>0.92</td>
<td>0.88</td>
<td>0.64</td>
<td>0.98</td>
</tr>
<tr>
<td>≤ 23</td>
<td>0.92</td>
<td>0.81</td>
<td>0.54</td>
<td>0.91</td>
</tr>
<tr>
<td>≤ 24</td>
<td>0.95</td>
<td>0.78</td>
<td>0.51</td>
<td>0.98</td>
</tr>
<tr>
<td>Missing</td>
<td>0.45</td>
<td>1.0</td>
<td>1.0</td>
<td>0.88</td>
</tr>
</tbody>
</table>

**Note:** Sn = Sensitivity; Sp = Specificity; PPV = Predictive Value of a positive test; NPV = Predictive Value of a negative test; ACC = Accuracy
4.4.2. Variety Score Validation

Using these definitions an inverse relationship between specificity and sensitivity is evident. For example, when the measure for selective eating was a Variety Score of \( \leq 18 \) foods over the three day period, this had a high specificity rate of 99%, meaning that 99% of individuals who met this criteria were identified as nutritionally inadequate, and therefore may be diagnosed with selective eating. However, the same Variety Rating, i.e. \( \leq 18 \) foods, also has a low sensitivity rating of 40% indicating that the test missed the diagnosis for 60% of those children who were identified by the dietitians as having deficient nutrition. Alternatively, a high sensitivity rating (92%) was found when the Variety Rating of \( \leq 22 \) was used indicating that the majority of children with deficient diets were identified, but using this cut off 12% of children were identified as having a problem who were not found to be nutritionally compromised (false positive).

For the purposes of this research, high specificity in the test is paramount as we are seeking to identify participants who have a diet that is nutritionally inadequate. This
ensures a low rate of false positives, meaning that few participants will be incorrectly classified as having an inadequate diet, which is preferable when trying to research characteristics of the population of selective eaters. The cut-point of ≤19 had very high specificity of 99%, and high Accuracy of 95%, and a lower although reasonable level of Sensitivity (77%), which is consistent with sensitivity values deemed appropriate in another study investigating food variety (Steyn et al., 2006). Predictive values were also adequate with a 93% probability of detecting nutritional compromise and a 94% chance of identifying those people without nutritional compromise. Cut-scores with high specificity are recommended for research purposes, as this enables identification of a group that do have a nutritionally adequate diet, therefore the variety rating of ≤19 foods was considered to be the most appropriate threshold to differentiate those children meeting the nutritional criterion of ARFID and for the classification of selective eating.

4.4.3. Missing Food Score Validation

The missing food group measure was found to have maximum specificity (100%) but low sensitivity (45%). This meant that 100% of children who were missing a food group were identified by the dietitians as having deficient nutrition; but, the measure was too strict in that it did not capture 45% of the sample of children who were identified by the dietitians as nutritionally deficient.

4.5. Discussion

One of the major issues facing clinicians and researchers in the field of childhood eating disorders and those interested in ARFID has been the absence of an objective, valid and reliable measure of restricted eating. This study aimed to develop such a measure working from the premise that a diet consisting of a restricted range of food would need to reflect nutritional deficiency to be of clinical importance. In this study, two experienced dietitians rated 102 food diaries of children with and without restricted eating patterns to determine if they were nutritionally deficient. This
assessment was used as the gold standard or criterion against which various recommended measures of dietary variety were compared. The aim was to determine which measure of variety was most useful in order to facilitate diagnosis of ARFID and selective eating. The specificity and sensitivity of the various cut-points were determined to assess the criterion validity of the measures. Previous recommendations regarding clinical levels of restricted range of food have included; 6 foods or less; 10 foods or less, 20 foods or less, or diets missing an entire food group or food texture group (e.g. eats only puréed foods). This study evaluated these recommendations in terms of their validity by comparing them to measure of nutritional inadequacy; the range of different food totals for individuals (from 6 through to 23) was investigated in an attempt to identify a valid threshold for nutritional deficiency.

This study found that two previously recommended thresholds would not have identified a number of children who would appear to have met criteria for ARFID. It has been suggested that selective eating be defined as eating less than 6 different foods (HEI-2005; Steyn et al., 2006) and less than 10 different foods (Nicholls et al., 2001; Williams et al., 2014). The finding of the current study would suggest that these criteria are too stringent, as no participants were found to have a Variety Score this low. This meant that these assessment guidelines missed all the children who were identified as nutritionally deficient by dietitian review, and therefore possibly experiencing ARFID. When the measure *missing food group* was assessed against the nutritional assessments, 100% of children who totally avoid a food group were identified as nutritionally deficient, but just over half of the sample of 20 participants assessed as nutritionally deficient were not identified by this measure. This measure is also therefore too conservative, lacks sensitivity to identify nutritional deficiency, and hence is likely to miss a significant proportion of children who would appear to be nutritionally compromised.
This study indicated that the most accurate dietary measure to identify nutritional deficiency is the variety score of 19 which equates to an individual eating 19 foods or less. This threshold is similar to the recommendation of the SOS treatment program of 20 foods (http://www.sosapproach-conferences.com). The measure of 19 foods or less cut-point had the highest accuracy rating of 95% (total number of true positives and true negatives), as well as a very high specificity rating of 99%, but a comparatively low sensitivity rating of 77%. The low sensitivity rating means that almost one quarter of the sample of nutritionally deficient individuals were missed. Having a high specificity rating but a low sensitivity rating is acceptable for research seeking identify selective eating cases but as a clinical measure may be considered too conservative. For clinical purposes a test with higher sensitivity may be more suited in order to screen for selective eating, or to form part of a more comprehensive assessment. On this basis, the best clinical measure appears to be 22 foods or less, which had a high sensitivity rating of 92% indicating that 18/19 out of the 20 nutritionally deficient individuals in this sample would be identified, but also an acceptable specificity of 88% which indicates that in this sample 10 out of a possible 84 individuals would be inaccurately identified as nutritionally deficient. These findings are similar to results from Bandini et al., (2010) who investigated the relationship between range of food eaten for typically developing and autistic spectrum selective eaters in a community sample (aged 3-11). In this study food repertoire was assessed via analysis of three day food diaries and how many different foods (including beverages) each child consumed over a 3-day period. No detail as to what constitutes a different food was offered. Results indicated that typically developing selective eaters (as defined by responses to FFQs) ate on average 22.5 different foods and autistic spectrum children ate 19 foods.
The aim of this study was to develop an empirically based measure of food variety that can differentiate between deficient and adequate nutritional status. The measure identifies at what point a restricted range of foods contributes to nutritional deficiency, and in doing so is able to differentiate deficient and adequate nutritional status and in doing so is able to differentiate between normal or sub-clinical levels of restricted eating and problematic levels of restricted eating. By linking the measure of diet variety with assessment of nutritional adequacy, it becomes feasible to use diet variety as a marker of the ARFID criterion of nutritional deficiency. As emphasized earlier, the nutritional deficiency criterion of ARFID has arguably potential to identify a wide range of children affected by ARFID as the first two criterion 1) weight loss and; 2) dependence on naso-gastric tube or supplement tend to apply to younger children with severe feeding disorders, whilst the fourth criterion of psychosocial impairment is not well understood or defined to date. Thus, the development of a dietary variety measure to assess the ARFID criterion of nutritional deficiency is valuable.

In addition, the variety score of 24 foods or above would appear to be the best threshold for determining nutritional adequacy and hence identifying children who are unlikely to have ARFID or selective eating. This cut-point may be useful for defining control groups for research purposes, as with a 95% sensitivity rating, participants scoring above this threshold are unlikely to have diets that are nutritionally deficient. It might also be used as a safe threshold to reassure anxious parents that their child’s diet is not problematic. Based on the current research, the recommended dietary guidelines using this dietary protocol are outlined in Table 22.
This study sought to validate the use of food variety as a marker of inadequate nutrition, which is an important aspect of diagnosing ARFID and selective eating. The development of food variety thresholds helps guide parental judgement of diet and provides assessment criteria that is relatively simple to understand and implement with low burden on the respondent. This will allow for use in research settings as the protocol can be applied to large numbers. These refined, precise but widely applicable assessment criteria will allow for accurate classification of all ranges of restriction eating, and can form a solid basis for ongoing research in field. It is intended that this assessment protocol will be used in the final study of this project (Study 4) which investigates the psychological factors associated with selective eating.

This study focused on food count as a measure of selective eating. It is noted that selective eaters often select food on the basis of sensory qualities of the food (Bryant-Waugh et al., 2010), and in the context of sensory processing sensitivities (Cermak et al., 2010). Future research could aim to refine the assessment of selective eating via nutrition intake by exploring the aspects of food such as colour, temperature, texture and packaging that may be associated with food choice of selective eaters.

Limitations of this study include the use of dietitian ratings on three days food diaries as the gold standard by which to validate food variety cut points. There may be
some question as to the reliability of clinical judgement used in the current study. However, while the consistency (Cohens kappa = .0935, p<.001) between assessors is reassuring it is acknowledged that alternative assessments of diet adequacy, for example involving computerised analysis of food diaries, may have provided more comprehensive and accurate assessments of nutritional status. Ability to access this type of assessment was beyond the scope of this project. Future studies should seek to validate the recommended variety cut-points using alternative measures of dietary adequacy.

Finally sample numbers were low, with current results based on 20 cases, therefore the generalisation of the results may be limited. In addition the sample was community based, potentially not covering the full range of severity of selective eating, which again may have affected the ability to generalise result findings. Despite these limitations, the current recommendations regarding variety rating cut points represents a valuable starting point to the operationalisation of the ARFID criteria of nutritional deficiency.
Chapter 5. Study Four: Psychological Factors Associated with Selective Eating

5.1. Introduction

Literature examining the psychological factors associated with selective eating is limited. As discussed, empirical research into selective eating has been hampered by the lack of clarity associated with diagnosis and assessment. This situation highlights a dilemma in the field associated with the differentiation between non-problematic levels of restrictive eating and pathological levels as evident in selective eating. It is plausible that for some children restrictive eating may be short lived, with minimal impact on other aspects of the child’s life such as peer relationship or family functioning. However, a significant minority of children appear to experience ongoing and clinical levels of the problem, and it can remain an issue into adulthood, affecting social development and causing marked familial conflict (Nicholls et al., 2001; Timimi et al., 1997). For these individuals, it is especially important to develop a more sophisticated understanding the nature of the problem.

Many factors may contribute to the development and maintenance of selective eating. As noted, eating disorders in children are complex and reflect the interplay between biological, psychological and social aspects of the problem (Kliegman et al., 2011; Sharp et al., 2010). The aim of the final study in this thesis is to explore and identify the psychological risk factors associated with selective eating. Whilst research exploring the psychological and social aspects of selective eating is restricted to case studies, extensive empirical research on psychosocial factors has been conducted in related fields of picky eating, food neophobia, feeding problems in infancy, and the normal development of food preferences. In order to set the context for the final study, the literature from these related areas as well as those pertaining to selective eating is
presented below and is grouped into the categories of child factors and, parent-
interational factors.

5.1.1. Child Factors

5.1.1.1. Medical-Biological Factors

There is a body of research that highlights the medical-biological influences on
the development of eating behaviours in children and underscores the bio-psycho-social
nature of eating disorders in children. According to retrospective case analysis selective
eaters tend to have a history of gastrointestinal symptoms such as retching, vomiting,
gagging and abdominal pain associated with eating (Nicholls, 2001; Timimi et al 1997).
These findings are replicated in cross sectional studies that have found that patients with
ARFID demonstrate more gastrointestinal symptoms such as reflux, constipation,
diarrhoea, food allergies and lactose intolerance. Non-gastrointestinal symptoms
including pulmonary problems, endocrine disorder, cerebral palsy, seizure disorder and
kidney disease have also been linked with selective eating (Williams et al., 2014).
Fisher et al. (2014) found that children with feeding problems and restricted eating
patterns not only tend to have co-morbid medical conditions, but may also demonstrate
neurological, learning or developmental problems. It is possible that for those children
with developmental delay and feeding or eating problems there may be physical or
medical constraints affecting the development of their eating. Schwartz, Corredor,
Fisher-Medina, Cohen, and Rabinowitz (2001) found that of 79 children with moderate
to severe developmental disability, 56% demonstrated gastrointestinal reflux and 27%
had oropharyngeal dysphagia (swallowing disorder).

Another biological factor thought to play a major role in the development of
selective eating is sensory processing. The anticipated sensory properties of food are
often cited as one of the main reasons for rejection of novel foods (Martins & Pliner,
2005). Sensory processing problems can be defined according to individual differences
in detection and responses to sensory information, including information from taste, touch, vision and olfactory senses (Dunn, 1999). Sensory sensitivity is believed to be an inherent factor (Dunn, 1999) which has been associated with physiological markers. For example, results from neuroimaging methods to measure the processing of sensory stimuli in the brain have indicated that children with sensory processing difficulties demonstrate different brain processing mechanisms when compared with a control group (Davies & Gavin, 2007). Specifically, electroencephalographic measures were used to examine brain processing in 28 children with sensory processing disorders (SPD) and 25 children who were typically developing, ages 5-12 years. Children with SPD demonstrated less sensory gating than children who were typically developing. Brain activity correctly distinguished children with SPD from children who were typically developing with 86% accuracy.

The process of eating involves integration across a variety of sensory modalities (i.e. touch, sight, smell), and differences can be seen in an individual’s sensitivity to the different qualities of food, such as taste (Bell & Tapper, 2006), and texture (Smith, Roux, Naidoo, & Venter, 2005). Farrow and Coulthard (2012) investigated the role of sensory processing in selective eating, and concluded that sensory sensitivity played an important role in the development of selective eating. In this research, sensory processing was assessed using parent report on the Short Sensory Profile (Dunn, 1999) and anxiety was assessed via parental report on the Spence Children’s Anxiety Scale for Parents (Spence, 1998). Selective eating was defined by parent report on the Food Fussiness Scale from the CEBQ (Wardle, et al., 2001), and responses on the CEBQ were treated as a continuous variable, with no cut off indicated for when the fussiness became pathological. The results indicated that parental reports of selective eating were related to both child sensitivity and child anxiety. Specifically, parent report of selective eating was associated with sensitivity in the child’s domains of taste/smell and touch,
but not in the domain of visual auditory processing. This is a similar finding to previous research, which found that food neophobia was associated with sensory sensitivity in the taste/smell and tactile domains, but not in the visual domain (Coulthard & Blisset, 2009).

The findings from Farrow and Coulthard (2012) also highlight the inter-correlation between sensory sensitivity and anxiety. In this research a mediation analysis indicated that child sensitivity to sensory information fully mediated the relationship between anxiety and selective eating. Subsequently, the authors suggested that that sensory processing problems are a primary issue in the development of selective eating and that anxiety was secondary to the sensory issues. There is limited research to examine the relationship between anxiety and sensory processing issues, but there is some indication with research with adults that they may be strongly associated (Liss, Timmel, Baxley, & Killingsworth, 2005). In this research, 213 college students were given a measure of sensory processing sensitivity (the Highly Sensitive Person Scale), the Parental Bonding Instrument (measuring parental care and over-protection), the State-Trait Anxiety Scale, and the Beck Depression Inventory. Sensory processing sensitivity predicted both anxiety and depression above and beyond parental factors, suggesting that it may be an independent risk factor. In addition an interaction was found between sensory processing sensitivity and parental care when predicting depression, suggesting that highly sensitive children may be particularly sensitive to parenting practices.

The influence of medical and biological factors is evident, however despite the findings indicating medical or sensory issues are often associated with restrictive feeding and eating patterns, many children with such medical or sensory conditions do not go on to develop ARFID or selective eating. In addition, the feeding or eating problem can continue long after the medical or sensory issue has resolved. This pattern
suggests that medical or sensory issues may be a risk factor, and it is possible that factors such as temperament, parent response and child anxiety operate in an additive fashion. This highlights the complexity and multi-factorial nature of childhood eating disorders.

5.1.1.2. Behavioural Problems

Research investigating the role of broader behavioural difficulties and their association with restricted eating patterns in children is limited and inconclusive. Lewinsohn et al. (2005) examined the extent to which the troublesome eating behaviours in three-year-old children were associated with other signs of psychopathology in the child. In order to assess the presence of eating/feeding problems an 89-item questionnaire was created and referred to as the Oregon Research Institute Child Eating Behaviour Inventory (ORI-CEBI). This questionnaire addressed constructs of dyadic interactions; affect at meals; refusal to eat; selective eating; restrictive eating; overeating and medical influences. It was found that children (n=93) who were described as picky or often refusing food were not likely to manifest more general behavioural problems as measured by the Achenbach Child Behaviour Check-list (CBCL; Achenbach, 1991) than normal eaters.

Conversely, other studies investigating the link between behavioural difficulties and restrictive eating problems have found an association. Choosy eaters as defined by parental report were found to demonstrate externalizing behavioural problems (Rydell, Dahl, & Sunderlin, 2001). In this study, a community sample of parents of 240 children aged 6-11yrs were invited to complete a questionnaire rating the occurrence of three eating behaviours: eats small portions, refuses food; disinterested in food (response scale: never; 3-4 times per week; and every day) together with the Rutter Children’s Behaviour Questionnaire (parent and teacher version; Rutter, 1967). Choosiness correlated with the Rutter total score ($r = 0.29$, $p < .0001$), with the externalizing and
hyperactivity scores ($r = .24 \text{ and } .26$, respectively, $p < .0001$) and to a small extent with the internalizing scores ($r = .13$, $p < .05$). However, it is important to note that whilst children with choosy eating had significantly higher Rutter scores, their Rutter scores did not place them in the clinical range of behavioural disturbance.

Equit et al., (2013) explored the relationship between selective eating and oppositional behaviours by including the following three statements in a parent report questionnaire: “Often has tantrums”; “Often resists my orders” and “Tries to pressurize me by not eating or eating too little” as part of a broader parent survey on selective eating. Participants were classified as selective eaters based on their high problem rating (i.e. endorsed often in a 3 point scale: often, sometimes, never) on three questions: “Avoids certain foods”, “Only eats a narrow range of foods, and “shows unwillingness to try new foods”. Using these measures selective eaters showed a higher rate of oppositional behaviour.

Jacobi et al. (2008) investigated the relationship between behavioural disturbance and picky eating older children (8-12yrs) and found that picky eaters had significantly higher scores on both the internalizing and externalizing scales of the CBCL. However, it was unclear whether these elevated scores placed the picky eaters in the clinical range of behavioural disturbance. In this study a community sample of 426 children were classified as picky eaters based on the question “Is your child a picky eater?”, a five point Likert scale was used (never to always), and behavioural problems were identified using the CBCL. Based on the results the authors concluded that “picky eating is associated with a wide range of behavioural problems in the child” (p 633).

Two studies already reported on extensively in this project also offer data on behavioural factors associated with selective eating. Timimi et al., (1997) conducted a case review whereby they looked separately at children under and over eight years of age. Focusing on children aged under eight years these authors noted that a range of
behavioural problems were evident including frequent temper tantrums, sleep problems and aggression, and on this basis concluded that selective eating was part of a wider picture of behavioural disturbance. Conversely, they found no such behavioural difficulties in older children (over eight years old), with anxiety more prevalent in this older age group. Similarly, Nicholls et al., (2001) did not report any behavioural disturbances or problems in their sample of selective eaters, who were all aged over seven years, but they did find evidence of anxiety. This pattern of results from these case studies suggests that the behavioural disturbance may be evident in young children with selective eating, but that if selective eating persists into middle childhood, anxiety may be a stronger factor.

Thus, the research into the relationship between behavioural disturbance and avoidant/restrictive eating is inconsistent. The inconsistencies may be due to a number of factors. Firstly, varying methods of assessment or identification of avoidant/restrictive eaters were used including parent report and retrospective review of case notes. For those studies using parent report, there was a wide range assessment methods ranging from responses to a single question (“Is your child a picky eater?”) to a comprehensive questionnaire with 89 items. It is also possible that studies where assessment of selective eating was reliant on parent report may not have adequately differentiated pathological and normal levels of restrictive/avoidant eating, therefore combining two potentially different subtypes of the problem. Finally, the different age ranges covered (i.e. three year olds vs. twelve year olds) may have confused the pattern of results as the eating issues may manifest in different ways at different developmental stages. The present study aims to address these issues by assessing behavioural difficulties across the age range, so that the pattern of differences across age can be tracked.
5.1.1.3. **Anxiety and Depression**

There is case report evidence to support the notion that childhood anxiety has a role in the development of selective eating. In two major case reviews of selective eating (Nicholls et al., 2001; Timimi et al., 1997) a significant number of selective eaters presented with anxiety symptoms consistent with obsessive compulsive disorder and social avoidance. Timimi et al., (1997) reviewed case notes of 33 patients with selective eating (aged between 4 and 14 years) and found that 30% of these children experienced obsessive compulsive symptoms. Nicholls et al., (2001) also examined case notes of 20 selective eaters and noted that half of the cases showed social avoidance and social anxiety, and nearly half demonstrated rituals or other obsessional symptoms.

