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What are New Zealand parents' understandings about
the effect of nutrition on children's learning?

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Abstract

While there is sufficient evidence, through research or implemented public health and school programmes, to support the importance of nutrition for health and wellbeing, there is limited research on what parents' understandings are regards the effect of nutrition on children's learning. As parents are role models and nutritional gatekeepers for their children's diet, gaining insight into their understanding of the relationship between nutrition and learning, would provide valuable data to inform this field of research. There is some research out of Europe but none within New Zealand.

The purpose of this study was to: Gain an understanding of New Zealand parents' views about the effect of nutrition on children's learning?

Five mothers of differing cultures, whose children attended a primary school in a large metropolitan city of New Zealand, were interviewed for this qualitative, exploratory case study. Semi-structured, in depth interviews were used to collect the data. The findings showed that parents in this study were aware and understood the physical and behavioural effects of food on children. Parents observed that diet affected learning, specifically concentration, but that this effect was an indirect effect, due to either the physical or behavioural effects of food on children. Parents distinguished between "good" and "bad" foods and what constituted a healthy diet and gave numerous examples of how "good" and "bad" food could affect a child. Quantity and the timing of food were also thought to impact children's behaviour, particularly in terms of mood fluctuations. These effects cannot be seen in isolation though, as parent values, their culture, their health priorities, their behaviour, their parenting practices and the school support they did or did not receive, all contributed to this complex arena of feeding their children.

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Chapter 1: Introduction

1.1 Background

Adequate nutrition is one of several factors, essential for normal physical and cognitive development of a child (Benton, 2010; Eilander et al., 2010; Nyaradi et al., 2013) and undernourishment and poor quality nutrition have been found to decrease cognitive functions in children (Bellisle, 2004; Benton, 2010; Florence et al., 2008).

The research into the topic of nutrition and cognitive performance has tackled the question from various angles, either focusing on a child's general diet or narrowing it down to specific nutrients to establish if cognitive performance (which will be referred to as *learning* in later sections) is impacted. Irrespective of the approach, there is evidence to support that providing sufficient nutrients, through general diet or supplementation increases micronutrient levels to influence optimal physical and cognitive functioning, thus influencing learning (Benton, 2010; Florence et al., 2008; Haapala et al., 2015; Lam & Lawlis, 2017).

Children however are not responsible for their food intake, especially in their formative years. Parents or caregivers are the nutritional gatekeepers to the children in their care (Brands et al., 2012; Gage et al., 2014), and primary role models for their children's dietary behaviour (Haines et al., 2019). Health and education ministries may be able to influence the nutritional message, but ultimately the responsibility lies with parents and/or caregivers. Thus, if nutrition can impact learning then understanding what parents' perceptions are with regard to the relationship between nutrition and learning would be valuable.

Reviewing the literature identified that while the relationship between nutrition and physical development is widely accepted, the notion that nutrition can impact cognition or cognitive performance is less well understood. There is also limited research into what parents' views are on the possible influence or impact of food on learning, and the research that is available is European-centric and quantitatively orientated. No research was found on New Zealand parents' views on this topic. There were national health surveys conducted by the New Zealand Ministry of Health which provided some insight into the health and wellbeing of New Zealand adults and children but the public message still seems to be predominately about healthy diets, making healthy food choices and increasing physical exercise (Ministry of Health, 2019). There seemed to be

limited awareness as to other factors, including the relationship between nutrition and cognitive performance or learning (Ministry of Health, 2017b).

As an educator, the questions then arose: for parents to ensure a child's future attainment and success, understanding the association between nutrition and cognitive performance would be important but how can parents knowingly moderate their child's diet to support optimal learning without this awareness? If they did have this knowledge, understanding whether they were moderating their children's diet to support optimal learning would be insightful and if no moderation was taking place, why not?

1.2 Research Proposal

Thus, this research focused on parents. Considering that parents are both gatekeepers of their children's nutritional intake understanding their perceptions, beliefs and attitude would be invaluable in gaining deeper insight into ways to ensure a child's future attainment and success. The study therefore aimed to examine New Zealand parents' perceptions of the relationship between nutrition and learning in children. Furthermore, in order to elicit and listen to parent's [multicultural] perspectives and experiences, a more qualitative research design would be needed. Due to the limited research on this topic in New Zealand, an exploratory case study was undertaken, to establish potential themes, which could then be expanded on in future research before any theories on this topic were established.