In a large international case review (Fisher et al., 2014), a retrospective chart analysis was completed on all new patients between the age of 8 and 18 years who presented to seven adolescent medicine eating disorder programs across the United States and Canada. Individuals were identified at each site using a diagnostic check-list based on the DSM-5 ARFID criteria. One aim was to compare those children with ARFID to those with AN and BN. It was found that of the 712 individuals studied, 98 (13.8%) met criteria for ARFID. Another aim was to determine what types of psychological symptoms those children with ARFID were experiencing. The authors grouped ARFID patients according to psychological symptoms documented in the medical record. This process found that patients with ARFID were more likely to have an anxiety disorder (ARFID 58%; AN 35%; BN 33%) and were less likely to have depression (ARFID 19%; AN 31%; BN 58%). Specifically, 24% of ARFID patients demonstrated Generalised Anxiety Disorder (GAD), 13% had fears of eating secondary to fears of choking or vomiting, and 6% experienced Obsessive Compulsive Disorder (OCD). The authors postulated that those children with features of OCD may have the rigidity of behaviour that might result in a structured, repetitive approach to eating in
order to keep it safe. Those individuals with GAD may have a propensity to develop a
fear or avoidance of food based on their food experiences (e.g. strong, bitter tastes) in
combination with a high-level worry that eating will lead to an adverse experience.
Similar studies looking at comorbid conditions of ARFID in clinical settings have also
found an association with anxiety. Norris et al., (2014) found that 50% of ARFID
patients (n=34) presented with generalised anxiety disorder, and lower rates of OCD,
panic disorder and social phobia were also present, and Nicely et al., (2014) also
reported that ARFID patients in a specialist treatment program (n=39) had higher rates
(72%) of anxiety than a non-ARFID group as determined by clinical diagnosis, and had
rates (23%) of depression when compared to a non-ARFID group. Cooney et al.,
(2017) similarly found 38.4% of ARFID patients experienced anxiety disorders and
7.6% were diagnosed with a mood disorder as defined by psychiatric assessment. This
study also measured co-morbid conditions via psychometric assessment and found that
no young person scored in the clinical range on the Child Depression Inventory, and
18.2% scored in the clinical range on the Multidimensional Anxiety Scale for Children
(MASC).

Farrow and Coulthard (2012) investigated the relationship between sensory
sensitivity, anxiety and selective eating patterns. Parents of 95 children (aged 5-10yrs)
from a community sample completed questionnaires about child eating behaviour, child
anxiety and sensory sensitivity. The questionnaire used to assess the presence of
selective eating was parent response on the Food Fussiness scale of the CEBQ, and the
Spence Children’s Anxiety Scale for Parents was used to assess child anxiety. Results
indicated that parent reports of selective eating were significantly correlated with both
anxiety and sensory sensitivity. Anxiety was also correlated with sensory sensitivity.
Farrow and Coulthard (2012) hypothesized that since the reports of anxiety were related
to general elements of anxiety and were not specific to eating, anxious children may be
more fearful of new experiences/sensations and therefore may not approach new situations, such as eating new foods, as readily. A mediation analysis demonstrated that sensory sensitivity mediated the predictive value of anxiety, and based on this the authors concluded that sensitivity to sensory information results in increased anxiety for the child which then results in restricted eating. It may be that the physiological and cognitive processes associated with anxiety (e.g. reduced appetite, nausea, hyper-vigilance) may heighten sensory activity and predict avoidant responses to food in children.

A population based study investigated the psychological factors of selective eating, and found that selective eaters (as defined by parent report) had a significantly higher rate of anxiety symptoms compared to normal eaters (Equit et al., 2013). Child anxiety was measured by parent endorsement of positive responses to two questions: 1) my child is more anxious than other children, and 2) my child is afraid of certain situations.

Little is known about the developmental pathway to selective eating; however, these findings add important information and point to the role of anxiety in the etiology and understanding of selective eating. Children with selective eating may be experiencing psychological symptoms such as anxiety, and may need detailed assessment in order to treat the issue effectively.

5.1.1.4. Temperament

The term temperament refers to stable differences between individual, visible from birth, in how they typically react to their social surroundings. These traits are thought to have a genetic component that in turn is influenced by a complex interplay with environmental factors (Rothbart, 2007). Early temperament can have a pervasive effect on life-course development, and offers clues about personality structure, interpersonal relations, psychopathology and crime in adulthood (Caspi, 2000; Prior,
Sanson, Smart, & Oberklaid, 2000; Prior, Sanson, & Oberklaid, 1989). A “difficult” infant temperament (i.e. irritable, shy, uncooperative) can lead to behavioural and emotional adjustment problems in early childhood and beyond, particularly if there are other risks in a child’s life (Vassallo, Sanson, & Olsson, 2014). Kagan, Snidman, Arcus, & Reznick (1994), and Kagan, Reznick, & Snidman, (1987) defined the extreme of this dimension as behaviourally inhibited and uninhibited. Kagan and colleagues found that children with an inhibited temperament were more timid with people and situations that were unfamiliar, and were generally inclined to withdraw from stimulation. By contrast uninhibited children spontaneously approach novel people and situations, and appear to seek sensation and stimulation. These behavioural differences in young children were accompanied by distinctive physiological differences, including differences in heart rate, pupillary dilation during cognitive tasks and amygdala response which continued to be evident into adulthood (Kagan et al., 1987; 1988; Schwartz, Wright, Shin, Kagan, & Rauch, 2003). These findings supports Kagan’s original theories that proposed that children with an inhibited temperament experienced a fundamental, physiologically based flight and/or fight reaction to newness, surprise and change. This means that they will try to avoid or seek to escape from stimuli or situations that are new to them. In addition, inhibited and uninhibited temperamental types may be at risk for developing subsequent symptoms profiles in adolescence and adulthood. An uninhibited temperament in early childhood has been associated with externalizing behaviours in adolescence, which include a hot temper, impulsivity and aggressive and antisocial behaviour, and by contrast an inhibited temperament in early childhood is a risk factor for the development of anxiety in children and adolescence, especially social anxiety (Hirshfeld et al., 1992; Kagan & Snidman, 1999; Schwartz, Snidman, & Kagan, 1999).
Research has also established a link between temperament dimensions and eating behaviours in infants. In a cross-sectional study of 6 month old infants (n = 99), Farrow and Blissett (2006a) found that *unadaptable* and *fussy-difficult* temperaments as measured by parent report were associated with feeding difficulties including food refusal. A longitudinal follow up of this study (n=62) concluded that a difficult temperament which was defined as a tendency to withdraw from or being slow to adapt to new situations, showed intense reactions, had irregular routines, and experienced negative mood predicted restricted feeding practices at two years of age. In addition, feeding difficulties have been found to be more prevalent in young children described as unsociable, difficult or demanding and parents who describe their child as shy and emotional, also report that their child shows an apparent unwillingness to try new foods (Lindberg et al., 1996; Hagekull & Dahl, 1987; Pliner & Loewen, 1997). In the food neophobia literature, Pliner and Loewen (1997) reported an association between parental reports of having a shy, emotional child and the expression of food neophobia. Specifically, for children aged between 5-11 years, behavioural neophobia scores (from the Food Neophobia Scale) and a liking for good tasting novel foods (laboratory measure) were significantly related to temperament dimensions (as measured by the Temperament Questionnaire) of emotionality and shyness and were negatively related to sociability and activity. In this context, Farrow and Blissett (2006b) concluded that infant temperament was of paramount importance in the development of feeding problems.

A fussy/difficult temperament has been found to be associated with the types of feeding practices that parents employ (Blissett & Farrow, 2007). This may be important as certain feeding practices, including controlling feeding practices may serve to increase feeding and eating difficulties (Fisher & Birch, 1999; Galloway, Fiorito, Francis, & Birch, 2006). In this research controlling feeding practices at one year old
were predicted by parent perception of infant temperament at six months. Temperament
was measured by the Infant Characteristics Questionnaire (Bates & Freeland, 1979)
which assesses infant temperament in terms of fussiness/difficulty and adaptability at
six months and one year, dullness and predictability at six months and sociability and
persistence at one year, and controlling feeding practices were defined as pressure to
eat; restriction and monitoring behaviours. Blissett and Farrow (2007) commented that
although maternal monitoring and restrictive feeding practices may be motivated by a
number of factors, the use of these parenting practices may be moderated by infant
temperament, and emphasized the transactional nature of the development of controlling
feeding practices. The association between infant temperaments and early feeding
practices was further explored in an Australian study where associations between
feeding practices and beliefs (Infant Feeding Questionnaire) and infant temperament
(easy-difficult continuous scale from the Short Temperament Scale for Infants) were
compared (McMeekin et al., 2012). Mothers of temperamentally difficult infants
reported a lower awareness of infant cues, were more likely to use food to calm, and
reported high concern about the weight of their infant. McMeekin et al., (2012)
conclude that infant temperament may be an important variable in the development of
feeding difficulties and that carers of temperamentally difficult infants may benefit from
targeted feeding advice to minimize the adoption of undesirable feeding practices.

The mechanisms by which temperament influences eating are yet to be clearly
articulated. Infants born with a biological predisposition to have a low threshold in the
amygdala and its projections display vigorous limb movements and are easily distressed
by unfamiliar stimulation (such as new foods). As young children, these infants present
as avoidant or fearful of unfamiliar events. These children are described as having an
“inhibited” temperament. It is these children who thought to be at higher risk for the
later development of anxiety (Kagan & Snidman, 1999). However, the fact that only a
small proportion of highly reactive infants become consistently fearful, anxious children implicates the role of environment. It is evident that when the inhibited child’s biological reactivity is brought to the meal table by the infant it can provoke a reaction in the parent that may serve to soothe the child or maintain the anxious response. The role of parent factors including psychopathology, negative cognitions and meal-time parenting practices are described in following sections.

5.1.2. Parent Factors

5.1.2.1. Parental Psychopathology

There is some evidence that children of parents with psychological disorders are themselves at increased risk of psychological disturbances in their development (Patel et al., 2002). Parental psychopathology appears to have a role in the development of problem eating in children; however, the relationships are complex and multi-factorial. Parent factors can influence childhood eating patterns in two interdependent ways; firstly, via the impact on the relationship between parent and child where emotional difficulties may influence the way a parent perceives his or her child’s eating behaviour and their capacity to respond sensitively to infant/child cues, which may, in turn, affect the attachment process. And secondly, by affecting parent meal time practices or behaviours such that caregiver psychopathology (as defined by having depression, anxiety or an eating disorder) may result in anxious, controlling or insensitive feeding behaviours by the parent that may precipitate and or maintain feeding problems.

The role of parent psychopathology has received a lot of attention in relation to feeding disorders in the 0-3 age group, where feeding is understood to develop in the context of the parent/child relationship. Attachment theory suggests that parental psychopathology can adversely affect the ability of the parent to accurately read their infants’ social and emotional cues which can impact on infant feeding at a number of levels. Firstly, for an infant to feed successfully they must reach and maintain state of
calm alertness which is developed within the establishment of cycles of sleep, wakefulness and elimination. In order for this life rhythm to be achieved the parent will need to respond to the infant signals contingently. When a parent can accurately read and respond to infant cues, they are said to show good attunement (Stern, 1985). If a parent is experiencing an emotional difficulty, for instance depression, their ability to read and respond to the infant cues may be compromised. The degree and nature of the missatunement will in part determine degree and type of disturbance in the parent/child dyad, and may manifest in problems when negotiating developmental phases such as dependence and individuation, examples of which are played out daily in the feeding situation. The quality of the parent-child relationship is often seen to be compromised in observations of feeding disordered dyads (Cooper et al., 2004; Lindberg et al., 1996). Research indicates that parental attachment or emotional problems impact on the parent’s ability to form a secure relationship with their child and this insecurity can manifest in significant food refusal (Chatoor et al., 1988; Chatoor et al., 1997). For example, it was found that toddlers with feeding difficulties demonstrated less dyadic reciprocity, less maternal contingency, more dyadic conflict, and more struggle for control than healthy eaters (Chatoor, Ganiban, Hirsch, Borman-Spurrell, & Mrazek, 2000). In infants with feeding problems parent-child interactions are characterised by parental insensitivity to infant cues, and parental controlling behaviours, whilst the infant was frequently found to have a difficult temperament and poor social communication in both feeding and play (e.g. Hagekull et al., 1997; Keren, Feldman, & Tyano, 2001). Finally, an observational study of one year olds indicated that the extent of conflict between mother and infant at mealtimes was found to be inversely related to infant weight. This suggests that when conflict predominates during mealtimes the infant consumes less food (Stein et al., 1994), but it was unclear if the conflict was a cause or effect of the picky eating.
Caregiver depression and/or anxiety appear to be associated with the existence and continuation of feeding problems in early childhood (Coulthard & Harris, 2003; Hellin & Waller, 1992; Micali et al., 2014). Anecdotal evidence suggests that mothers of selective eaters may be prone to emotional difficulties, particularly depression and anxiety. Timimi et al., (1997) noted a high proportion of depression amongst parents of selective eaters, and also speculated about the role of excessive maternal anxiety regarding child choking that may have hindered the infant’s development of self-confidence with food. Research has refined the notion of parent psychopathology to investigate the impact of parental cognitions on mother-infant feeding interactions (Farrow & Blissett, 2006b). This study addressed the question of causality between maternal psychopathologic symptoms and infant eating problems by measuring the mothers’ core beliefs (using the Young Schema Questionnaire) during pregnancy and observing infant feeding problems post-partum. Farrow & Blisset (2006) found that certain core beliefs were more influential in the development of infant feeding problems than psychopathologic symptoms such as anxiety and depression. Specifically, higher levels of emotional deprivation and entitlement core beliefs and lower levels of enmeshment and self-sacrifice core beliefs predicted greater feeding problems. The authors theorized that women with such beliefs may be less sensitive or responsive to their child’s hunger or satiety signals, less tolerant of the mess and disorder of their infants’ mealtimes, forceful or negative when mealtimes were not how they wanted them to be, and employ coercive child feeding tactics. It has also been found that while coercive feeding practices may result in short-term food intake, they are also likely to exacerbate subsequent feeding problems (Douglas, 1998; Harris & Booth, 1992). These findings indicate that certain maternal maladaptive core beliefs were more pertinent in the explanation of infant feeding problems than psychopathologic diagnosis (i.e. anxiety and depression) traditionally associated with feeding problems.
Maternal depression can impair parenting practices and has been linked with less sensitive feeding interactions with children. One study aimed to examine relationships between maternal self-reported symptoms of depression with observations of mothers’ child feeding practices during a mealtime (Haycraft Farrow, & Blissett, 2013). In this study 58 mothers of 3-4 year old children were video recorded eating a standardised lunch. The recording was then coded for instances of maternal controlling feeding practices and maternal vocalisations using the Family Mealtime Coding System. Mothers also provided information on current symptoms of depression and anxiety. Mothers who reported greater symptoms of depression were observed to use more verbal and physical pressure for their child to eat and to offer more incentives or conditions in exchange for their child eating. Mothers also used more vocalisations with their child about food during the observed mealtime when they had greater symptoms of depression.

The issue of whether a parent with an eating disorder may facilitate intergenerational transmission of feeding and eating problems is not clear. Much of the literature in this area is more focused on the feeding patterns of infancy and early childhood, and research into older age groups is focused on the development of disorders such as AN or BN, rather than selective eating. Mealtime can be a testing time for parents, and for parents with eating disorders it may be even more challenging. However, it remains unclear whether a parent with any type of significant mental health condition may struggle with developing a feeding routine with their child, or whether there are specific risk factors for parents with eating disorders. There is a small body of research that has investigated the relationship between parental eating disorder and early childhood feeding, but there is a lack of controlled studies, and many studies suffered from small and/or biased samples, making it difficult to generalize from findings (e.g. Russell, Treasure, & Eisler, 1998). The first longitudinal controlled study
looked at parental eating disorder in combination with mother-infant interaction, feeding patterns and growth (Stein et al., 1994). Eating disordered parents were more intrusive during both mealtime and play and they expressed more negative emotion towards their infants during meals. The children of eating disordered parents had a more negative emotional tone and their mealtimes were more conflicted compared to controls. In addition, infants of parents with eating disorders weighed less than controls and infant weight was found to be inversely correlated to both the amount of conflict observed at meals and the extent of the mother’s concern about her own body shape. In a review of the literature Patel et al., (2002) highlighted that mothers with eating disorders are less likely to breast feed but are more likely to be intrusive at mealtimes, use food for non-nutritive purposes, and express negative comments towards their children at meal times.

Other studies have taken a bottom up approach whereby the child’s eating pathology is used as the starting point. Whelan and Cooper (2000) examined parental eating disorder pathology in a community sample of three groups of children aged four years: Children with feeding disorders; children with emotional and behavioural disturbance but not in the feeding domain, and children with no disturbance. They found that compared with the mothers of the two comparison groups of children, the mothers of children with feeding disorders had significantly higher rates of past and present eating disorder. These results raise the question of the mechanism by which this relationship between child feeding disorder and maternal eating disorder is established and maintained.

Cooper et al., (2004) sought to determine what mediated this effect, and path analysis found that for children of pre-school age, parents with an eating disorder provided a disorganized mealtime environment and had a more controlling and
The question remains whether these mealtime processes are specific to parents with eating disorders, or whether similar difficulties may be associated with other psychiatric disorders. This was addressed in a large (n=250) controlled study comparing rates of feeding disorders in the children of parents with AN; BN; other psychiatric disorders; and no psychiatric disorder. Results indicated that AN parents had children who were at higher risk for feeding difficulties at age 0-6 months compared to the children of parents without psychiatric disorders, but children with AN parents had a similar rate of feeding difficulties as the children of parents with other psychiatric disorders (Micali, Simonoff, & Treasure 2009). This suggests that general parental psychopathology, not limited to eating disorders, may contribute to the development of child eating problems.

Research into child feeding and eating disorders has often focussed on the mechanisms by which parental psychopathology impacts on child feeding and eating. The current review indicates parental psychopathology, including anxiety, depression and eating disorders, impacts on the relationship with the child and is associated with certain meal time parenting behaviours (e.g. negativity, controlling, and coercive). It is theorized that these types of mealtime parenting practices may contribute to the development of feeding and eating issues in early childhood. The following sections reviews the literature on the impact of parental mealtime practices on the development of feeding and eating patterns.

5.1.2.2. **Mealtime Parenting Practices**

The literature in parent mealtime practices and the impact on childhood feeding and eating derives from studies in four areas; 1) the normal population and the
development of food preferences; 2) food neophobia; 3) infant feeding disorders; and, 4) avoidant/restrictive eating disorders in older children.

5.1.2.2.1. Mealtime Practices Associated with the Development of Food Preferences

Studies investigating the development of food preferences in children in the “normal” population, that is, without feeding/eating disorders comprise a large body of research. The aim of this research is understand factors that help develop healthy eating patterns in children across the population, with an emphasis on preventing obesity. Typically research on food preferences focuses on increasing the range of foods a child eats by increasing the intake of healthy foods (fruit and vegetables) and decreasing the intake of unhealthy options such as food high in fat or salt. Parents influence young children’s eating habits and the development of food preferences in several ways. The following section reviews the ways in which home mealtime environment and parental feeding practices influence children’s eating behaviours and the development of food preferences both within the normal population and with picky eaters.

5.1.2.2.1.1. Role Modelling

There is growing evidence that parental modelling of fruit and vegetable intake and making fruits and vegetables available and accessible promote fruit and vegetable consumption. Foods served in the family set an important outer limit to children’s food preference learning; parents dictate which foods are available, how foods are prepared, and in what quantity. More subtly, parents’ own food related behaviour may affect the eating patterns of their children by way of modelling. Research has focused on the role of parent food choices and Wardle (1995) concluded that:
“Parental attitudes must certainly affect their children indirectly through the foods purchased for and served in the household…influencing the children’s exposure and…their habits and preferences.” (p. 754)

Family members influence each other with respect to food preferences as evidenced by the strong positive relationship between mothers’ and children’s intake of specific foods (Cooke et al., 2004; Gibson, Wardle, & Watts, 1998). Data indicate that parents seldom serve food items that they dislike or that are novel to them (Koivisto, Fellenius, & Sjödén, 1994; Koivisto & Sjödén, 1996). If parents have a restricted range of foods in their diet, many foods will not appear on the table on enough occasions to allow for sufficient exposure (Carruth & Skinner, 2000; Wardle et al., 2005), or for positive role modelling, (Jansen & Tenney, 2001). It has been found that child preferences resemble those of their parents and even more so of their siblings (Pliner & Pelchat, 1986). Olivera et al. (1992) reported a similarity between parent and child food choices for preschool aged children. Likewise, Contedo et al. (1993) found a relationship between mothers’ health motivation and the quality of children’s diets. The impact of observational learning has also been shown in an intervention study designed to change children’s eating behaviour using video based peer modelling (Lowe, Downey, & Horne, 1998). Birch (1980) found that peers also have a significant impact on children’s food choices. Children were placed for four consecutive days next to other children who preferred a different vegetable to themselves (e.g. peas and carrots). By the end of study the children showed a shift in their vegetable consumption which persisted at follow up assessment several weeks later.

Galloway and colleagues (2005) conducted a longitudinal analysis to assess the effect of role modelling on picky eating. Participants were 173 non-Hispanic white girls
and their mothers and data was collected when the girls were aged 7 and 9 years. Structural equation modelling examined relationships among mothers’ fruit and vegetable intake; child feeding practices; daughters’ pickiness; and fruit, vegetable, micronutrient, and fibre intakes. In this study, children who were pressured to eat more by their parents at seven years of age consumed fewer fruits and vegetables at nine years old.

Although these findings could reflect either genetic similarities or some reverse causation (child preferences influencing family intake), it does suggest that parental modelling of food choices is a strong predictor of child food preferences.

5.1.2.2.1.2. Feeding Practices

Specific feeding practices may play a role in children’s acceptance of a wider variety of foods. Central to the different measures of parent feeding practices is the concept of parental control which includes parent behaviours such as pressure to eat, restriction of food intake, monitoring of food intake, or the use of food as a reward. The practices that have received a lot of research attention are restriction of food intake and pressure to eat (Fisher & Birch, 1999; Galloway, Fiorito, Francis, & Birch, 2006) which are often referred to as “controlling” mealtime feeding practices. Restriction is the practice of limiting children’s access to specific foods or specific amounts of food. Pressure to eat refers to enforcing or strongly encouraging certain foods or amounts of foods.

Research indicates that the impact of controlling feeding practices may be the opposite of parent intention with pressured foods being consumed less and restricted foods being preferred more (Galloway et al., 2006; Jansen, Mulkins, Emond, & Jansen, 2008; Wardle, 1995). In a laboratory based experiment, Jansen et al. (2008) compared two groups of young children who were forbidden to eat fruits and sweets (prohibition groups) with a control group who were invited to eat everything (no-prohibition
condition). Desire for sweets remained high in the sweets-prohibition condition, whereas it decreased in the fruit-prohibition and no-prohibition conditions. No group differences were found regarding the desire for fruit. With respect to intake, children in both the fruit- and the sweets-prohibition condition consumed more of the formerly forbidden food during a taste session as compared to the no-prohibition condition. In addition, total food intake was higher in the two prohibition conditions than in the no-prohibition condition. The authors concluded that the data were indicative of adverse effects of restriction which included an increased desire and intake for prohibited food.

Galloway et al., (2006) examined whether pressuring pre-schoolers to eat would affect food intake and preferences, using a repeated-measures experimental design. In the experimental condition, children were pressured to eat by a request to finish their food. Children consumed significantly more food when they were not pressured to eat and they made markedly fewer negative comments. It was also found that children who were pressured to eat at home had lower body mass index percentile scores and were less affected by the pressure in the lab setting than children who were not pressured at home. The author concluded that this correlational data indicated that pressure can have negative effects on children’s affective responses to and intake of healthy foods.

These studies suggest that parental control may have a detrimental impact in developing variety on a child’s diet. However, it is also evident that moderate restrictive practices (restriction of sugary foods as snacks; prohibition of biscuits and cakes) also results in a lower intake of sweets and increased intake of fruit and vegetables (Gubbels et al., 2009), particularly if this is combined with availability of fruit and vegetables and parent intake and modelling of fruit and vegetable consumption (Pearson, Biddle, & Gorely, 2009; Sleddens, Kremers, De Vries, & Thijs, 2010). Similarly, Brown and Ogden (2004) reported that greater parental control was associated with higher intakes of healthy snack foods. In explaining such inconsistencies Ogden, Reynolds & Smith
(2006) suggested that there may be a difference in overt parental behaviours (such as encouragement to eat healthy foods) and covert practices (such as avoiding buying sugary foods). The authors conclude that “parental control may be more complex than previously assumed” and that “different forms of control (i.e. overt and covert) may influence different areas of eating behaviour” (p. 105). The complexity and subtle micro-management of the environment in feeding and mealtime situations may not be accurately captured by the available questionnaires on parenting practices, therefore Ogden et al. (2006) suggest that a broader conceptualization of parental control is needed.

In summary, the research on the development of food preferences in the normal population suggests that non-directive practices, which are designed to encourage trying of fruit and vegetables, but not control consumption, accompanied by moderate restrictive parenting practices concerning consumption of less healthy foods, are associated with better fruit and vegetable intake in children. It is unclear if this picture of specific parenting mealtime practices is also associated with children with selective eating, and this will be investigated in the present study.

5.1.2.2.1.3. Parenting/Feeding Style

Research has also considered the impact of broader parenting style on dietary behaviour of children. Parenting style refers to the emotional climate within which parenting techniques or practices are applied. Baumrind’s (1971) original conception of parenting style referred to parents’ attitude and values about parenting and beliefs about development, whereas parenting “practices” refer to behavioural strategies used in particular situations. Measures assessing general parenting approaches, rather than those specific to eating, are typically used in this area of research. Parenting style has been classified into one of three typologies, which vary according to the dimensions of warmth or responsiveness and demandingness or degree of behavioural control (Darling
& Steinberg, 1993); 1) authoritarian parenting (low warmth/high demand), 2) authoritative (high warmth/high demand), and 3) permissive (high warmth/low demand). Authoritarian parents are highly demanding and highly controlling and are also emotionally unresponsive. Permissive parents impose limited control, either through overly indulgent (warm) or neglectful (emotionally cold) parenting. Authoritative parenting style is described as “appropriately demanding and controlling, but also warm and responsive” (Haycraft & Blissett, 2008, p. 478).

The literature examining associations between parenting styles and childhood food intake is limited to the impact of parenting style on fruit and vegetable consumption and shows equivocal results. Some studies found no association between parenting style and fruit and vegetable consumption (Vereecken, Legtest, De Bourdeaudhuij & Maes, 2009; Cullen, Baranowski, & Rittenberry, 2000) while others show a positive correlation between an authoritative parenting style and fruit and vegetable consumption (Kremers, Brug, deVries, Engels, 2003). In the context of these conflicting results some authors suggest that it is the interaction between parenting styles and specific parent feeding practices is important (Haycraft & Blissett, 2008).

Several papers have examined parenting styles specifically within the context of the mealtime situations, and the area that combines parenting style and feeding practices have come to be known as feeding styles. One of the key studies in this area established that feeding styles reflect elements of parents’ broader parenting styles (Hughes, Power, Fisher, Mueller, & Nicklas, 2005). In this study of 231 low income minority parents of 3-5-year-old children, parents who demonstrated an authoritarian parenting style also demonstrated an authoritarian feeding style, and used higher levels of restrictive and pressuring feeding practices than parents with a permissive parenting style, and used less monitoring of children’s food intake than parents with an authoritative feeding style. More authoritative feeding styles were associated with greater availability of fruit.
and vegetables, more attempts to get the child to try fruit and vegetables and maternal report of higher consumption of fruit and vegetables. Authoritarian feeding styles were characterised by attempts to control the child’s choices and preferences, poorer availability of fruit and vegetables and poorer vegetable consumption. In this study the measure of feeding style was the Child Feeding Questionnaire (Birch et al., 2001) which has four factors: 1) Parental Perception (perceived responsibility; perceived child weight; parental weight and concern about child weight); 2) Pressure to Eat (four items – e.g. “My child should always eat all the food on her plate”); 3) Restriction (eight items – e.g. “I intentionally keep some foods out of my child’s reach”); and ( ) Monitoring (three items – e.g. “How much do you keep track of high fat foods that your child eats?’’). However, another study, using the Child Feeding Questionnaire (n=48, mean age of children 42 months) found that there was no relationship between authoritarian parenting and controlling feeding styles. Permissive parenting style was related to lower monitoring of children’s unhealthy food intake, but parenting style was not related to BMI. However, higher child BMI was predicated by lower paternal application of pressure to eat (Haycraft & Blissett, 2008).

Hoerr, Hughes, Fisher, Nicklas, Liu and Shewchuk, (2009) found that in their sample of low income preschool children intake of fruit and vegetables were lowest in children of permissive parents. In contrast to other studies indicating that authoritative feeding styles produced the best outcome of dietary variety, this research found that authoritarian feeding styles were associated with better eating behaviours in low income children. Based on this result the authors concluded that within the eating context parental demandingness may be positive with young children and those from some cultural and socio-economic groups.

Overall the evidence suggests that parents who place no demands on their children to consume fruit and vegetables do not tend to have children who eat fruit and
vegetables. There is also evidence to suggest that overly controlling parenting styles and feeding practices may result in lower intake of fruit and vegetables, particularly with older age groups. The feeding style literature is consistent with the parenting style studies, indicating that parents who are firm regarding their demands on the feeding context, but not controlling or restrictive, have children with the highest fruit and vegetable consumption (Blissett, 2011). In summary, there appears to be an emerging theme of needing to find some middle ground in parent interaction with children around meals. There is some evidence that suggests that a lack of any control over children’s food intake, perhaps characteristic of a permissive style of parenting, may result in a low intake of fruit and vegetables. Similarly, excessive control or pressure to eat and high restriction may result in low intake of fruit and vegetables. The results tentatively suggest that authoritative feeding style which is characterised by warmth and responsiveness results in in the highest levels of fruit and vegetables consumption.

These results are consistent with studies from other areas of childhood development; there is extensive literature linking parenting styles to child and adolescent behaviour problems, and in general authoritative parenting is negatively associated with internalizing and externalizing problems in childhood and adolescence (e.g. Steinberg Blatt-Eisengart, & Cauffman, 2006; Williams et al., 2009). In addition authoritative parenting style has been shown to be associated with the development of a secure attachment in middle childhood and adolescence (Karavasilis, Doyle, & Markiewicz, 2003), and it is well understood that a secure attachment is associated with positive child outcome in social, emotional and behavioural domains (for a summary see Grossman, Grossman, & Waters, 2006). In contrast both permissive and authoritarian parenting styles are positively associated with emotional and behaviour problems such as internalized stress, conduct disorder and delinquent behaviour (e.g. Querido, Warner, & Eyberg, 2002; Thompson, Hollis, & Richards, 2003).
5.1.2.2.1.4. Exposure

Exposure and availability of foods is also a major determinant in the development of food preferences (Addessi, Galloway, Visalberghi, & Birch, 2005; Birch, Savage, & Ventura, 2007). According to Zajonic (1968), in the mere exposure theory familiarity with a new food may also influence preferences. The mere-exposure effect is a psychological phenomenon by which people tend to develop a preference for things merely because they are familiar with them. In social psychology, this effect is sometimes called the familiarity principle. Exposure increases the familiarity and thus reduces the anxiety, and as a consequence can lead to an increase in acceptance (for a review see Barlow, 2002). Based on exposure theory, by repeatedly offering an initially rejected food parents can play a crucial role in transforming an unfamiliar food to a familiar one, thereby reducing anxiety associated with eating that particular food.

Studies across the field support this view (Birch & Marlin, 1982; Wardle, Herrara, Cook, & Gibson, 2003), and researchers have tried to delineate the elements of exposure that are effective. Increased exposure to vegetables by parents (more than any other adult) is likely to lead to greater acceptance from the child to eat vegetables (Wardle, et al., 2003). Schwartz, Scholtens, Lalianne, Weenen and Nicklaus, (2011) found that exposure is important along dimensions of taste and texture (i.e. incremental changes to taste such as vanilla yoghurt to strawberry yoghurt; and texture changes such as pureed foods to food with very small lumps). Studies also indicate that the number of exposures required for acceptance of a new food increases from very few in infancy (Maier, Chabanet, Schaal, Issanchou, & Leathwood, 2007; Sullivan & Birch, 1994), five to ten in 2 year olds (Birch & Marlin, 1982; Birch, McPhee, Shoba, Pirok, & Steinberg, 1987), and up to 15 in 3-4yr olds (Sullivan & Birch, 1990). However, children are often not offered this number of repeated exposures with initial rejection commonly misinterpreted by parents as a genuine dislike of the foods being offered (Cooke, 2007;
Cooke et al., 2004; Skinner, Carruth, Bounds, & Zielger, 2002). Early introduction and exposure to a range of foods is positively associated with increased intake and variety of foods later in childhood (Cooke et al., 2004; Skinner et al., 2002). This pattern of results has led to the theory that there are critical windows for exposure and at these times the development of food preferences is facilitated and generated. This research is in its infancy but animal studies suggest that perinatal and immediate post weaning periods are critical windows to increase preference for foods later in life (Gugusheff, Ong, & Muhlhausler, 2014).

5.1.2.2.1.5. Mealtime Practices Associated with the Development of Food Preferences in the Normal Population: A Summary

The previous section looked at the research in the development of food preferences within the normal population and specifically the contribution of parental meal time practices over four areas: Role modelling, feeding practices, parental/feeding style, and exposure. These studies are important for the current study into selective eating, as selective eaters consume a very low range of foods and there is interest in exploring whether identified factors in normal child development operate for children with restrictive eating disorders. Overall, within the normal population, a number of parenting practices appear to influence the development of food preferences in children. In the area of role modelling parental intake is strongly correlated with child intake, and peers also seem to have a positive impact on the development of food preferences. Certain feeding practices also appear to have an effect. Highly coercive parenting practices such as pressuring to eat may result in a reduction of intake, and parental restriction of child intake may also lead to an increase in desire and intake for the restricted food. However, there is also evidence to suggest that moderate levels of restriction of sweet foods results in lower intake and similar moderate levels of control
have been associated with a higher intake of healthy foods. It appears that parents who are firm regarding their demands on the feeding context, but not controlling or restrictive have children with the highest fruit and vegetable consumption. Finally, food exposure is an important factor in the development of food preferences, and there may be critical windows for exposure and at these times the development of food preferences is facilitated and generated. Whilst there is a large body of research investigating the parental meal time practices that may affect the development of food preferences in the normal population, there are fewer studies looking at how meal time practices are involved in the development of restrictive eating disorders, and this research is presented below.

5.1.2.2.2. Mealtime Practices Associated with Feeding/Eating Problems in Children

Parent mealtime practices thought to be associated with picky eating, food neophobia, and infant eating disorders are reviewed below.

5.1.2.2.1. Mealtime Practices and Picky Eating

Crist and Napier-Phillips (2001) compared the meal time practices, as measured by the Behavioural Pediatric Feeding Assessment Scale (Crist, Dobbelsteyn, Brousseau, & Napier-Phillips, 2004) of children without picky eating issues and those treated at a feeding clinic. The age range was nine months to seven years. Parents of children the problem feeding/eating group reported using tactics such as coaxing, threats, making multiple meals and force feeding, more so than parents of healthy eaters. An Australian study investigated the relationship between controlling feeding practices of 239 Australian-Indian mothers and picky eating in children aged 1-5 years. (Mehta, Mallan, Mihrshahi, Madalika, & Daniels, 2013). A positive association was noted between “pressure-feeding” (as measured by Restriction and Monitoring scales on the Child Feeding Questionnaire: Birch, Fisher, Grimm-Thomas, Markey, Sawyer, & Johnson,
2001; and the Pressure to Eat scale on the Comprehensive Feeding Practices Questionnaire: Eizenman & Holub, 2007) and perceptions of pickyness. The authors noted that their data is correlational so the causal relationship between parental control and feeding or eating problems cannot be determined.

5.1.2.2.2.2. Mealtime Practices and Food Neophobia

A handful of studies have examined the association between parental feeding practices and child food neophobia. Most studies have investigated whether parenting practices associated with broader food preferences in the general population (as described above) are applicable to individuals with food neophobia. Koivisto and Sjödén (1996) investigated the use of parent mealtime practices associated with food neophobia in a community sample (n=57) with children aged 2 -17 years. In order to assess food intake and mealtime behaviours a Food Frequency Questionnaire was completed by all family members and the Mealtime Practice Questionnaire (Fellenious, Lappalainen, & Sjoden, 1990) was completed by parents in relation to children aged 2 – 9 years. To assess levels of food neophobia, children over seven-years-old also completed the Food Neophobia Scale (Pliner & Hobden, 1992) and scores were referred to as the “child food neophobia score”. And parents were asked to rate the extent of their child’s neophobia on a 100mm line with endpoints likes new foods and tastes and does not like new foods and tastes. Correlations were calculated between mealtime practice factors, child neophobia scores, and the parent neophobia ratings. No association was found between child neophobia scores and mealtime practices. When parental ratings of food neophobia were examined there were positive correlations between neophobia ratings and several mealtime practices. The authors concluded that the more neophobic the child, the more often parents were inclined to postpone meals in order to facilitate consumption and to allow their child to decide how much he/she wants to eat. Permissive meal practices have shown to be negatively
correlated with developing food preferences (Hoerr et al., 2009), and therefore may help explain why a child continues to experience food neophobia.

Conversely some researchers have examined the association between food neophobia in children and excessive parental control at mealtime. The premise of this research is that increased parental control as evidenced by mealtime practices of restriction and pressure to eat can result in reduced intake of vegetables and fruit in a non-food neophobic sample (Fisher, Mitchell, Smiciklas-Wright, & Birch, 2002). Wardle, Carnell, and Cooke (2005) addressed the question of causation when they investigated the associations between a controlling parental feeding style, restricted intake of fruit and vegetables, and child food neophobia. A cross sectional survey was conducted with parents of aged 2-6yrs (n=564) using questionnaires that assessed fruit and vegetable intake together with the Parental Control Index and the Child Food Neophobia Scale. Findings replicated research that found a correlation between parental control and lower intake of fruit and vegetables. The strongest predictor of child fruit and vegetable consumption, accounting for 21.5% of variance of the model, was parental fruit and vegetable consumption, which is consistent with previous research that has demonstrated the positive impact of parent role modelling on food intake (Cooke et al., 2004; Fisher et al., 2002; Gibson et al., 1998). The next strongest predictor was child’s food neophobia, explaining and additional 5.5% of variance, and parental control showed no additional effect. The authors concluded that controlling mealtime parenting practices were more likely to be a response to, rather than a cause of neophobia.

A subsequent study extended these findings by investigating parent and child neophobia and a broader range of parental feeding practices (Tan & Holub, 2012). In this study, 85 mothers of three to 12 year-olds completed a questionnaire online regarding food neophobia and parenting practices. Measures used were the child and parent versions of the Food Neophobia Scale (Pliner, 1994), and The Comprehensive
Feeding Practices Questionnaire (Musher-Eizenman & Holub, 2007), which has five factors: Healthy Eating Guidance; Monitoring; Parent Pressure; Restriction; and Child Control. Three parenting practices were associated with child food neophobia. Firstly, child food neophobia was related the controlling feeding practice of food restriction for health (as opposed to weight) reasons. The nature of this relationship was unclear on the one hand the authors postulated that given that children with food neophobia tend to prefer sugary and high fat foods (Cooke et al., 2003), this may lead to parental concerns about adequate nutrition which manifests in restriction of these less healthy foods. Alternatively, the parent feeding practice of restriction for health may result in reduced variety of intake consistent with similar findings in non-neophobic samples (Galloway et al., 2006; Jansen et al., 2008). Second, parents of children with food neophobia reported less monitoring of their children’s food intake. These findings seemed to intuitively contradict the finding that these parents also used restriction for health, but were not monitoring their child’s intake. The authors theorized that perhaps these parents were defeated by their child unwillingness to try new foods, or that they had lost confidence in their ability to provide a healthy meal for their child. Finally, parents whose children were high in food neophobia reported that they are less likely to make healthy foods readily available and easily accessible to their children. The authors again noted that the nature of this relationship was unknown; was the relationship one where parents react to their child’s neophobia by becoming exasperated and were therefore less likely to make available foods that they assumed that their child would not eat? Or was the lack of a readily available range of foods a reason why the child may develop neophobia?

It is known that exposure to foods is important in order to develop and extend food preferences (Maier, et al., 2007; Schwartz et al., 2011; Sullivan & Birch, 1994; Wardle et al., 2003). Pliner et al. (1993) reported a two part investigation of factors
underlying neophobia and how these can be addressed by exposure. In the first part of the study the authors attempted to determine whether individuals consider novel foods (in comparison to familiar foods) to be dangerous and expect to dislike their tastes, and, if so, whether willingness to eat novel foods is related to the degree of perceived danger and expected disliking. A series of multiple regression analyses revealed that disliking and danger are both good predictors of willingness to try novel foods while willingness to try familiar foods is predicted only by disliking. In the second part of the study they examined experimentally the effect of forced exposure to novel foods on subsequent neophobia. Some participants were required to taste seven novel foods while others tasted seven similar familiar foods; all participants were then given the task of selecting for tasting one member of each of 11 pairs of foods. The pairs were comprised of one novel and one familiar food (different from those used in the exposure to novelty manipulation), and number of novel choices was the measure of neophobia (with fewer choices indicative of greater neophobia). Results indicated that participants in the forced exposure group had lower food neophobia scores. In interpreting their results the authors emphasized the importance of conceptualizing food neophobia as a phobia (i.e. an unwarranted fear of a stimulus that is not harmful). They theorized that the forced exposure was similar to the behavioural technique of extinction whereby the forced exposure to the new food in the absence of negative consequence reduced the fear. They base this idea on another finding in the study that unfamiliar foods were perceived as very slightly but significantly more dangerous than familiar foods. The authors do not make assumptions about how these data may translate into parenting practices.

In summary, the relationship between parental mealtime practices and neophobia is unclear. On the one hand, there is evidence to suggest that neophobia is associated with less parental control (such as letting the child decide the portion size) and less monitoring of food intake. Conversely, food neophobia was also associated
with excessive control at mealtime including practices such as “restriction for health”. As the scale and number of studies is limited the results are preliminary and three factors may contribute to inconsistent results. Firstly, it is possible that the different results are an artefact of variation in mealtime practice measures. It was difficult to determine from the literature exactly what was meant by parenting practices such as “child control” or “involvement” and how the constructs in each of the questionnaires used were similar or different. Secondly, study samples varied in age ranging from 2 years to 12 year. This age range spans very different developmental phases, which may impact on the type of parenting practices used and limits the ability to generalize results across the age range. For example, parents of younger children may use less coercive parenting practices with the assumption that the child may grow out of the neophobic behaviour, whilst parents of older children may be more concerned about the restricted intake patterns and therefore attempt to exert more control. Conversely parents of younger children may exert more control at meals because parents are more involved in meals and in general with their children in early childhood, whereas middle childhood is a time of increased independence, and parenting practices may in response involve less monitoring. The relationship between child age and parenting practices is unclear, and is a question that is addressed in the fourth study of this thesis. Another reason for the inconsistent results may be associated with the assessment of food neophobia. All studies used the Food Neophobia Scale as the measure of food neophobia. One study reported markedly different results depending on whether the food neophobia was assessed via self-report or parental report (Koivisto & Sjödén, 1996), which raises questions about the validity of different perspectives and judgements of food intake.

5.1.2.2.2.3. Mealtime Practices and Infant Feeding Disorders

Research into parental feeding practices has also focused on infant feeding problems. In this age group, generally considered to covered ages 0-3 years, research
focused on the nature of the relationship between parent and child, and how this manifests in feeding problems. Research suggests that attachment problems between parent and infant contribute to feeding difficulties (Chatoor et al., 1988; Chatoor et al., 1997). There are a number of parental feeding behaviours that have been found to be associated with feeding problems including “struggles for control” (e.g. Chatoor et al., 2000), parental insensitivity to infant cues (e.g. Hagekull, Bohlin, & Hammarberg, 2001), and dyadic conflict (Chatoor et al., 2000). Parents of toddlers with feeding difficulties demonstrated less dyadic reciprocity (accurate and sensitive reading of infant cues), less maternal contingency, more dyadic conflict, and more struggle for control than parents of healthy eaters (Chatoor et al., 2000). Similarly, children with food refusal had parent-child interactions characterised by parental insensitivity to infant cues, and parental controlling behaviour (e.g. Hagekull et al., 1997; Keren et al., 2001). An observational study of one year olds indicated that the extent of conflict between mother and infant at mealtimes was found to be inversely related to infant weight, suggesting that when conflict predominates during mealtimes the infant consumes less food (Stein et al., 1994).

Various factors have been found to be associated with parental attempts to control their infant’s feeding. Research has suggested that those parents with body image problems or eating disorders employ controlling feeding practices of pressure to eat and restrictive feeding practices respectively (Taveras et al., 2004; Duke, Bryson, Hammer, & Agras, 2004). In addition, anxious pathology in parents is more likely to be associated with maternal control of infant food intake (Farrow & Blissett, 2005; Blissett & Farrow, 2007). Blissett and Farrow (2007) also note that anxious parents tend to perceive their infants as difficult to feed (e.g. Hellin & Waller, 1992), and theorize that early parent perceptions of a poor appetite in their infant may set the stage for the development of subsequent pressurising feeding practices. It also appears that control
over child feeding is relatively stable across time (Blissett & Farrow, 2007). It has been shown that pressurising parental feeding styles and attitudes are predictive of controlling feeding styles in later childhood (Duke et al., 2004), and that pressure to eat at two years of age was predicted primarily by the use of this practice at one year (Blissett & Farrow, 2007). Finally, Blisset and Farrow (2007) also found that a difficult or inhibited infant temperament was also related to controlling feeding practices, and they concluded that “although maternal monitoring and restrictive feeding practices may be motivated by a variety of factors, their use of these practices may be moderated by infant behaviour in broader domains than meal time interactions” (pg. 1525).

5.1.3. Rationale for Study Four

In summary, research has found a number of psychological factors to be associated with childhood eating/feeding problems. These factors are outlined in Table 23. The implications of these factors, in particular in relation to actual risk for an avoidant/restrictive eating pattern, such as ARFID or selective eating, are not yet clear.

Table 23

*Psychological Factors Associated with Avoidant/Restrictive Eating Patterns in Children*

<table>
<thead>
<tr>
<th>Child Factors</th>
<th>Parent Factors-Interactional Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td>• Childhood Anxiety, particularly OCD characteristics</td>
<td>• Caregiver depression, anxiety or eating disorder</td>
</tr>
<tr>
<td>• Childhood behaviour problems</td>
<td>• Parent meal time practices</td>
</tr>
<tr>
<td>• Infant temperament characteristics of shyness, emotionality, demanding/difficult</td>
<td>• Attachment difficulties between parent and child.</td>
</tr>
<tr>
<td>• Gastrointestinal symptoms such as retching, vomiting, gagging and abdominal pain associated with eating, which may result in anxiety.</td>
<td></td>
</tr>
</tbody>
</table>

It is important to determine the relevance of the above factors for selective eating as it will aid in the understanding of etiology as well as guide clinical goals both
in terms of prevention and treatment. In the final study of this project these psychological factors, excluding attachment issues, were explored.

Much of what is known about the clinical characteristics of selective eating is via retrospective case study analysis (Nicholls et al., 2001; Timimi et al., 1997). Empirical research has been hampered by the variability of definitions and lack of objective assessment methods. In Study 3 a validated, objective dietary assessment protocol was established that can assist with the accurate assessment and diagnosis of selective eating. This assessment protocol can facilitate research into the psychological correlates of selective eating by differentiating clinical and sub-clinical presentations of the problem. Specifically, a clinical group of selective eaters as defined by the dietary assessment protocol was compared to a control group across a range of psychological factors. Awareness of what factors are associated with selective eating will aid in prevention, assessment and treatment of the condition. This study extends previous research by examining a range of psychological variables allowing for a comprehensive picture of the nature of selective eating, and importantly the use of the dietary assessment protocol established in study 3, enabled a clear assessment of selective eating group or clinical group as distinct from a control group.

5.1.4. Hypotheses for Study Four

The following hypotheses are based on a literature review of psychological factors thought to be associated with avoidant/restrictive eating from infancy to adolescence. The focus of the current research is exploratory and therefore the hypotheses are broad in nature. Firstly, it is hypothesized that selective eaters will demonstrate an inhibited temperament (Carey Temperament Scale), when compared to a normal eaters, and they will also demonstrate higher levels of anxiety and OCD and more behavioural difficulties. Parents of selective eaters are hypothesized to be more likely to use mealtime practices defined as Pressure to Eat and Monitoring (Child
Feeding Questionnaire), will have higher levels of stress, anxiety and depression and will be less likely to be characterised by an authoritative parenting style.

5.2. Method

5.2.1. Participants

The study sample comprised of a selective eating group (SE; n=62) and a normal eating group (NE; n=40). The SE group was selected on the basis of variety scores calculated from food diary content. Specifically, SE group subjects had to have consumed ≤19 different foods, and the NE group had to have eaten ≥24 different foods. These cut-points were selected based on Study 3 findings. Specifically Study 3 indicated that a variety rating score of ≤ 19 foods reflected a diet that was very likely to be nutritionally deficient and hence indicate a diagnosis of ARFID and selective eating. Conversely those participants who ate 24 foods or more over the three day period had a 95% chance of having a diet that was nutritionally adequate, and therefore would be unlikely to be classified as ARFID or selective eating. The accuracy and validity of these scores enabled good discrimination between selective eaters and normal eaters.

Participants were aged between 3-15yrs. Exclusion criteria were intellectual delay and autism spectrum disorders as identified by parental report. Ethics approval was granted by the University of Western Australia Human Research Ethics Committee.

5.2.2. Procedure

Selective eating group participants were recruited on the basis of convenience sampling via a newspaper article. The article discussed selective eating and the potential impact on children and families and invited those interested to make contact. Interested parents (n = 131) were sent an information sheet and questionnaire pack (see Appendix A and C). Participants were also offered a raffle ticket for each questionnaire completed, which allowed them to enter into the draw for a meal voucher to the value of 120 dollars. This process resulted in 75 participants (57% response rate) returning the
questionnaires, with 62 identified as SE using the dietetic protocol established in Study 3. Participants were also offered access to psychological group treatment for selective eating problems.

The NE group was recruited using various methods. Initially, SE group subjects were asked to nominate (by consent) other families with children who were not considered to be selective eaters to be part of the research. Seven families were nominated and invited to participate, with 100% of those contacted returning questionnaires. Subsequently, three advertisements were placed in local papers and one advertisement in a leading state-wide paper, calling for healthy eaters to take part in the research. This resulted in a further 48 questionnaire packs being sent out and 15 (31% response rate) returned. Finally, 16 social acquaintances of the investigator, but blind to study aims and hypotheses were invited to complete questionnaires (100% response rate). The number of NE respondents recruited was 41. In order to qualify as a NE group member, participants had to record a variety rating of ≥24, and all but one respondent achieved this, taking the NE group number to 40. The same raffle ticket incentive was offered to the NE group members, except for those who were known to the researcher.

Different questionnaire packs were sent to parents based on the age of the child. All parents completed the Depression Anxiety and Stress Scales (DASS-21; Henry & Crawford, 2005), Child Feeding Questionnaire (CFQ: Birch, Fisher, Grimm-Thomas, Markey, Sawyer & Johnson, 2001), Child Eating Behaviour Questionnaire (CEBQ; Wardle, Murphy & Budd, 2001), Parental Authority Questionnaire - Revised (PAQ–R; Buri, 1991) and descriptive questions pertaining to developmental history of the child. Administration of the Child Behaviour Check-List (CBCL: Achenbach, 1991) varied depending on the age of the child. There are different versions of the CBCL used for children aged between 1.5-5 years; 6-11 years and 12-18 years, which were sent out for
completion in accordance with the child’s age. In addition, parents of children younger than eight years of age completed different versions of the Short Temperament Scale for Children (STSC: Prior, Sanson, Smart, & Oberklaid, 1989) dependant on age, split into groups of 3-5 and 6-8 years. Temperament measures were not administered for older children for two reasons. Firstly temperament is considered to be early emerging basic predispositions evident across the lifespan therefore early childhood measures served to assess the phenomenon, and second questionnaires for older children (e.g. Early Adolescent Temperament Questionnaire-Revised, for children aged 9-15; Capaldi & Rothbart, 1992) were longer, not adapted to Australian populations and assessed different temperament dimensions. Children older than eight years completed self-report measures which included the Multidimensional Anxiety Scale for Children (MASC; March, Parker, Sullivan, Stallings, & Connors, 1997) and the Leyton Obsessional Inventory (LOI; Bamber, Tamplin, Park, Kyte, & Goodyer, 2002). All parents completed a three-day food diary. In addition parents provided details of family psychiatric history and their child’s medical history. Parents were asked about aspects of their child’s sensory processing and history of feeding problems and finally the child’s weight and height were also recorded. Questionnaire packs and food diaries were returned in a stamped addressed envelope.

5.2.2.1. Measures

5.2.2.1.1. Child Measures

Child Behaviour Check-list (CBCL)

The parent-report CBCL (Achenbach, 1991) includes two dimensions (1) externalising behaviours; which comprises subscales of aggressive behaviour and rule breaking behaviour, and (2) internalising behaviours; comprising subscales of somatic complaints, anxious/depressed, and withdrawn behaviour. There are a further three subscales (attention problems; social problems and thought problems) which are combined
with externalising and internalising scores to determine a total score. There are two different versions of the parent report CBCL reflective of different age groups: 1.5-5 years; 6-18 years. Parents rate behaviours in their child using a three point likert scale (0-not true; 1-sometimes true; 2-often true) in response to descriptive statements regarding behaviour and higher scores indicate increased observation of behavioural problems. The CBCL has satisfactory validity and reliability (Nakamura, Ebestutani, Bernstein, & Chorpita, 2009; Ostrander Weinfurt, Yarnold, & August, 1998). Psychometric data reported for the CBCL for 6-18 year olds indicates that Cronbach’s alpha coefficient for was 0.90 for internalizing problems, 0.94 for externalizing problems and 0.97 for the total problem scale. For questionnaires regarding children aged 1.5-5 years, the Cronbach’s alpha coefficient for internalising problems was 0.87, for externalizing problems was 0.89, and for the total problem scale was 0.94.

**Short Temperament Scale for Children (STSC)**

The scales used to assess temperament were developed by the Australian Temperament Project with revisions for Australian usage of the Childhood Temperament Questionnaire (CTQ: Thomas and Chess, 1977) for children aged 3-8 years. A shorter version of the questionnaire: The Short Temperament Scale for Children (STSC), comprising 30 items was derived from an Australian adaptation, and was reported to have significantly improved psychometric properties compared with the original measures from which they are derived (Prior et al., 1989; Sanson, Prior, Oberklaid, Garino, & Sewel, 1987). Different forms of the questionnaire are used for children aged between 3-5 years and 6-8 years. Exploratory factor analysis revealed a four factor structure comprising Approach, Rhythmicity, Persistence; and Inflexibility. The scale of Approach refers to how the child responds (whether positively or negatively) to new people or environments; the tendency to approach new people and situations versus shyness and withdrawal. This scale is understood to be reflective of the dimension of
approach/inhibition whereby low scores on this scale suggest that the child has an inhibited temperament. Rhythmicity refers to the level of predictability in a child’s biological functions, such as waking, becoming tired, hunger, and bowel movements. Persistence and attention span refers to the child’s length of time on a task and ability to stay with the task through frustrations. Inflexibility refers to negative emotionality. Parents rate the frequency of the particular behaviour described in an item statement on a Likert scale ranging from 1 (almost never) to 6 (almost always), and higher scores reflect higher levels of the temperament expression. The four subscales have internal consistencies (alpha coefficients) ranging from .85 for persistence to .82 for inflexibility (Sanson, Smart, Prior, Oberklaid, & Pedlow, 1994).

Multidimensional Anxiety Scale for Children (MASC).

The self-report MASC (March et al., 1997) was used to measure child anxiety. The MASC has well established reliability and validity in child clinical and non-clinical samples (March, et al., 1997), is rated on a 4-point Likert scale ranging from 0 (never true about me) to 3 (often true about me), and has a total scores ranging from 0 to 45 with higher scores indicated higher levels of anxiety. The scale measures Physical Symptoms, Harm Avoidance, Social Anxiety, Separation and Panic, and Other related anxiety symptoms.

Leyton Obsessional Inventory (LOI).

The 20 item self-report LOI short form for children was used to measure child obsessive-compulsive symptoms in the previous 2 weeks (Bamber et al., 2002). The LOI yields the three factors: Compulsions, Obsessions/incompleteness, and Concern with Cleanliness. The LOI has high internal consistency, and sound reliability and validity with Chronbach alpha scores of .73, .79 and .75 for scales of Compulsions, Obsessions/Incompleteness, and Cleanliness respectively (Bamber et al, 2002). The LOI requires a yes or no answer, plus a rating on symptom interference scale. The total scores
range from 0 to 60 with a high score indicative of higher levels of OCD behaviours and the child must be at least 8 years old to complete the questionnaire.

*Children Eating Behaviour Questionnaire (CEBQ)*

The 35-item parent-report CEBQ (Wardle et al., 2001) assesses eight dimensions of eating behaviour in children; Satiety Response, Eating Speed, Food fussiness, Emotional Undereating, Food Responsiveness, Enjoyment of Food, Emotional Overeating, and Desire to Drink. Only one scale of the questionnaire was used, the Food Fussiness scale (FF scale) which has six items. The FF scale measured the parent’s perception of their child’s lack of openness to new foods and his or her disinterest in tasting new flavours. Parents rate each item on a 5-point Likert scale (1 = *never* to 5 = *always*). The CEBQ has established reliability and validity (Sparks & Radnitz, 2012), and internal reliability coefficients (Cronbach’s alpha) from 0.74 to 0.91, except for the Emotional Undereating and Overeating sub-scales with reliabilities of 0.52 and 0.64 respectively (Wardle et al., 2001).

*Child Body Mass Index (BMI)*

Parents were asked to record their child’s weight and height, and from this a Body Mass Index was calculated, corrected for age and gender using BMI-for-age-charts.

*5.2.2.1.2. Parent Measures*

*Depression Anxiety and Stress Scales (DASS-21)*

The DASS-21 (Henry & Crawford, 2005) is a self-report measure and consists of three 7-item scales adapted from the full version of the DASS that measure Depression, Stress and Anxiety states experienced over the past week and expressed on a 4-point severity scale. The DASS-21 has well established reliability and validity, including support for the proposed factor structure, in clinical and community samples (Clara, Cox, & Enns, 2001; Henry & Crawford, 2005). Cronbach’s alpha across scales has ranged from 0.82 to 0.97 (Henry & Crawford, 2005)
**Child Feeding Questionnaire (CFQ).**

The 31-item parent-report CFQ (Birch et al., 2001) assesses the perceptions and concerns of parents regarding the weight of their child, and attitudes and practices regarding child feeding, and has been used in studies investigating parent feeding practices in picky eating (Birch et al., 2001; Galloway et al., 2005; Tharner et al., 2014). The CFQ measures seven dimensions of child feeding (four measuring parental attitudes and three measuring parenting practices): Perceived Parent Weight, Perceived Child Weight, Parental Concern about child weight, Parental Responsibility, Restriction, Pressure to Eat, and Monitoring. The last three sub-scales were used in this research as they directly assessed parent mealtime and feeding practices. Restriction involved regulating intake of sweets or high-fat foods. Pressure to Eat included items such as encouraging the child to eat all of the food on his/her plate, and Monitoring referred to keeping track of sweets, snack foods, and high-fat foods that their child consumed. The CFQ has high internal consistencies ranging from 0.70 to 0.92 (Birch et al., 2001).

**Parental Authority Questionnaire (PAQ).**

The parent-report PAQ (Buri, 1991) measures three parental authority prototypes; Permissive, Authoritarian and Authoritative, and yields total scores for each prototype ranging from 10 to 50; the higher the score, the greater the evaluated level of the parental authority prototype. The PAQ uses a 5-point Likert scale ranging from 1 = *strongly disagree* to 5 = *strongly agree*. The factor structure and reliability of the PAQ-R is modest, but generally within the acceptable range (Reitman, Rhode, Hupp, & Altobello, 2002). The internal consistency of the PAQ-R subscales ranged from .66 to .77. Although coefficient alphas of .80 and above are generally considered to be desirable, Clark and Watson (1995) note that “it is not uncommon for contemporary researchers to characterize reliabilities in the .60s and .70s as good or adequate” (p. 315).
5.2.2.1.3. Developmental History Survey

One section in the questionnaire pack asked parents to respond to a range of questions pertaining to their child’s developmental history. The questions were constructed based on literature review of possible factors associated with selective eating. The literature review indicated that children who experience avoidant/restrictive also experience a range of medical issues including gastro-intestinal symptoms such as reflux, allergies and vomiting as well as non-gastrointestinal symptoms (Williams, et al., 2014; Nicholls et al., 2001; Timimi et al., 1997). Developmental issues such as learning difficulties or developmental delays have also been indicated (Fisher, 2014), and sensory processing issues are thought to play a role (Williams et al., 2005; Farrow & Coulthard, 2012; Cermak et al., 2010). We were also interested in whether there was any family/parent history of psychiatric difficulty including eating disorders for selective eaters (e.g. Patel et al., 2002; Coulthard & Harris, 2003). There are also indications that selective eating follows on from eating problems in infancy so questions aimed at identifying early experiences of feeding were included (Nicholls et al., 2001; Chatoor et al., 1997; 1998). One open ended question was included to invite parents to talk about any concerns (“Do you have any other concerns about your child?”). For each question parents were asked to respond with either yes or no, and space was provided for comments. The developmental history questions are outlined in Table 24.

5.3. Results

5.3.1. Statistical Analysis

5.3.1.1. Descriptive Statistics

Table 25 outlines the characteristics of SE and NE participants, and summarises descriptive statistics for each measure. Participants in both groups had similar ages and age ranges.
Table 24

*Parent Survey Regarding Developmental History*

1) Were there any problems with early bottle or breast feeding?
2) As an infant were there any feeding troubles for solid foods (e.g. Chewing, swallowing, gagging, excessive reflux, colic, oral motor problems)?
3) Did your child go through the stage of mouthing lots of objects (i.e. putting objects in his/her mouth to explore them) during infancy?
4) Did your child go through the phase of playing with foods with his or her hands during infancy?
5) Did your child achieve developmental milestones within expected ranges? (e.g. crawling, walking, talking, toileting)
6) Has your child experienced any medical problems now or in the past?
7) Do you have any other concerns about your child, other than their eating?
8) Is there any family history of any eating difficulties or major psychiatric disorder?

Table 25

*Descriptive Statistics for Selective Eating and Normal Eating Groups*

<table>
<thead>
<tr>
<th></th>
<th>SE</th>
<th>NE</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sex (female), n (%)</td>
<td>62</td>
<td>30 (48)</td>
</tr>
<tr>
<td>Age (years), M (SD)</td>
<td>62</td>
<td>8.23 (2.72)</td>
</tr>
<tr>
<td>Age Range (years)</td>
<td>62</td>
<td>3-13</td>
</tr>
<tr>
<td>BMI percentile (SD)</td>
<td>62</td>
<td>17.87 (3.01)</td>
</tr>
</tbody>
</table>

BMI did not differ significantly between SE and NE and fell within the average range. The gender ratio was comparable between groups with females comprising 48% of the sample for SE and 47% for NE.

5.3.1.2. Psychological Correlates of Selective Eating

In order to determine the psychological correlates of selective eating the generalised linear mixed model (GLMM) procedure was used to compare differences between SE and NE groups. A priori power analysis based on 80% power, an alpha level of .05, a large effect size ($f = 0.40$), and the F test family (analysis of variance) indicated that a total sample size of at least 52, or 26 per group, was required (G*Power 3) (Faul, Erdfelder, Lang, &
Buchner, 2007). A mixed effects linear regression examined differences in scores on questionnaires assessing child behaviour (CBCL), child temperament (Short Temperament Scale for Children), parenting style (Parent Authority Inventory), child eating (Child Eating Behaviour Questionnaire), parental attitude to meals (Child Feeding Questionnaire), child anxiety (MASC) and child OCD (Leyton Obsessional Inventory). A measure of effect size, Cohen’s d was computed.

Prior to analysis, data were inspected for non-normality in each group using visual inspection of histograms, skewness and kurtosis statistics, and normality tests, specifically Shapiro-Wilk test for $n < 50$ and Kolmogorov-Smirnov test for $n \geq 50$ and outliers. The skewness and kurtosis cut-offs were both $<3$. (Tabachnick & Fidell, 2007). Each variable was examined for the presence of univariate outliers ($z \geq |3.29|$) (Tabachnick & Fidell, 2007). There were minor violations to normality, with positive skewness on some variables for both SE and NE groups suggesting floor effects, and one univariate outlier identified in each group on different variables. An advantage of GLMM is that it is more robust to assumption violations than traditional parametric methods, such as ANOVA or t-test. When outliers were removed using list-wise deletion, findings were identical, so all analysis are of the original data. The relationship between the mean and dependent variable can be modelled as a linear function and the random effect was found to follow a relatively normal distribution. A correction to the alpha level was applied due to multiple testing. The Holm-Bonferroni (Holm, 1979) procedure was chosen because it safeguards against inflation of Type I error, but is not as conservative as Bonferroni, which is important in this scenario due to the exploratory nature of the study, and the importance of also mitigating against Type II error. Results of the GLMM tests appear in Table 26.

5.3.1.2.1. **Child Factors**

Selective Eaters showed lower levels of Approach temperament ($F = 14.73; d = 0.98, p < .001$), indicating higher levels of inhibition. Selective eaters also showed
higher levels of anxiety (F = 83.26; d = 0.29, p < .001) and OCD (F = 34.00; d 1.56, p < .001). Selective eaters also demonstrated higher levels of behavioural problems as measured by the CBCL; Internalizing (F = 34.00; d = 1.52, p < .001), Externalizing (F = 91.22; d = 1.32, p < .001), and Total score (F = 91.22; d = 1.82, p < .001). There was no significant difference between SE and NE groups on other measures of temperament; Persistence (F = 1.11; d = 0.25, p < .297, Rhythmicity (F = 2.61, d = 0.42, p < .112), and Inflexibility (F = 0.05; d = 0.06, p < .833).

5.3.1.2.2. **Parent Factors**

Parents of SE reported higher levels of stress, anxiety and depression (DASS Total score: F = 35.03, d = 1.09, p < .001), than NE group parents and more use of parenting practices of Pressure to Eat (F = 70.92; d = 1.71, p < .001); and Monitoring of food choices (F = 54.74; d = 1.45, p < .001). There was no difference between parents of SE when compared NE group parents on measures of Restriction of food choices (F = 0.58; d = 0.17, p < .449) There was also no significant difference on the measures of broader parenting style; Authoritative (F = 4.26; d = 0.41, p < .042), Authoritarian (F = 3.19; d = .35, p < .070), and Permissive (F = .92; d = 0.19, p <.338).

5.3.1.3. **Frequency Analysis of Parent Survey of Developmental History**

**Data**

Responses to developmental history questions were summarised using a frequency analysis, which outlined what percentage of parents in each group reported responded yes to each question. Results are outlined in Table 27.
Table 26
Comparisons Between Selective Eaters and Normal Eaters on Psychological Variables

<table>
<thead>
<tr>
<th>Measure</th>
<th>n</th>
<th>SE</th>
<th>n</th>
<th>NE</th>
<th>F</th>
<th>p</th>
<th>d</th>
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<tbody>
<tr>
<td>CBCL Total,</td>
<td>62</td>
<td>53.35 (9.68)</td>
<td>40</td>
<td>38.63 (6.07)</td>
<td>91.22</td>
<td>&lt;0.001*</td>
<td>1.82</td>
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<td>M (SD)</td>
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<tr>
<td>CBCL Internal,</td>
<td></td>
<td>56.40 (10.35)</td>
<td>40</td>
<td>42.38 (7.95)</td>
<td>34.00</td>
<td>&lt;0.001*</td>
<td>1.52</td>
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<td>M (SD)</td>
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<tr>
<td>CBCL External,</td>
<td>38</td>
<td>51.16 (10.24)</td>
<td>23</td>
<td>39.53 (7.07)</td>
<td>49.95</td>
<td>&lt;0.001*</td>
<td>1.32</td>
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<td>M (SD)</td>
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<tr>
<td>STSC Inflexibility,</td>
<td>2.98 (0.87)</td>
<td>3.03 (0.61)</td>
<td>0.05</td>
<td>0.833</td>
<td>0.06</td>
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<td>M (SD)</td>
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<tr>
<td>STSC Persistence,</td>
<td>3.23 (0.93)</td>
<td>3.44 (0.67)</td>
<td>1.11</td>
<td>0.297</td>
<td>0.25</td>
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<td>M (SD)</td>
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<tr>
<td>STSC Approach,</td>
<td>2.79 (0.87)</td>
<td>3.62 (0.80)</td>
<td>14.73</td>
<td>&lt;0.001*</td>
<td>0.98</td>
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<td>M (SD)</td>
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<tr>
<td>STSC Rhythmicity,</td>
<td>2.98 (0.71)</td>
<td>2.69 (0.66)</td>
<td>2.61</td>
<td>0.112</td>
<td>0.42</td>
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<td>M (SD)</td>
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<tr>
<td>PAQ Authoritative,</td>
<td>31.50 (3.24)</td>
<td>30.23 (2.84)</td>
<td>4.26</td>
<td>0.042</td>
<td>0.41</td>
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<td>M (SD)</td>
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<tr>
<td>PAQ Authoritarian,</td>
<td>31.48 (4.60)</td>
<td>32.90 (3.46)</td>
<td>3.19</td>
<td>0.070</td>
<td>0.35</td>
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<td>M (SD)</td>
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<tr>
<td>PAQ Permissive,</td>
<td>28.66 (3.28)</td>
<td>29.30 (3.33)</td>
<td>0.92</td>
<td>0.338</td>
<td>0.19</td>
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<td>M (SD)</td>
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<tr>
<td>CFQ Restriction,</td>
<td>3.30 (1.93)</td>
<td>3.08 (0.72)</td>
<td>0.58</td>
<td>0.449</td>
<td>0.17</td>
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<td>M (SD)</td>
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<tr>
<td>CFQ Pressure to eat,</td>
<td>3.15 (0.97)</td>
<td>1.66 (0.82)</td>
<td>70.92</td>
<td>&lt;0.001*</td>
<td>1.71</td>
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<td>M (SD)</td>
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<tr>
<td>CFQ Monitoring,</td>
<td>4.12 (0.93)</td>
<td>2.93 (0.67)</td>
<td>54.75</td>
<td>&lt;0.001*</td>
<td>1.45</td>
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<td>M (SD)</td>
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<tr>
<td>MASC,</td>
<td>44.84 (16.64)</td>
<td>12.33 (11.26)</td>
<td>83.26</td>
<td>&lt;0.001*</td>
<td>2.29</td>
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<td>M (SD)</td>
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<tr>
<td>LOI Compulsion,</td>
<td>5.64 (4.73)</td>
<td>0.95 (2.17)</td>
<td>22.55</td>
<td>&lt;0.001*</td>
<td>1.27</td>
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<td>M (SD)</td>
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<tr>
<td>LOI Obsessional,</td>
<td>6.44 (4.00)</td>
<td>0.93 (1.70)</td>
<td>44.39</td>
<td>&lt;0.001*</td>
<td>1.79</td>
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<td>M (SD)</td>
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<tr>
<td>LOI Cleanliness,</td>
<td>3.57 (2.87)</td>
<td>0.85 (1.93)</td>
<td>18.01</td>
<td>&lt;0.001*</td>
<td>0.66</td>
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<td>M (SD)</td>
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<tr>
<td>LOI Total,</td>
<td>15.64 (10.53)</td>
<td>2.72 (5.15)</td>
<td>34.00</td>
<td>&lt;0.001*</td>
<td>1.56</td>
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<td>M (SD)</td>
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<tr>
<td>DASS Total,</td>
<td>15.08 (14.26)</td>
<td>3.55 (4.72)</td>
<td>35.30</td>
<td>&lt;0.001*</td>
<td>1.09</td>
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<td>M (SD)</td>
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Note: CBCL = Child Behaviour Check-list; CTS = Carey Temperament Scale; PAQ = Parent Authority Questionnaire; CFQ = Child Feeding Questionnaire; LOI = Leyton Obsessive Inventory; MASC = Multidimensional Anxiety Scale for Children; DASS = Depression, Anxiety and Stress Scale; Effect sizes: nil = 0 to <0.2, small = 0.2 to <0.5, medium = 0.5 to <0.8, large = ≥0.8. *Significant after Holm-Bonferroni correction.
Table 27
Frequency Analysis of Developmental History Survey Data

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<tbody>
<tr>
<td>SE (%)</td>
<td>24.2</td>
<td>24.2</td>
<td>14.5</td>
<td>19</td>
<td>4.8</td>
<td>13.0</td>
<td>3.2</td>
</tr>
<tr>
<td>NE (%)</td>
<td>7.5</td>
<td>2.5</td>
<td>2.5</td>
<td>0</td>
<td>10</td>
<td>7.5</td>
<td>2.5</td>
</tr>
</tbody>
</table>

5.4. Discussion

This study aimed to examine the psychological correlates of selective eating in children aged 3 to 15 years.

Hypothesis 1: An inhibited child temperament will be associated with selective eating.

Results indicated that selective eaters demonstrated higher levels of an inhibited temperament, and did not differ from normal eaters on the other temperamental patterns (i.e. persistence; rhythmicity and inflexibility). Previous research has also established links between temperament and eating behaviours in infants, for example a difficult temperament, characterised by withdrawn behaviours, slowness to adapt to new situations, negative mood and intense reactions has been found to be associated with feeding problems in infancy (Farrow & Blisset, 2006a). Similarly, young children (3-8 years old) who demonstrated “emotional” temperaments, characterised by emotional reactivity and intensity, were reported to display “food avoidant” behaviours (Haycraft et al., 2011). The current finding supports the results of this study by drawing the temperament-problem eating association with older children (up to 8 years old), suggesting that the effect is ongoing, and in addition the effect was present in selective eaters specifically.
The mechanisms by which an inhibited temperament influence eating are yet to be clearly articulated. Children with an inhibited temperament are more timid with people and situations that are unfamiliar, and generally tend to withdraw from stimulation and change (Kagan et al., 1994; 1987). Infants with inhibited or emotional of difficult temperaments may be born with a biological tendency to experience situations, and particularly unfamiliar situations as stressful (Kagan et al., 1988; 1987; Schwartz et al., 2003), and as young children present as avoidant or fearful of unfamiliar events (Kagan & Snidman, 1999). Developing a repertoire of foods can be considered as a learned behaviour, It is therefore it plausible that eating and/or trying new foods may represent an unfamiliar situation that could cause distress, which may result in avoidance of eating and food restriction.

However, it is also possible that child temperament, which is thought to be innate, influences parent responses, which in turn influence the child’s responses. This has been referred to as the “transactional model” of development (Sameroff, 2009). In this model, the development of the child is seen as a product of the continuous dynamic interactions of the child and the experience provided by his or her social settings. What is at the core of the transactional model is the emphasis placed on the bidirectional, interdependent effects of interactions between child and carer. Consistent with this model, children’s temperament appears to significantly influence parent-infant interaction, and negative emotionality in the child has been found to predict difficulties for the mother in supporting their child’s independent eating (Cerniglia, Cimino, & Ballrotto, 2014). Specifically, Cerniglia et al. (2014) found that parents of infants with negative emotionality tend to make strong requests or orders and be critical of their child, while the child tended to be oppositional at meal times. In contrast, other research has suggested that temperamentally easy children are more likely to be involved in good quality interactions with their parents (Mehall, Spinrad, Eisenberg, &
Therefore, it may be that the effect of temperament is bi-directional whereby a child’s inhibited temperament may result in food refusal which may be exacerbated or maintained by negative or coercive parenting behaviours at mealtimes. This theory of bi-directional influence was investigated in the present study by also assessing how the parents of selective eaters respond to their child at feeding and meals.

_Hypothesis 2: Parent mealtime practices of pressure to eat and monitoring will be associated with selective eating._

By investigating parent mealtime practices the aim was to explore possible interactional elements between parents and children contributing to childhood selective eating. This study found that controlling parent practices of pressure to eat and monitoring, were associated with selective eating. Pressure to eat refers to enforcing or strongly encouraging certain foods or amounts of foods and in this study was indicated by parents endorsing the following Child Feeding Questionnaire (CFQ; Birch et al., 2001) items: My child should always eat all of the food on his/her plate; I have to be especially careful that my child eats enough; If my child says I am not hungry I try to get him/her to eat anyway, and; if I did not guide or regulate my child’s eating, he/she would eat much less than he/she should. The second mealtime practice found to be associated with selective eating was monitoring. In this study monitoring was assessed as parents indicating that they monitored or kept track of sweets, snack food; and high fat foods in their child’s diet. Monitoring items included questions of: How much do you keep track of sweets that your child eats?; how much do you keep track of snack foods that your child eats?; how much do you keep track of high-fat foods that your child eats?

These results support the findings of previous studies which indicate that high levels of controlling mealtime practices, including pressure to eating and monitoring are associated with picky eating (Galloway et al., 2006; Mehta et al., 2013) and with the
child eating less of the target food (Galloway et al., 2006; Jansen et al., 2008; Wardle et al., 2005; Crist & Napier-Phillips, 2001). Parental pressure to eating and monitoring of consumption may be related to either the development and/or maintenance of selective eating by reducing the extent to which the child responds to their internal signals of hunger and satiety (Birch & Fisher, 1998). In addition, the mechanism by which selective eating develops may be akin to the bi-directional models of feeding difficulties found in infants whereby controlling parenting practices (such as pressure to eat or excessive monitoring of intake) may serve to increase infant/child distress which may in turn lead to further food avoidance/restriction and vice versa. Some researchers believe that these kinds of repeated negative and adverse interactions may be either be the result of an insecure attachment pattern or serve to disrupt the parent-child attachment patterns (Chatoor et al., 2000; 1998; 1997) This notion is explored by Black and Aboud, (2011) who suggest that the interactions between parents and their children at mealtime constitute an important context in which children learn to make sense of interpersonal communication, and thereby build the foundations for attachment quality that in turn form essential roots for healthy emotional and behavioural functioning. However, it is unclear whether the types of parent-child interactions characterised by controlling parenting behaviours and inhibited child temperament responses are associated with insecure or disrupted attachment patterns, as this was beyond the scope of the current research. Nevertheless, it does appear that parenting practices of pressure to eat and monitoring are associated with selective eating, although the causal direction of this association is unclear.

Hypothesis 3: Parents of selective eaters will not demonstrate an authoritative parenting style.

The hypothesis that parents of selective eaters may demonstrate a broader parenting style not specific to mealtime parenting practices was not supported by the
current research. There was no significant difference between SE and NE groups on measures of parent style, assessed in terms of authoritarian (low warmth/high demand), authoritative (high warmth; high demand) or permissive parenting (high warmth/low demand) styles. This is the first study to investigate the potential link between broad parenting style and selective eating: previous studies have focused on how parenting style relates to fruit and vegetable intake in the general population (Vereeeken, et al., 2009; Cullen, et al., 2000; Kremers, et al., 2003; Haycraft & Blissett, 2008). The results of the current study indicate that whilst parents of selective eaters appear be employing controlling parenting practices in the mealtime situation, in general they are not differentiated from parents of normal eaters in terms of broad parenting style. This also suggests that the parenting practices employed at mealtimes may be in response to the demands or stressors of the eating/feeding situation, rather reflecting a broader parenting style. It is plausible that the parents of selective eaters worry about their child’s restricted eating pattern and in their efforts to pressure the child to eat increase the stress in the mealtime or feeding situation. This pattern of results suggests that in terms of etiology it may be that selective eating or restrictive eating begins with the child, but it may be maintained or exacerbated by controlling parenting mealtime practices developed in response to food avoidance.

Hypothesis 4: Parents of selective eaters will be more stressed, anxious or depressed.

This study found that when parent stress, anxiety and depression was measured using the DASS21 total score (Lovibond & Lovibond, 1995) parents of selective eaters demonstrated higher total scores than normal eaters. Whilst this is significant it cannot be assumed that parents of selective eaters are more likely to experience clinical levels of stress, depression or anxiety. Self-report measures, such as the DASS21 tend to report more symptoms than when compared to structured interviews (Frank et al., 1992;
Mitchell, Burns, & Dorstyn, 2007), and this is one reason the DASS21 has been recommended for use as a screening tool (Mitchell et al., 2007). The DASS21 is a quantitative measure of distress along the three axes of depression, anxiety and stress, and was not designed to be a categorical measure of clinical diagnosis. Despite this limitation total scores on the DASS21 provide cut points designed to categorise severity of distress across the three subscales. The majority of parents of selective eaters reported normal or mild levels of depression (71%), anxiety (98%), and stress (65%), whilst smaller percentages reported severe/extremely severe levels of depression (8%), anxiety (6%) and stress (14%). The majority of parents of normal eaters reported or normal/mild levels of depression (95%), anxiety (100%), and stress (97%), with nil or very small numbers of parents of normal eaters reporting severe/extremely severe levels on each scale; depression (0%) anxiety (0%) and stress (2%). This pattern of results suggests that a small percentage of parents of selective eaters reported severe levels of anxiety, stress and depression (8-14%), but the majority of parents of selective eaters do not appear to be experiencing such levels. So whilst this study found that parents of selective eaters tend to report more symptoms of anxiety, stress and depression, it appears that majority of the sample are not reporting high levels of mood disturbance. However a small group of parents of selective eaters acknowledged high levels of distress and hence clinicians and future researchers should be alert to the need to screen parents for mood disturbance. It is also possible that elevated scores on the DASS21 may reflect a situational crisis, in the context of the child’s eating problems, rather than reflecting more pervasive symptoms of depression or anxiety within the parent. Irrespective of the degree of psychopathology, it is evident from this study that the parents of selective eaters report higher levels of stress, anxiety and depression that the parents of normal eaters, and it is conceivable that this may be a factor in the development and/or maintenance of the problem.
This result supports previous findings that caregiver depression and anxiety are associated with feeding problems in infancy and early childhood (Haycraft, Farrow, & Blissett, 2013; Hellin & Waller, 1992; McDermott et al., 2008; Micali et al., 2014). Symptoms of depression have been associated with early termination of breast feeding (Cooper, Murray, & Stein, 1993), with problematic feeding interactions (Coulthard & Harris, 2003), and with less sensitive feeding practices (e.g. Francis, Hofer, & Birch, 2001; Hurley, Black, Papas, & Caulfield, 2008; Mitchell, Brennan, & Miles, 2009). Case study evidence suggests that mothers of selective eaters were prone to emotional difficulties, particularly anxiety and depression (Timimi, et al., 1997). Symptoms of depression have been linked with observations of mothers implementing a more controlling, less sensitive feeding style with their child (Haycraft et al., 2013) which has been shown to correlate with picky eating (Galloway et al., 2006; Mehta et al., 2014).

Based on this, it has been suggested parental psychopathology, such as anxiety and depression, may have an impact on child feeding and eating via prompting controlling parenting practices that negatively impact on child eating and are associated with picky eating patterns.

Another way that parental depression may influence child eating patterns is via the attachment between parent and child (Chatooor et al., 1998; 1997). On the basis of the current study, no comment can be made on the status of attachment patterns within parent-child dyads of selective eaters, however this study identifies three factors that may be part of an interdependent relationship important in the development and maintenance of selective eating: infant and child temperament; parental feeding practices; and parental stress, anxiety and depression. These factors are known to negatively influence each other. In interpreting the interactions between these factors, it is possible that children with an inhibited temperament approach the feeding situation with excessive caution, which results in distress and avoidance. Parents prone to stress...
may respond to this in an agitated or task focused manner or try hard to engage their child in eating by employing controlling parenting practices. These factors may interact in an escalating fashion resulting in ongoing feeding and eating problems.

This study is important in that all three factors, temperament, for the first time, have been identified in the same sample of eating disordered children, who have shown selective eating patterns. In addition, the effect has been demonstrated across a broad age range.

Hypothesis 5: Selective eaters will demonstrate more anxiety in areas not associated with eating.

Results indicated that selective eaters over eight years old demonstrated higher levels of anxiety, and higher levels of specific OCD symptoms that normal eaters. However, the mean level of both general anxiety as measured by the MASC and OCD as measured by the LOI in children did not reach clinical cut-off scores. That is, the mean levels of anxiety and OCD evident in the selective eaters were not to the degree that may warrant a formal diagnosis. Despite the fact that the average level of OCD appears to be at sub-clinical levels, these findings provide empirical support for case study reports which have consistently identified symptoms of OCD and other anxiety (such as generalised anxiety disorder, specific phobias of vomiting or choking, and social anxiety) as being associated with ARFID and selective eating (Fisher et al., 2014; Nicely et al., 2014; Nicholls et al., 2001; Norris et al., 2014; Timimi et al., 1997).

However, whilst the average level of anxiety and OCD was not within clinical ranges, 68% of selective eaters reported clinically significant levels of OCD on at least one scale of the LOI (Compulsions, Obsessions/Incompleteness and Cleanliness), and 18% reported clinically significant levels across all three scales. This suggests that selective eaters may experience co-morbid OCD whilst others may experience obsessive compulsive characteristics, and a minority may not experience any OCD symptoms.
This pattern of results is similar to AN and BN which often occur combination with other disorders including OCD (Salbach-Andrea, Klaus, Simmendinger, Klinkowski, Lehmkuhl, Pfeiffer, & Ernst 2008). Whilst some selective eaters experienced clinically significant levels of OCD, no child in either the selective eating or normal eating group reported symptoms of anxiety (total scores) that were in the clinical range. The question of whether selective eating is a symptom of another problem, such as anxiety, or a disorder in its own right was first posed by Nicholls et al., (2001). At the time the authors indicated that they did not have sufficient evidence to define selective eating in terms of “its own prognostic significance” (pg. 268). The results of the current study indicate that whilst anxiety is an important element of selective eating, and may be present at levels that may warrant a formal diagnosis, that selective eating may be present without comorbid anxiety conditions being evident.

There are a number of factors associated with elevated anxiety that may impact on the development of eating. Anxiety in children and adolescents is associated with an inhibited temperament in early childhood (Hirshfeld et al., 1992; Kagan & Snidman, 1999; Schwartz, Snidman, & Kagan, 1999). Anxious/inhibited children may be cautious about life in general, and fear the unknown, and this cautiousness may extend to trying new foods. In addition, those children with OCD characteristics may have a structured, repetitive, approach to food in order to keep it “safe” which prevents them from experimenting with new sensations. The child who cannot adjust to new foods, demonstrating rigidly, ritualism and compulsion may be generally unable to adjust to and accommodate change, unfamiliarity and discomfort in other contexts as well. Individuals experiencing OCD may be contamination-sensitive which could result in obsessions regarding cleanliness, germs and illness which could lead to suspicion about unfamiliar foods.
Hypothesis 6: Selective eaters will demonstrate behaviour problems not associated with eating.

Selective eaters demonstrated more behavioural difficulties characterised by internalizing and externalizing behaviours across the age range. Our results demonstrated that selective eating was related to a variety of behavioural problems, including both internalizing and externalizing behaviours. Selective eaters in this study were characterised by more symptoms of withdrawal, more somatic complaints, more symptoms of anxiety and depression and by higher levels of aggressive and oppositional behaviours.

However, the mean levels of behavioural difficulty were not within clinical ranges according to CBCL clinical cut-off scores. These results indicate that whilst the internalizing/externalizing behavioural difficulties were evident, they were at sub-clinical levels, whilst the eating issues were at clinical levels. Therefore, the pattern of results suggest that in this community sample the eating disorder is of primary concern for most participants, whilst the behavioural difficulties may be less concerning or secondary to the eating problems. This is in contrast to previous research which suggested that the eating disorder is part of a broader behavioural problem, or is secondary to a behavioural difficulty (Jacobi et al., 2008; Timimi et al., 1997; Zucker et al., 2015). However, there were some children in this study who experienced clinically significant levels of behavioural difficulty. Specifically, a minority of children had scores over the CBCL clinical cut off (t score ≥ 70) for total scores (6.4%), internalising (8%) and externalising (5%), whilst no normal eaters had scores over clinical cut-points on any scale. This suggests that for some selective eaters in this community sample, there may be a co-morbid behavioural difficulties.

The presence of both internalizing and externalizing issues evident for selective eaters may reflect an undifferentiated presentation of behavioural and emotional
disturbance often found in young children. The overlap of externalizing and internalizing symptoms in young children has been noted by several researchers (Campbell, 1995; Shaw, Keenan, Vondra, DelliQuadri, & Giovannelli, 1997). Rescorla (1986) found that in pre-school children, a mixture of externalizing and internalizing symptoms was the rule rather than the exception. These results suggest that in young children there is a non-specificity of the expression of distress. If this is the case it may be that young selective eaters are experiencing higher levels of distress than normal eaters.

Higher levels of child externalising problems in older children, characterised by reports of opposition, aggression, arguing, and demanding behaviour may conceivably contribute to conflict and negative parent-child interactions at mealtimes, which may affect levels of selective eating. The CBCL Internalising scales provide valuable information about whether a youth is likely suffering from an anxiety disorder, and scores on these scales have been found to discriminate cases with any anxiety disorder or with generalized anxiety disorder from all other diagnoses (Van Meter, Youngstrom, Youngstrom, Ollendick, Demeter, & Findling, 2014). This suggests the internalising scale is capturing aspects of anxiety, which may be expressed by the child at meals in terms of avoidance of certain foods, rigidity of eating patterns or high levels of distress, thereby influencing the levels of selective eating, as described above.

5.4.1. Parent Survey on Developmental History

The frequency analysis of survey questions suggested that parents of children with selective eating reported more difficulties than normal eaters across a number of areas. Nearly one quarter of parents of selective eaters reported problems with breast and bottle feeding with comments indicating that their infant had troubles “latching on”, “was not properly breastfed”, had “no sucking reflex” or “refused to breastfeed”, and some indicated that breastfeeding finished early. Two infants were born with
ankyloglossia (tongue-tie) which would clearly impact on early feeding. Similarly 24% of parents of selective eaters reported problems in the transition to solid foods as characterised by problems chewing, swallowing, gagging, excessive reflux and/or colic compared with 2.5% of parents of normal eaters. It is possible that early feeding problems may reflect problems the infant brings to the feeding situation related to biological or developmental factors. It is also possible that when parents have children with feeding/eating problems, this might affect their perception of difficulties and perhaps lead to over reporting of early developmental difficulties (Field, 1992; Geller & Johnston, 1995; Griest et al., 1979; Johnston & Short, 1993). Given that this study has also found that parents of selective eaters demonstrated higher total scores on the DASS21 than normal eaters it is possible that parent report of early feeding problems may also be an artefact of parent stress/anxiety/depression. The possible interaction of child and parent factors in this manner highlights the conceptualisation that feeding problems can often be the result of an interaction between biology and the environment (Field et al., 2003)

Questions 3 and 4 in the survey asked parents to report on whether their child “mouthed” objects during infancy and “played” with food with their hands. In typical, early development (up to ~18-24 months), mouthing non-food objects is considered essential for sensory exploration for taste, touch and smell, as well as assisting with development of oral motor skills necessary for eating and speech production (Marcus & Breton, 2013). Similarly, when children play with their food it is thought to be pre-feeding strategy to encourage children to interact with foods that they normally would not, and to establish familiarity in a non-confrontational way, so that they can learn about the feel, smell and taste of the food. Both hands and mouth are sensory organs that are highly perceptive to texture. So manipulating food with the hands can desensitize a child to different foods and support them in trying new foods (Marcus &
Breton, 2013). This study found that 14.5% of respondents reported that their child did not mouth objects and 19% did not play with food. All the children in the normal eating group were seen by their parents to have explored their food manually and orally. Children who avoid sensory exploration either orally or via food play have been described as demonstrating *sensory defensiveness* (Yi, Joug, Choe, Kim, & Kwon, 2015) and the consequence of the defensiveness is that it is believed to limit exploration of the food and therefore impede learning and development with respect to eating.

These data support the notion often reported regarding the presence of sensory sensitivities associated with selective eating (Cermak et al., 2010; Chatoor, 2009; Farrow & Coulthard, 2012; Field, Garland, & Williams, 2003, Foster et al., 2011; Smith et al., 2005). Future studies could investigate the degree and nature of sensory processing issues associated with selective eating using psychometric data (e.g. The Sensory Profile; Dunn 1999), which may also add to the discussion about the existence of ARFID subtypes, particularly those thought to be related to sensory sensitivities (Bryant-Waugh, 2010, Norris et al., 2017).

According to parent report selective eaters had experienced more medical problems than normal eaters. For example children in the SE group had Pylori Stenosis (digestive problem that leads to severe vomiting), neurofibromatosis, “slow bowel”, heart condition, kidney problems, and four parents reported allergies in their child. These results lend support to previous research that has indicated that children with selective eating tend to have medical problems associated with the gastrointestinal tract such as reflux and constipation as well as food allergies and intolerances (Field et al., 2003; Fisher et al., 2014).

Finally, the survey also revealed that 13% of parents of children with selective eating also identified selective eating in the family history but there were no reports of any major psychiatric history in family members. The parents of normal eaters did not
identify any history of eating difficulties or psychiatric disorder. This pattern of results raises the question of heredity in selective eating which may be mediated by biological factors such as sensory processing, medical conditions and/or developmental issues, however this is a tentative suggestion as it is based on small sample sizes. The results of the parent survey on developmental history are preliminary, however suggest that selective eaters tend to have more complex developmental histories and may experience early feeding problems, sensory issues associated with food, and medical issues particularly associated with the gastrointestinal tract. These results support previous research looking at medical and developmental history and it is plausible that these types of difficulties in early childhood may result in pain or discomfort or anxiety associated with eating, which may in turn help explain development of food avoidance.

5.5. **Summary**

In summary, empirical analysis indicates selective eating in children is associated with a combination of psychological, biological, and social factors that may act in an interdependent manner. Firstly, when we consider psychological factors, selective eaters demonstrate higher levels of anxiety, OCD and behavioural problems than children who eat normally. In addition, young selective eaters were more likely to have an inhibited temperament, which appears to manifest in anxiety type symptoms of withdrawal, fear and distress. The sub-clinical levels of anxiety and behavioural difficulties coexist with the clinical levels of disordered eating in this sample. It is of note that the mean levels of anxiety, OCD and behavioural disturbance were not to the degree that may result in a formal diagnosis. This pattern of results needs to be seen in the context of the community sample, and it is possible that if the sample was clinically based that we may have seen more cases of clinically significant levels of anxiety. In clinical settings anxiety is associated with ARFID (Fisher et al., 2014; Nicely et al.,
particularly OCD and GAD, and anxiety is also associated with all three ARFID subtypes proposed by Norris et al., (2017).

Both parental report and self-report of the children over eight years old indicates that there is an association between anxiety symptoms and selective eating. In terms of the role of anxiety it is proposed that those children with anxiety or an inhibited temperament may have a cautious approach to food, with an inherent tendency to avoid distressing or novel situations, thereby setting the scene for a restricted food intake. Similarly, those children who experience OCD symptoms may have a structured and ordered approach to eating, tending to prefer to eat the same foods in the same manner, in order to reduce anxiety and feel safe.

Parental factors may also play a role in the development and/or maintenance of selective eating. Again, whilst the level of psychological distress was not at clinical levels, there are indications that parents of the selective eaters in this community sample experience higher levels of stress, anxiety and/or depression than parents of selective eaters. These parental psychological factors can influence the social or relational aspects of eating which may contribute negatively to the parent-child relationship and general home environment. Parents of selective eaters also demonstrated more controlling mealtime practices across the age range. We are unable to comment on whether anxious and controlling responses to selective eating are a cause or effect of the child’s difficulties. However, it is conceivable that parent responses characterised by stress and high emotion and controlling practices may serve to increase anxiety and distress in the child, and thereby potentially maintain the problem. The interplay between parent psychology and reactions to selective eating represents the social or interactional components of the issue. Health professionals working with families where mothers have symptoms of depression may benefit from receiving training about the possible impact of maternal depression on child feeding practices, while mothers
with symptoms of depression may benefit from guidance regarding its potential impact on their child feeding interactions.

Biological factors also appear to be at play for selective eaters. Qualitative analysis indicated that selective eaters are more likely to experience sensory issues, medical issues and have more complex developmental histories than normal eaters. For example, selective eaters had a higher rate of medical problems in infancy and early childhood, especially related to the medical complications of the gastro-intestinal tract (e.g. reflux), and developmental delays (e.g. language delays). Nicholls et al., (2001) also identified the importance of biological factors in their conception of selective eating in their description of a neurodevelopmental type of selective eater, and similarly Dovey et al., (2010) describe a medical subtype of avoidant/restrictive eater with substantial medical complexities.

This is the first time that these child and parent factors have been compared simultaneously between selective and normal eaters across a broad age range (3-15 years). The results emphasise that the constellation of factors associated with selective eating are complex and inter-dependent and supports previous notions of a bio-psycho-social model of the childhood eating disorders.

We found that selective eaters can experience a range of factors that have been used to identify and separate subtypes of childhood eating problems. For example, one classification system described ARFID subtypes as ARFID-avoidant; ARFID-limited intake, and ARFID-restricted range, and selective eating appeared to populate the ARFID-restrictive range category. It is probable that for some children that one issue or factor may stand out more than others, however this study has found that often a number of risk factors may co-exist for some children, and that selective eating as described in this study did not fit neatly in a specific ARFID subtype. Given the apparent complexity and interplay between biological, psychological and social factors
attempts to conceptualise various subtypes of avoidant-restrictive eaters may prove difficult. It appears that there are many different pathways to selective eating, which in itself is only one type of ARFID, and whether these varied pathways can be consistently is yet to be determined. In the meantime, it will be important for researchers and clinicians to hold a number of etiological pathways in mind.

A strength of the current study was our capacity to objectively identify groups of selective eaters and normal eaters. Previous studies have often relied on parent report, sometimes on the basis of just one or two questions to define children with eating disorders, whereas this study used objective measures of dietary quality, validated in Study 3 of this project. In addition, few studies have employed a comparison control group, which is important in studies on avoidant/restrictive in order to differentiate developmentally normal levels of the issue from problematic levels. Also, this study sought to assess a range of psychological factors within the child, parent and their interaction and to do so across a broad age range of selective eaters. A limitation of the study is that all parent and child measures were administered on a cross sectional basis, and therefore no conclusions about the temporal order or causal relationship of these variables can be drawn. Accordingly, the identified child and parent variables may either be a precursor, concomitant, or the consequence of selective eating and vice versa. The area will benefit from longitudinal analysis of the factors identified in the present study to more clearly articulate the etiology of selective eating and determine causal pathways between key parent and child variables. In addition whilst the control group in this study was matched on average age and gender ratio, the groups were not matched on a number of variables that may differentiate the groups. Future studies would benefit from matching participants on sociodemographic variables (e.g. SES) which may influence eating and questionnaire responses. Finally, the size of the sample was adequate in terms of analysis’ used and good in comparison with many previous
studies, but was still small when we consider how stated rates of occurrence translated into participant numbers, for example 13% of parents with children with selective eating also identified a history of selective eating in the family history refers to just 8 participants.
Chapter 6. Discussion of the Main Findings of this Thesis

6.1. Overview

This chapter aims to provide an overview of the main themes and research questions of this thesis and discuss implication of the current results; articulate and evaluate the strengths and implications of the thesis; and consider the limitations of the thesis and discuss possible directions for future research. As findings from studies 1-4 have been reviewed in previous chapters an extensive summary of the results will not be repeated here. Similarly, as attention has already been paid to the methodological strengths and limitations of each study the focus here will be on the strengths and limitations of the thesis at an overall conceptual level.

6.2. Summary of the Main Findings

At the outset of this thesis it was understood that many parents reported selective eating behaviour. Whilst it is difficult to be precise it has been suggested that between 3% and 34% of the population may be experiencing selective eating (Equit et al., 2013; Tharner et al., 2014), with a significant minority continuing to experience marked problems into adolescence (Nicholls et al., 2001). Selective eating is understood to be a variant of the DSM-5 diagnosis of ARFID, which describes children who have avoidant/restrictive eating patterns not associated with concerns about weight and shape, and who may not be experiencing significant weight loss. This group of children often have a complex multifactorial presentation characterised by biological, psychological and social factors. Selective eating has been difficult to investigate mainly due to the problems in accurately assessing the phenomenon, and more specifically, differentiating developmentally normal stages of restricted eating from pathological levels. In addition, many attempts to identify selective eating have relied on parent report, which may not be a valid indicator of the problem. A central
focus of this thesis was on the assessment of selective eating with the aim of
developing a valid dietary assessment protocol. Armed with the new assessment
method, we then sought to identify selective eaters and explore psychological factors
associated with the phenomenon.

The first study sought to establish how many parents in a community setting
were reporting selective eating, and the relationship between levels of reported
selective eating, age and gender. Specifically, Study 1 sought to compare the age and
gender profiles of children determined by their parents to be highly or moderately
selective eaters. Based on parent report 6.72% of children were reported to be
classified as high levels of selective eating. There was a small age effect and no
gender effects were observed. Analysis of the proportions of different levels of
severity of problem eating across two age groups (0-6 yrs and 7-12 yrs) did not
support the hypothesis that the frequency with which children are reported to
demonstrate this type of selective eating varied with age and severity. Specifically
children whose parents reported moderate levels of the problem were not found to
experience a shorter duration of the problem, thereby demonstrating a pattern whereby
they grow out of the problem as they age, compared with reported severe
presentations. It was noted that the results found in Study 1 were dependant on the
validity of parent report of the issue which had not been established.

Study 2 and 3 addressed the assessment of selective eating. As noted, accurate
assessment of selective eating was a focus of this research, as inconsistent definitions
and arguably invalid assessment of the issue have significantly hampered research
efforts and clinical understanding. Two issues seemed important, a) whether parent
report was a valid indicator of selective eating (Study 2), and b) how to differentiate
between developmentally normal levels of selective eating and more pathological
levels of the problems, namely selective eating (Study 3).
In Study 2 parent report of selective eating was compared with assessments of dietary quality, as determined by analysis of food diaries by experienced dietitians. The presence of nutritional deficiency was considered an important diagnostic factor for selective eating, as it is criterion for a diagnosis of ARFID. The rationale was that if parent report of selective eating was found to be indicative of dietary deficiency, this would provide validation of parent report of selective eating. However, results indicated that parent report of selective eating was in fact a poor indicator of dietary deficiency, with 77% of children identified as a selective eater by their parents found to have an adequate diet. Parent report was found to be a non-significant predictor of dietary quality. This means that the majority of children identified by parents as selective eaters had no significant dietary deficiency, which cast significant doubt on the validity of parent reported selective eating. This finding is significant as many studies to date have relied on parent report to identify pathological levels of selective eating.

Study 2 also found that in contrast to parent report, variety rating, or the number of different foods eaten was a valid predictor of dietary adequacy and inadequacy. Therefore Study 3 looked at how variety rating could be utilised to develop an objective and validated measure of selective eating. In order to identity individuals who demonstrate selective eating, two factors needed to be simultaneously evident. Firstly, the person needed to eat a restricted range of food, and secondly, they needed to have a diet deemed nutritionally deficient. Whilst it was relatively easy to determine if diet quality was deficient, guidelines to determine adequate dietary variety were more elusive. Recommendations about how to assess dietary variety are available, however research validating suggested cut off values, is lacking. Our task therefore was to determine at what point dietary variety is so restrictive that it is indicative of a deficient diet. To achieve this, different cut-points were tested to
determine the point at which diet range was likely to reflect dietary deficiency. Utilising the concepts of specificity and sensitivity it was determined that for an individual who ate ≤19 foods there was a 99% chance that they would also be experiencing dietary deficiency. This value was therefore deemed a good research cut off score for selective eating as it will ensure that a sample selected using this cut off is almost certain to be comprised of selective eaters. Different cut off values were recommended for clinical purposes, where the cut off might better be used as a screening measure to make sure all people who may have selective eating are identified in the first instance, and then with further evaluation, those who may be not be selective eaters can be subsequently identified. Consequently, higher sensitivity values are preferred, and with this in mind cut off score of ≤ 22 foods was recommended which yielded a 92% sensitivity, a specificity rating of 88%, and an accuracy of 88%. In defining selective eating using food variety scores and nutritional assessment were are able to assess with validity the presence of dietary deficiency associated with different levels of dietary restriction, and in addition suggest different cut off values for clinical and research purposes.

In Study 4, the variety rating cut off points identified in Study 3 were used to select both selective eaters and a control group, and the psychological factors associated with selective eating were investigated. Results confirmed that selective eating is a complex issue with a range of psychological, social and biological factors involved. Selective eaters demonstrated higher average levels of anxiety and OCD than normal eaters. Similarly, selective eaters demonstrated more internalizing and externalizing behaviours more than normal eaters, and selective eaters were also more likely to have had an inhibited temperament in early childhood. It was noted that within the sample of selective eaters some children were reported to experience OCD and behavioural difficulties at clinically significant levels, whilst some were reported
to experience psychological difficulties at sub-clinical levels. This pattern of results suggested that whilst selective eaters, overall may experience higher levels of OCD, anxiety and behavioural problems, individual cases may vary on the severity of co-existing psychological issues. Some children may experience co-morbid psychological conditions such as OCD, and others may experience sub-clinical levels of other psychological difficulties. Results indicating that anxiety and behavioural problems often co-exist with selective eating and may play a role in either the development or maintenance of the problem. For example anxiety symptoms such as avoidance or high levels of distress may exacerbate food avoidance, and externalizing behavioural problems may contribute to parent-child conflict during meals which may also contribute to the problem.

Parent mealtime practices such as monitoring of food intake and pressure to eat were more apparent in the parents of selective eaters. However, it appears that differences between parents of selective eaters and normal eaters were specific to eating as they did not differ in terms of overall parenting style. Parenting style was assessed using the Parent Authority Questionnaire which assesses overall parenting style resulting in scores on three scales: Authoritative, Authoritarian and Permissive. Results indicated that the parents of selective eaters and normal eaters did not differ on this more global measure of parenting style suggesting that differences in parenting were specific to meal time practices only. Whilst this correlational data does not allow causal explanation, it is plausible that, given that parents of selective eaters are generally similar to their normal eating counterparts with respect to overall parenting style, that parent mealtime practices may be a reaction to, rather than a cause of restricted eating evident in the child, but these more controlling parenting practices may, at least in part, maintain the eating issues. It was also found that parents of restrictive eaters had higher levels of stress anxiety and depression than the control
group parents. Again, it is unclear if this is independent of, or in response to their child’s eating issues, but it is likely that this heightened emotionality may feed into the problem. Several mechanisms were proposed.

Much is said, particularly in the literature on early feeding difficulties, about the nature of the interaction between parents and children and the importance of secure attachment and behavioural reciprocity between parent and child in development of good eating patterns. Whilst we cannot comment on the nature of attachment patterns between parent-child dyads, our data suggests that there are heightened levels of emotions evident in both parent and child. It is apparent that there is stress around eating and meal-times and that this may exacerbate the child’s problems with eating.

The final piece to the puzzle of selective eating came by way of parental reports of the child’s medical and developmental history. The frequency analysis of parent responses to survey questions suggested children with selective eating had more developmental and medical problems than normal eaters. Selective eaters were reported to have more complicated medical and developmental histories, particularly characterised by evidence of more gastrointestinal symptoms (e.g. reflux, tongue tie, swallowing dysphagia, irritable bowel syndrome), sensory processing problems and developmental delays (e.g. language disorders). They were also more likely to have a parent with an avoidant/restricted eating pattern. Whilst these data is preliminary and subject to the frailties of parental report, it does appear to indicate the biological and medical aspects of selective eating may play a role in the development of selective eating. For example, if a child were to experience high levels of reflux in infancy, they may develop avoidance or anxiety associated with eating, which may under certain circumstances develop into selective eating. Consideration of the medical aspects of the individual’s history may assist in developing etiological theories, and may therefore be important in clinical assessment and treatment.
The results of Study 4 emphasise that the constellation of factors associated with selective eating are complex and inter-dependent and supports previous notions of a bio-psycho-social model of the childhood eating disorders. As a working hypothesis, it is possible that in combination with child anxiety, that the biological or medical factors serve to trigger distressed responses to food, which may be maintained by parental stress, child behavioural disturbance and controlling mealtime practices. How the factors relate and interact with each other may vary between individuals, and it appears that there may be many different pathways to selective eating. Whether these pathways can be successfully differentiated into various subtypes of ARFID is yet to be determined. In the meantime, it will be important for researchers and clinicians to hold a number of etiological pathways in mind.

6.3. Strengths and Implications

There are several features of this thesis that may be considered novel. The first is the finding that parent report of selective eating may not be a valid measure of the issue. In much of previous research, parent report has been used to identify avoidant/restrictive eating: the present research indicates that caution is needed when relying on parent report in this manner. These results challenge long held views regarding the validity of parent report in the field, and signify the need for alternative methods of assessing selective eating.

The second novel feature of this research was the development of an objective, validated measure of selective eating based on dietary intake. The proposed assessment protocols and cut off points based on variety ratings will assist in the future identification and diagnosis of ARFID and selective eating in both research and clinical arenas. This is particularly useful given the recency of the ARFID diagnostic criteria and the opportunity to generate new research within the ARFID classification. The inability to accurately assess selective eating has significantly limited attempts to
understand the problem, and it is hoped with the development of this new dietetic assessment protocol, identification of ARFID and selective eating can be refined and will generate new understanding in the area.

The evaluation of psychological factors thought to be implicated in selective eaters and their parents also added to knowledge in the field. Previously, much of what we have learned about selective eating has been derived from retrospective case studies or ARFID cases in clinical settings. For the first time, selective eaters, who were accurately identified by via food records, were compared to a control group across a number of parent and child factors. The assessment of a number of factors simultaneously and across a large age group allowed a comprehensive investigation of psychological elements of selective eating to date. Results of this study confirmed the bio-psycho-social understanding of selective eating, and importantly began to refine of the understanding of psychological factors thought to be involved. The research highlighted the importance of understanding how child factors including an inhibited temperament, child anxiety and OCD may play a role. In addition, externalising and internalising behavioural difficulties were also associated with selective eating. Importantly, the levels of anxiety and behavioural difficulties, although higher for selective eaters than normal eaters, were not to the degree considered clinically significant. This is a key finding as it suggests that anxiety, OCD characteristics and behavioural difficulties may be part of the picture of selective eating, but that selective eating is not a symptom of a broader anxiety or behavioural problem, and is better viewed as a disorder in its own right.

6.4. Limitations and Future Research Directions

Assessment of food diaries by dietitians was an important part of this research. It was the basis of the validation of parent report in Study 2, and in Study 3 it was used as the “gold standard” to determine clinical cut off scores used to identify selective
eating. Whilst clear rationales were presented as why food diary assessment by a dietitian was relevant to assess diet deficiency associated with range of food eaten, it may be that this criterion needs to be further validated using other measures. For example, dietitian assessment of food diaries may be compared to computerised assessment of food diaries, or laboratory assessments of intake. Future research could also explore whether the cut off values determined for selective eating (i.e. eating ≤ 19 foods) developed in Study 3 predict other measures of dietary adequacy.

This research was cross sectional in nature which results in a number of limitations in respect to conclusions that can be drawn. No definitive conclusions can be made about the developmental trajectory of selective eating. Longitudinal research will aid not only in determining the trajectory and age distribution of selective eating, but will also assist in developing a clearer understanding the trajectory of developmental normal avoidant/restrictive eaters. This would be beneficial not only to identify and assess the trajectory of the children who grow out of the problem, but also investigate those children who do not, and identify the factors that differentiate between the two groups. Longitudinal research will also allow for a clearer understanding of how various factors interact in the development of selective eating. For instance, the various factors identified in Study 4 as associated with selective eating, such as temperament, parenting practices, child anxiety and medical issues, can be explored in terms of how they interact over time, which will assist in a clearer understanding of etiological pathways.

The samples used in these studies were community based, and study results may not generalise to clinical samples. While Study 1 found that 6.7% of parents reported their children to be selective eaters found only a small proportion of these children may ever present clinically. Further research could seek to understand what prompts concerned parents to seek help for their child and how children who present at clinics
differ from those children whose parents, despite reporting high levels of concern, do not present clinically. Study 4 identified psychological factors associated with selective eating in community samples including comorbidity, behavioural problems and parental stress or anxiety. Research looking at factors such as these in clinical samples is needed.

Finally, there is a large group of selective eaters that was not investigated in the project, namely those children with developmental issues such as Autism Spectrum Disorder or Intellectual Disability. It is known that many children within these categories experience highly restrictive eating patterns but it is unclear whether selective eaters with and without developmental problems share similar psychological characteristics. The results and conclusions of the present study may not be relevant to those children with developmental problems, and the assessment protocol established in Study 3 may also not be relevant. Another significant sub group of avoidant restrictive eaters that this study did not include were those children who were significantly medically compromised, to the point of needing hospitalisation, and there were no children in this study who were dependant on tube feeding. It will be important for future research to incorporate these types of presentations in determining the influence of the psychological factors outlined in the current study.

6.5. Conclusion

This thesis aimed to explore the nature of the little understood phenomenon of selective eating. Four studies provided information on the prevalence, assessment and psychological correlates of selective eating in a community setting. Results indicated that parent report of selective eating was a poor indicator of clinical levels of the problem and this highlighted the need for objective assessment methods to be developed. Subsequently, a new assessment protocol based on dietary intake was established, which can assist in the identification of selective eating. Child factors of inhibited temperament, anxiety, OCD, and behavioural problems were associated with
selective eating. Selective eaters were reported by their parents to have more complex medical and developmental histories, possible sensory processing issues in relation to eating, and were more likely to have a parent with selective eating. Parent factors of stress and mealtime practices were also associated with selective eating, highlighting the likely interactional nature of the problem. Taken together the association of these child and parent factors are consistent with the view that childhood eating disorders are best viewed as an interplay of bio-psycho-social factors. Given the reality that many individuals with selective eating have complex presentations that benefit from specialised treatment, it will be important to educate clinicians about ARFID and selective eating. To understand the assessment of the condition and the various etiological factors. Currently there are no prospective studies that have reported outcomes on interventions that have targeted patients with ARFID and selective eating. As these evidence-based treatments become available, it will be important to apply interventions that optimise outcomes with the hope of minimising medical complications and co-morbidity associated with the condition.
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Appendix A:

Information sheet for Study 1 & 3

Ms Carol Smith is a Clinical Psychologist and PhD student in the Psychology Department at University of Western Australia, and is conducting research into the development of selective eating. Ms Smith is supervised by Mr Neil McLean, Lecturer at the University of Western Australia.

Selective eating, often referred to as extremely fussy or picky eating, is a little studied phenomenon that is broadly defined as occurring when a child or adult has a severely restricted range of foods in their diet, associated with an unwillingness to try new foods.

The present study is exploratory in nature and initial aims are to determine how common selective eating is in children aged 18mths – 12 years. In order to achieve this, a large number of parents across Perth are invited to complete a brief questionnaire that investigates the nature of eating in their children, together with some basic demographic information.

The questionnaire will take about 5 minutes to finish, and completed questionnaires can be placed in the box at your Day Care Centre, or you may post it to Ms Smith directly at 4/82 Reserve St Wembley WA 6014. If you need more questionnaires please feel free to photocopy the questionnaire or contact Ms Smith to order extras. All information gathered will be coded to ensure confidentiality.

Should you decide to complete the questionnaire you have the chance to win a 120.00 voucher to be spent at a shop or restaurant of your choice. Each completed questionnaire (only one per child) entitles the family to one raffle ticket. Winners will be notified by telephone.

You may be contacted and invited to participate in subsequent research related to selective eating. However participation in any subsequent research is entirely voluntary, and completely confidential. You are free to withdraw from the research at any time, without the need to provide justification. If this occurs, records of your involvement will be destroyed, unless otherwise agreed by you.

Please do not hesitate to contact Ms Smith on 0407 828 944 if you have any queries or concerns.

Please detach this form from the questionnaire and keep it for your information.

Thank-You,
Carol Smith

The Human Research Ethics Committee at the University of Western Australia requires that all participants are informed that, if they have any complaint regarding the manner, in which a research project is conducted, it may be given to the researcher or, alternatively to the Secretary, Human Research Ethics Committee, Registrar’s Office, University of Western Australia, 35 Stirling Highway, Crawley, WA 6009 (telephone number 6488-3703). All study participants will be provided with a copy of the Information Sheet for their personal records.
Ms Carol Smith, a Clinical Psychologist and PhD student in the School of Psychology at the University of Western Australia, is conducting research into the development of selective eating. Ms Smith is supervised by Mr Neil McLean from the School of Psychology.

Selective eating, often referred to as fussy or picky eating, is a poorly understood but relatively common phenomenon. The fussy eater eats from within a severely restricted range of foods, and is unwilling to try new foods.

The present study aims to identify some of the psychological characteristics associated with selective eating in children aged 2-18 years. Parents and older children (8-18) will be asked to complete questionnaires and a three day food diary that will be sent to the participant by mail. The parent questionnaires will take about 45 minutes to complete and will ask participants to provide information on themselves and their child so that we can gain a better understanding of the experiences of children and the parents of children who are selective Eaters. The child questionnaires will take no more than 20 minutes to complete and will ask children to complete two widely used scales that measure aspects of their behavior. Questionnaires can be returned by reply paid envelope, and all information gathered will be coded to retain confidentiality.

We are also interested in looking at psychological characteristics of children with a wide range of eating patterns, that is, we are also interested to assess children who do not necessarily demonstrate selective eating. If you have a friend with children of similar age to yours, you may like to ask them if they would be interested in being part of our study. If they are interested and agree to you providing us with their contact details, we will then contact them and invite them to participate. Please write their contact details on the questionnaire pack in the space provided. This is voluntary and will not impact on any other aspect of your participation of the research.

Should you decide to complete the questionnaire you have the chance to win a dinner at a restaurant of your choice to the value of $120.00. Each completed questionnaire pack (only one per child) entitles the family to one raffle ticket in the draw for the restaurant voucher. Winners will be notified by telephone.

In addition an education and behavioural program to facilitate healthy eating patterns will be offered free of charge to interested participants.

Participation in the research is entirely voluntary, and completely confidential. You are free to withdraw from the research at any time, without the need to provide justification. If this occurs, records of your involvement will be destroyed, unless otherwise agreed by you. Your participation in the study does not impact on any right to financial compensation, or any treatment you may currently be seeking.

Please do not hesitate to contact Ms Smith on 0407 828 944 if you have any queries or concerns.

Please detach this cover sheet and keep it for your information.

Thank you,
Carol Smith

Approval to conduct this research has been provided by The University of Western Australia, in accordance with its ethics review and approval procedures. Any person considering participation in this research project, or agreeing to participate, may raise any questions or issues with the researchers at any time. In addition, any person not satisfied with the response of researchers may raise ethics issues or concerns, and may make any complaints about this research project by contacting the Human Research Ethics Office at The University of Western Australia on (08) 6488 3703 or by emailing to hreo-research@uwa.edu.au. All research participants are entitled to retain a copy of any Participant Information For and/or Participant Consent Form relating to this research project.
Appendix B:

Food Dairy.

How to complete this food diary:

1. Be honest and list all of the food and drinks consumed throughout the day.

2. Choose three consecutive days; including two work or week days and one weekend day.

3. Carry this diary with you at all times on these days and complete after every meal, drink or snack.

4. Give as much detail as possible to show variety.
   For example: A honey sandwich: two pieces of wholemeal bread, butter and honey. Include brand names of food where possible.

5. Use the comments box to explain any unusual situations or events in the day that may have impacted on your child’s eating.

6. Please return your completed food diary and questionnaire in the reply paid envelope.

Thank You

(Please complete the questionnaire on the back page)

Please complete the following:
(Please circle one response)

1. My child refuses new food at first:
   Never Rarely Sometimes Often Always

2. My child enjoys tasting new food:
   Never Rarely Sometimes Often Always

3. My child enjoys a wide variety of food:
   Never Rarely Sometimes Often Always

4. My child is difficult to please with meals:
   Never Rarely Sometimes Often Always

5. My child is interested in tasting food she he hasn’t had before:
   Never Rarely Sometimes Often Always

6. My child decides that she doesn’t like a food, even without tasting it:
   Never Rarely Sometimes Often Always

Please indicate if you would like to have feedback about your child’s results: Yes  No

Carol Smith
0407 828 944
Email: csmith@westhealth.com.au

University of Western Australia

<table>
<thead>
<tr>
<th>DAY 1</th>
<th>Date:</th>
<th>Time</th>
<th>Food &amp; Drink consumed</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
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<table>
<thead>
<tr>
<th>DAY 2</th>
<th>Date:</th>
<th>Time</th>
<th>Food &amp; Drink consumed</th>
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<tbody>
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</tbody>
</table>

<table>
<thead>
<tr>
<th>DAY 3</th>
<th>Date:</th>
<th>Time</th>
<th>Food &amp; Drink consumed</th>
</tr>
</thead>
<tbody>
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</tbody>
</table>

ID:
Appendix C:

Questionnaire pack sent to children for Study 4.

Selective Eating Study

Child Booklet
For children age 8 years and older

Name: _________________________________
Date of Birth: ________________________ Age: _______

Parents please note: Some younger children may need help reading and completing these questionnaires. If this is the case please try to ensure that you do not influence the child’s responses in any way, simply help them to record their own answers.

THANK YOU.
This questionnaire asks you how you have been thinking, feeling, or acting recently. For each item, please circle the number that shows how often the statement is true for you. If a sentence is true about you a lot of the time, circle 3. If it is true about you some of the time, circle 2. If it is true about you once in a while, circle 1. If a sentence is not ever true about you, circle 0. Remember, there are no right or wrong answers, just answer how you have been feeling recently.

On the next page are two examples to show you how to complete the questionnaire. In Example A, if you were hardly ever scared of dogs, you would circle 1, meaning that the statement is rarely true about you. In Example B, if thunderstorms sometimes upset you, you would circle 2, meaning that the statement is sometimes true about you.

<table>
<thead>
<tr>
<th></th>
<th>Never true about me</th>
<th>Rarely true about me</th>
<th>Sometimes true about me</th>
<th>Often true about me</th>
</tr>
</thead>
<tbody>
<tr>
<td>Example A. I’m scared of dogs</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
<tr>
<td>Example B. Thunderstorms upset me</td>
<td>0</td>
<td>1</td>
<td>2</td>
<td>3</td>
</tr>
</tbody>
</table>
Now try these items yourself.

<table>
<thead>
<tr>
<th></th>
<th>Never true about me</th>
<th>Rarely true about me</th>
<th>Sometimes true about me</th>
<th>Often true about me</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I feel tense or uptight.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2.</td>
<td>I usually ask permission.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3.</td>
<td>I worry about other people laughing at me.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4.</td>
<td>I get scared when my parents go away.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5.</td>
<td>I keep my eyes open for danger.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6.</td>
<td>I have trouble getting my breath.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>7.</td>
<td>The idea of going away to camp scares me.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>I keep the light on at night.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>9.</td>
<td>I try to stay near my mum or dad.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>10.</td>
<td>I’m afraid that other kids will make fun of me.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>11.</td>
<td>I try hard to obey my parents and teachers.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>12.</td>
<td>I get dizzy or faint feelings.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>13.</td>
<td>I check things out first.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>14.</td>
<td>I worry about getting called on in class.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>15.</td>
<td>I’m jumpy.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>16.</td>
<td>I’m afraid other people will think I’m stupid.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>17.</td>
<td>I keep the light on at night.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>18.</td>
<td>I have pains in my chest.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>19.</td>
<td>I avoid going to places without my family.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>20.</td>
<td>I feel strange, weird, or unreal.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>21.</td>
<td>I try to do things other people will like.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>22.</td>
<td>I worry about what other people will think of me.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>23.</td>
<td>I avoid watching scary movies and TV shows.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>24.</td>
<td>My heart races or skips beats.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>25.</td>
<td>I stay away from things that upset me.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>26.</td>
<td>I sleep next to someone from my family.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>27.</td>
<td>I try to do everything exactly right.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>28.</td>
<td>I get scared riding in the car or on the bus.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>29.</td>
<td>I feel sick to my stomach.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>30.</td>
<td>If I get upset or scared, I let someone know right away.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>31.</td>
<td>I get nervous if I have to perform in public.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>32.</td>
<td>Bad weather, the dark, heights, animals, or bugs scare me.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>33.</td>
<td>I have trouble asking other kids to play with me.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>34.</td>
<td>My hands shake.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>35.</td>
<td>My hands feel sweaty or cold.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>36.</td>
<td>I check to make sure things are safe.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

Please turn to the next page.
Now please complete the next questionnaire in the same way.

<table>
<thead>
<tr>
<th></th>
<th>Never true about me</th>
<th>Rarely true about me</th>
<th>Sometimes true about me</th>
<th>Often true about me</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>I felt I had to do certain things even though I knew I didn’t really have to (like always having to count the steps as I went up them.) I felt something bad would happen if I didn’t.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>2.</td>
<td>Thoughts or words kept going over and over in my mind even though I didn’t want them to.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>3.</td>
<td>I had to check things several times (e.g. the switches were turned off or windows closed).</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>4.</td>
<td>I hate dirty things.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>5.</td>
<td>I felt that if someone used or touched something it was spoilt for me.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>6.</td>
<td>It was hard for me to make up my mind.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>7.</td>
<td>I worried about being clean enough.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>8.</td>
<td>I was fussy about keeping my hands clean.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>9.</td>
<td>When I put things away at night they had to be put away just right (i.e. in a special order or a special way).</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>10.</td>
<td>I got angry if other people messed up my things at school.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>11.</td>
<td>I spent a lot of extra time checking my homework to make sure it was just right.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>12.</td>
<td>I had to do things over and over again before they seemed quite right.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>13.</td>
<td>I had to count in a special way several times or go through numbers in my mind.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>14.</td>
<td>I had trouble finishing my schoolwork or other jobs because I had to do something over and over again.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>15.</td>
<td>I had a special number that I liked to count up to or I had to do things just that number of times.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>16.</td>
<td>I often felt guilty because I had done something even though no one else thought it was bad.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>17.</td>
<td>I worried a lot if I did something not exactly the way I liked.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>18.</td>
<td>I kept on thinking about things that I had done because I wasn’t sure that they were the right things to do.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>19.</td>
<td>I moved or talked in a special way to avoid bad luck.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>20.</td>
<td>I had special numbers or words that I said because I hoped they kept bad luck or bad things away.</td>
<td>0</td>
<td>1</td>
<td>2</td>
</tr>
</tbody>
</table>

THANKS!
Appendix D:

Parent Questionnaire Booklets for Study 4

*Note*: There were different parent booklets for different ages (3-6; 6-8; Over 8yrs) reflecting different CBCL (1.5-5yrs; 6-18yrs) and temperament questionnaires (3-6yrs; 6-8yrs) for different ages.

Selective Eating Study

Parent Booklet
For children age 3 – 6 years

Child Name: ________________________________

Gender: M or F (please circle)

DOB: ____________________ Age: ______________

Parent Name: ______________________________

Address: ___________________________________________________________________

Telephone: ___________________________________________________________________

Please let us know your child’s weight and height

Weight: (kgs.) ______________________________

Height: (cms.) _____________________________

Please provide details below of anyone that you know that is willing (make sure they are happy to be contacted by us) to be part of this research project. In doing so, you will receive an extra raffle ticket in the draw for the meal voucher worth $120.

Name: ________________________________________

Telephone number: ___________________________

Address: _____________________________________

Please let us know if you are interested in receiving feedback about your child and if you would like to be part of a treatment program based on the results of this study:

Feedback: Yes  No  Treatment: Yes  No

(Please circle)

THANK YOU.
1. Developmental History

<table>
<thead>
<tr>
<th>Question</th>
<th>Yes</th>
<th>No</th>
<th>Details</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Were there any problems with early bottle or breast feeding?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>2. As an infant were there any feeding troubles for solid foods (e.g. chewing, swallowing, gagging excessive reflux, colic, oral motor problems)?</td>
<td></td>
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<td></td>
</tr>
<tr>
<td>3. Did your child go through the stage of mouthing lots of objects (i.e. putting things in his or her mouth to explore them)?</td>
<td></td>
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</tr>
<tr>
<td>4. Did your child go through the phase of playing with foods with his or her hands?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>5. Did your child achieve developmental milestones within expected ranges? (crawling, walking, talking, toileting)?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>6. Has your child experienced any medical problems now or in the past?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Do you have any other concerns about your child, other than their eating?</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>8. Is there any family history of any eating difficulties or major psychiatric disorder?</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
2. Child Behaviour Questionnaire

Below is a list of items that describe children. For each item that describes your child now or within the past 6 months, please circle the 2 if the item is very true or often true of your child. Circle the 1 if the item is somewhat or sometimes true of your child. If the item is not true of your child, circle the 0. Please answer all items as well as you can, even if some do not seem to apply to your child.

0 = Not True (as far as you know)  1 = Somewhat or Sometimes True  2 = Very True or Often True

0 1 2  1. Aches or pains (without medical cause; do not include stomach or headaches)
0 1 2  2. Acts too young for age.
0 1 2  3. Afraid to try new things
0 1 2  4. Avoids looking others in the eye
0 1 2  5. Can't concentrate, can't pay attention for too long
0 1 2  6. Can't sit still, restless, or hyperactive
0 1 2  7. Can't stand having things out of place
0 1 2  8. Can't stand waiting; wants everything now
0 1 2  9. Chews on things that aren't edible
0 1 2  10. Clings to adults or too dependent
0 1 2  11. Constantly seeks help
0 1 2  12. Constipated, doesn't move bowels (when not sick)
0 1 2  13. Cries a lot
0 1 2  14. Cries a lot
0 1 2  15. Defiant
0 1 2  16. Demands must be met immediately
0 1 2  17. Destroys his/her own things
0 1 2  18. Destroys things belonging to his/her family or other children
0 1 2  19. Diarrhea or loose bowels (when not sick)
0 1 2  20. Disobedient
0 1 2  21. Disturbed by any change in routine
0 1 2  22. Doesn't want to sleep alone
0 1 2  23. Doesn't answer when people talk to him/her
0 1 2  24. Doesn't eat well
0 1 2  25. Doesn't get along with other children
0 1 2  26. Doesn't know how to have fun; acts like a little adult
0 1 2  27. Doesn't seem to feel guilty after misbehaving
0 1 2  28. Doesn't want to go out of home
0 1 2  29. Easily frustrated
0 1 2  30. Easily jealous
0 1 2  31. Eats or drinks things that are not food
0 1 2  32. Fears certain animals, situations, or places
0 1 2  33. Feelings are easily hurt
0 1 2  34. Gets hurt a lot, accident-prone
0 1 2  35. Gets in many fights
0 1 2  36. Gets into everything
0 1 2  37. Gets too upset when separated from parents
0 1 2  38. Has trouble getting to sleep
0 1 2  39. Headaches (without medical cause)
0 1 2  40. Hits others
0 1 2  41. Holds his/her breath
0 1 2  42. Hurts animals or people without meaning to
0 1 2  43. Looks unhappy without good reason
0 1 2  44. Angry moods
0 1 2  45. Nausea, feels sick (without medical cause)
0 1 2  46. Nervous movements or twitching (describe): _______________
0 1 2  47. Nervous, high strung or tense
0 1 2  48. Nightmares
0 1 2  49. Overeating
0 1 2  50. Overtired
0 1 2  51. Shows panic for no good reason
0 1 2  52. Painful Bowel movements (without medical cause)
0 1 2  53. Physically attacks people
0 1 2  54. Picks nose or mouth or other part of the body
0 1 2  55. Plays with own sex parts too much
0 1 2  56. Poorly coordinated or clumsy
0 1 2  57. Problems with eyes (describe) _______________
0 1 2  58. Punishment doesn't change his or her behaviour
0 1 2  59. Quickly shifts from one activity to another
0 1 2  60. Rash or other skin problems (without medical cause)
0 1 2  61. Refuses to eat
0 1 2  62. Refuses to play active games
0 1 2  63. Repeatedly rocks head or body
0 1 2  64. Resists going to bed at night
0 1 2  65. Resists toilet training (describe): _______________
0 1 2  66. Screams a lot
0 1 2  67. Seems unresponsive to attention
0 1 2  68. Self-conscious or easily embarrassed
0 1 2  69. Selfish or won't share
0 1 2  70. Shows little affection towards people
0 1 2  71. Shows little interest in things around him/her
0 1 2  72. Shows too little fear of getting hurt
0 1 2  73. Too shy or timid
0 1 2  74. Sleeps less than most children during day and/or night
0 1 2  75. Smeared or plays with bowel movements
0 1 2  76. Speech problem
0 1 2  77. Stares into space or seems preoccupied
0 1 2  78. Stomach aches or cramps (without medical cause)
0 1 2  79. Rapid shifts between sadness and excitement
0 1 2  80. Strange behaviour (describe): _______________
0 1 2  81. Stubborn, sullen, or irritable
0 1 2  82. Sudden changes in mood or feelings
0 1 2  83. Sulks a lot
0 1 2  84. Talks or cries out in sleep
0 1 2  85. Tempers tantrums or hot temper
0 1 2  86. Too concerned with neatness or cleanliness

301
0 1 2  87. Too fearful or anxious
0 1 2  88. Uncooperative
0 1 2  89. Underactive, slow moving, or lacks energy
0 1 2  90. Unhappy, sad, or depressed
0 1 2  91. Unusually loud
0 1 2  92. Upset by new people or situations
       (describe)________
0 1 2  93. Vomiting, throwing up (without medical cause)
0 1 2  94. Wakes up often at night
0 1 2  95. Wanders away
0 1 2  96. Wants a lot of attention
0 1 2  97. Whining
0 1 2  98. Withdrawn, doesn’t get involved with others
0 1 2  99. Worries
3. Child Temperament Questionnaire

(3-6 years old)

<table>
<thead>
<tr>
<th></th>
<th>Almost Never</th>
<th>Not Often</th>
<th>Variable, Usually does not</th>
<th>Variable, Usually does</th>
<th>Frequently</th>
<th>Almost Always</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. My child is shy with strange adults.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>2. When my child starts a project such as a model or a puzzle, he/she works on it without stopping until it is completed even if it takes a long time.</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
<td></td>
</tr>
<tr>
<td>3. My child has a bowel motion at about the same time each day.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>4. My child is shy when first meeting new children.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>5. My child likes to complete one task or activity before going on to the next.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>6. My child asks for or takes a snack at about the same time every day.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>7. When upset or annoyed with a task, my child throws it down, cries, slams doors, etc.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>8. If my child wants a toy or sweet while shopping, he/she will easily accept something else instead.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>9. After my child is put to bed at night, he/she takes about the same length of time to fall asleep.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>10. My child is unwilling to leave a game or activity that he/she has not completed.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>11. If my child resists some activity such as having her hair brushed, he/she will continue to resist it for some months.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>12. My child stays with an activity (e.g. a puzzle, construction kit, reading) for a long time.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td></td>
<td>Almost Never</td>
<td>Never</td>
<td>Variable Usually</td>
<td>Almost Never</td>
<td>Frequently</td>
<td>Almost Always</td>
</tr>
<tr>
<td>---</td>
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<td>-------</td>
<td>-------------------</td>
<td>--------------</td>
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<td>---------------</td>
</tr>
<tr>
<td>13. When in the park or visiting, my child will go up to children they do not know and join in their play.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>14. My child sleeps for a different length of time each night.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>15. If my child is shy with a stranger (adult), he/she gets over this quickly (in about half an hour).</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>16. When my child is angry about something, it is difficult to sidetrack him/her.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>17. My child gets hungry at different times each day.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>18. When the family goes on a trip, my child immediately makes himself/herself at home in the new surroundings.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>19. When shopping together, if I do not buy what my child wants (e.g. sweets, clothing) he/she cries and yells.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>20. If my child is upset it is hard to comfort him/her</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>21. When unknown adults visit our home, my child is immediately friendly and approaches them.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>22. My child eats a lot one day and very little the next day, rather than the same amount each day.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>23. When a toy or game is difficult, my child quickly turns to another activity.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
<tr>
<td>24. If a favourite toy or game won’t work, my child gets noticeably upset.</td>
<td>1</td>
<td>2</td>
<td>3</td>
<td>4</td>
<td>5</td>
<td>6</td>
</tr>
</tbody>
</table>
25. When my child objects to wearing certain clothing, he/she argues loudly or cries.

26. On weekends and holidays, my child wakes up at the same time each morning.

27. My child practices an activity (e.g., new song, writing) till he/she masters it.

28. The first time my child is left in a new situation without mother (such as kindergarten, school or music lesson) he/she gets upset.

29. If my child starts to play with something and I want him/her to stop, it is hard to turn his/her attention to something else.

30. My child gets involved with quiet activities such as reading or looking at books, and doing crafts.
4. Parenting Questionnaire

SA = Strongly Agree; A = Agree; N = Neither Agree nor Disagree; D = Disagree; SD = Strongly Disagree.

1. In well-run home children should have their way as often as parents do.  
SA  A  N  D  SD

2. It is for my children’s’ own good to require them to do what I think is right, even if they don’t agree.  
SA  A  N  D  SD

3. When I ask my children to do something, I expect it to be done immediately without question.  
SA  A  N  D  SD

4. Once family rules have been made, I discuss the reasons for the rules with my children.  
SA  A  N  D  SD

5. I always encourage discussion when my children feel family rules and restrictions are unfair.  
SA  A  N  D  SD

6. Children need to be free to make their own decisions about activities, even if this disagrees with what a parent might want to do.  
SA  A  N  D  SD

7. I do not allow my children to question the decisions that I make.  
SA  A  N  D  SD

8. I direct the activities and decisions of my children by talking with them and using rewards and punishments.  
SA  A  N  D  SD

9. Other parents should use more force to get their children to behave.  
SA  A  N  D  SD

10. My children do not need to obey rules simply because people in authority have told them to.  
SA  A  N  D  SD

11. My children know what I expect from them, but feel free to talk with me if they feel my expectations are unfair.  
SA  A  N  D  SD

12. Smart parents should teach their children early exactly who is the boss in the family.  
SA  A  N  D  SD

13. I usually don’t set firm guidelines for my child’s behaviour.  
SA  A  N  D  SD

14. Most of the time I do what my children want when making family decisions.  
SA  A  N  D  SD

15. I tell my children what they should do, but I explain why I want them to do it.  
SA  A  N  D  SD

16. I get very upset if my children try to disagree with me.  
SA  A  N  D  SD
17. Most problems in society would be solved if parents would let their children choose their activities, make their own decisions, and follow their own desires when growing up.  

18. I allow my children to decide most things for themselves without a lot of help from me.  

19. I listen to my children when making decisions, but I do not decide something simply because my children want it.  

20. I do not think of myself as responsible for telling my children what to do.  

21. I have clear standards of behaviour for my children, but I am willing to listen to their concerns and discuss the rules with them.  

22. I expect my children to follow my directions, but I am always willing to listen to their concerns and discuss the rules with them.  

23. I allow my children to form their own opinions about family matters and let them make their own decisions about those matters.  

24. Most problems in society could be solved if parents were stricter when their children disobey.  

25. I often tell my children exactly what I want them to do and how I expect them to do it.  

26. I set firm guidelines for my children but understand when they disagree with me.  

27. I do not direct the behaviours, activities or desires of my children.  

28. My children know what I expect of them and do what is asked simply out of respect for my authority.  

29. If I make a decision that hurts my children, I am willing to admit that I made a mistake.
5. **Child Eating Questionnaire**
Please circle the correct answer for the following questions

1. My child refuses new food at first:
   - Never
   - Rarely
   - Sometimes
   - Often
   - Always

2. My child enjoys tasting new food:
   - Never
   - Rarely
   - Sometimes
   - Often
   - Always

3. My child enjoys a wide variety of food:
   - Never
   - Rarely
   - Sometimes
   - Often
   - Always

4. My child is difficult to please with meals:
   - Never
   - Rarely
   - Sometimes
   - Often
   - Always

5. My child is interested in tasting food s/he hasn’t had before:
   - Never
   - Rarely
   - Sometimes
   - Often
   - Always

6. My child decides that s/he doesn’t like a food, even without tasting it:
   - Never
   - Rarely
   - Sometimes
   - Often
   - Always
6. Parent Questionnaire

Please read each statement and circle a number 0, 1, 2 or 3 which indicated how much the statement applied to you over the past week. There are no right or wrong answers. Do not spend too much time on any statement.

*The rating scale is as follows:*

<table>
<thead>
<tr>
<th></th>
<th>Did not apply to me at all</th>
<th>Applied to me to some degree, or some of the time</th>
<th>Applied to me to a considerable degree, or a good part of time</th>
<th>Applied to me very much, or most of the time</th>
</tr>
</thead>
<tbody>
<tr>
<td>0</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>I found it very hard to wind down</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>I was aware of dryness of my mouth</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>I couldn’t seem to experience any positive feeling at all</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>I experienced breathing difficulty (eg. Excessively rapid breathing, breathlessness in the absence of physical exertion)</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5</td>
<td>I found it difficult to work up the initiative to do things</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>I tended to over-react to situations</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>I experienced trembling (eg. In the hands)</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>I felt that I was using a lot of nervous energy</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>9</td>
<td>I was worried about situations in which I might panic and make a fool of myself</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>10</td>
<td>I felt that I had nothing to look forward to</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>I found myself getting agitated</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>I found it difficult to relax</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>I felt down-hearted and blue</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>I was intolerant of anything that kept me from getting on with what I was doing</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>I felt I was close to panic</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>16</td>
<td>I was unable to become enthusiastic about anything</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>17</td>
<td>I felt I wasn’t worth much as a person</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>18</td>
<td>I felt that I was rather touchy</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>19</td>
<td>I was aware of the action of my heart in the absence of physical exertion (eg. Sense of heart rate increase, heart missing a beat)</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>20</td>
<td>I felt scared without any good reason</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
</tr>
<tr>
<td>21</td>
<td>I felt that life was meaningless</td>
<td>0 1 2 3</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>
7. Child Feeding Questionnaire

For each statement below circle the number that best describes your beliefs about parenting your child. There are no right or wrong answers. We are looking for your overall impression regarding each statement. Please CIRCLE your answer for each item:

(1= never, 2= seldom, 3= half of the time, 4= most of the time, 5=always).

1. When your child is at home, how often are you responsible for feeding him/her?
   1  2  3  4  5

2. How often are you responsible for deciding what your child’s portion sizes are?
   1  2  3  4  5

3. How often are you responsible for deciding if your child has eaten the right kinds of food?
   1  2  3  4  5

1=unconcerned, 2= a little concerned, 3= concerned, 4= fairly concerned, 5= very concerned)

1. How concerned are you about your child eating too little when you are not around him/her?
   1  2  3  4  5

2. How concerned are you about your child having to eat to gain weight?
   1  2  3  4  5

3. How concerned are you about your child being under weight?
   1  2  3  4  5

(1= disagree, 2=slightly disagree, 3= neutral, 4= slightly agree, 5= agree)

1. I have to be sure that my child does not eat too many sweets (candy, ice-cream, cake or pastries).
   1  2  3  4  5

2. I have to be sure that my child does not eat too many high-fat foods.
   1  2  3  4  5

3. I have to be sure that my child does not eat too much of his/her favourite foods.
   1  2  3  4  5

4. I intentionally keep some foods out of my child’s reach.
   1  2  3  4  5

5. I offer sweets (candy, ice cream, cake, pastries) to my child as a reward for good behaviour.
   1  2  3  4  5

6. I offer my child his/her favorite foods in exchange for good behaviour.
   1  2  3  4  5
7. If I did not guide or regulate my child’s eating, he/she would eat too many junk foods.  
1 2 3 4 5

8. If I did not guide or regulate my child’s eating, he/she would eat too much of his/her favourite foods.  
1 2 3 4 5

(1=disagree, 2=slightly disagree, 3=neutral 4=slightly agree, 5=agree)

1. My child should always eat all of the food on his/her plate.  
1 2 3 4 5

2. I have to be especially careful to make sure my child eats enough.  
1 2 3 4 5

3. If my child says “I’m not hungry” I try to get him/her to eat anyway.  
1 2 3 4 5

4. If I did not guide or regulate my child’s eating, he/she would eat much less than he/she should.  
1 2 3 4 5

(1=never, 2=rarely, 3=sometimes, 4=mostly, 5=always)

1. How much do you keep track of the sweets (candy, ice cream, cake, pies, pastries) that your child eats?  
1 2 3 4 5

2. How much do you keep track of the snack food (potato chips, Doritos, cheese puffs) that your child eats?  
1 2 3 4 5

3. How much do you keep track of the high-fat foods that your child eats?  
1 2 3 4 5

THANK YOU

Don’t forget to complete the food diary and post it back to us!
Appendix E:

Coding structure used to compute variety measure in study 2 and 3.

The food coding structure used to compute the variety measure in Study 3 was based on the recommendations made in the Healthy Eating Index (HEI – 2005; www.cnpp.usda.gov/healthyeatingindex), which in turn was based on the 1994-1996 Continuing Survey of Food study. This large scale population based study provided estimates of food intake across three years for over 16,000 individuals in the USA with the aim of providing benchmark data on the nutritional intake of average and low average income Americans (Goldman, Boudoir & Berlin, 1997). The following principles were used to make food variety coding decisions:

- Foods that were nutritionally similar were grouped together.
- Foods made with separate commodities were generally grouped separately.
- Foods differing only in fat content were generally grouped together.
- Vegetables were each given separate codes, but different forms of the same vegetable were coded together.
- Different forms of the same meat were coded together; organ meats and ham were two exceptions.
- Each type of fish was coded differently, but different cooked or processed forms of the same fish received the same code.
- Most forms of fluid milk had the same code.
- Most cheeses has the same code, the exception was cottage cheese.
- All white breads were given the same code. Sweet rolls and pasta received different codes.
Whole wheat products were coded differently than were products made with refined wheat flour.

Ready-to-eat cereals were assigned codes based on the grain in the cereal. Those made from different grains received different codes. For example “Weeties” and “Weet-bix” were given the same code, however “Weeties” and “Rice Bubbles” were given different codes.

Other coding decisions, not covered by the HEI-2005, and agreed by consensus between the dietitians concerned those foods that had limited nutritional content aside from sugar and fat, which were referred to as extras. For example ice cream was coded as an extra and not as a diary based food. Other examples were: mayonnaise, butter, oil, pastries, cakes, fruit bars, curry puffs, pretzels, hot chips/wedges, crackers (Jatz, Ritz, rice crackers), meat pies; muffins and “yogos”. A number of foods were also categorized as an extra plus a type of food group. For example a “pizza bun” was categorised as one serve of cereal and one of “extra”. Other examples of this type of categorizations were: Milo (one serve dairy plus one serve extra); Cheese burger (one serve protein, one serve cereal, one serve extra); pikelets (one serve cereal, one serve extra); scones (one serve cereal, one serve extra); Coco Pops/Fruit Loops(one serve of cereal, one serve of extra). Finally fruit juices were considered as a fruit, and different juices were coded differently. Also different flavoured yoghurt were also coded as different types of food.