1.3 How was the research done

The study was conducted by interviewing parents from a multicultural primary school in a large metropolitan area in New Zealand, selected for its diverse cultural community as well as this researcher having no affiliation to the chosen school. Five parents volunteered to be part of the exploratory case study. They all had children aged 5-12 years of age. This age group was chosen because parents would be predominately responsible for their food intake. Each parent was involved in one 45-60 minute interview, which was recorded and transcribed. Consent forms were signed by all participants.

1.4 Outline of this Thesis

Chapter 1 is an introduction to the research study. It outlines the background context to the study and why the study was undertaken.

Chapter 2 is a review of the literature. It explores current research on the effects of nutrition on cognitive performance, parental views on the effects of nutrition on cognitive performance and identifies gaps in the research about how New Zealand parents view the effects of nutrition on cognitive performance.

Chapter 3 discusses the methodology used to conduct the research, and why it was deemed to be appropriate. The research question for the study is introduced. Research principles are examined, such as validity and integrity of the data, and potential ethical issues considered. It further outlines the practical implementation of the research, how the research was managed, challenges that were encountered during the implementation period and how these challenges were mitigated.

Chapter 4 presents the findings of the research, highlighting the key themes that arose from the data. The voices of the participants can be heard in this chapter.

Chapter 5 discusses the findings. The findings of the research are analysed against the literature. Alignment of the research findings with the literature is examined as well as highlighting that the research results make a potential original contribution to the literature in terms of a New Zealand perspective.

Chapter 6 concludes this study. The research question is answered, outcomes and implications from the research are discussed and some recommendations for future research are made.

Chapter 2 Literature Review

This literature review explores the research and scientific evidence supporting the nutrient impact on brain development and functioning; how the psychology and education domains measure cognitive functions; the adverse effects of diet on cognitive functioning and the role parents play in their child's nutrition and the theory behind this role. The review covers the literature on some of the programmes currently in place across the world to support the value of nutritional considerations in supporting a child's education. It also reviews the divergent evidence on the topic of nutrition and cognitive functioning. The review concludes with a focus on the New Zealand landscape, looking at the nutrition statistics available for both New Zealand adults and children to identify their health status.

2.1 Nutrition and Brain Functions

Nutrients are essential for brain development especially during pregnancy and early years where the foundation is laid for the development of cognitive, motor and socio-emotional skills needed throughout childhood and adulthood. Nutritional deficiencies during this stage can thus affect the development of the brain, motor skills and socio-emotional skills, all of which have been linked to cognitive functioning impairment (Benton, 2010; Lam & Lawlis, 2017). Macro nutrients, such as protein, carbohydrates or energy, long-chain polyunsaturated fatty acids (PUFAs), and micro nutrients, such as Vitamin B12, folate, iron, zinc and iodine all support the development of optimal brain structure and function and deficiencies in these areas can lead to alteration of neurons form and function, as discussed below. It is important to understand that these alterations in the brain may be irreversible at a later stage (Benton, 2010).

Protein malabsorption and deficits have been shown to directly affect the hippocampus and cortex of the brain especially in the first few years of life (Benton, 2010; Georgieff, 2007; Grantham-McGregor & Baker-Henningham, 2005). The brain, which is the most metabolically active organ in the body, relies on energy or the supply of glucose. The body, however has a limited capacity to store energy, so this energy has to come from the diet, which then highlights the importance of diet composition (Benton, 2010). Humans also have a limited capacity to synthesise long chain polyunsaturated fatty acids such as docosahexaenoic acid (DHA) and yet the brain needs this nutrient for brain functions relating to learning, cognitive development,

memory and speed of performing cognitive tasks. A review of randomised control trials by Stonehouse (2014) spanning countries such as the United Kingdom, South Africa, Mexico, Australia, Indonesia, India and America from 2009 – 2014 concluded that even though more randomised control studies were needed, it was still prudent to supplement a diet with DHA for optimal learning. The brain and its central nervous system are made up of neurons which are central for learning and the forming of new connections as we learn (Sylwester, 1995). These neurons are protected by a myelin sheath which enables the electric impulses that travel along the neurons to fire accurately and quickly, imperative for optimal learning. The development of these myelin sheaths is known as myelination and there are certain micronutrients that are needed for both the development of the myelin as well and the maintenance thereof. Iron is needed for myelination and folate and Vitamin B12 maintain the health of the myelin sheath (Black, 2003) and as such it is reasonable to expect that a lack of myelination would impact cognitive development, which in turn could affect learning (Benton, 2010; Georgieff, 2007). Iron is also needed for the synthesis of neurotransmitters and brain energy metabolism and a deficiency can thus impair processing speed, affect reward-motivated behaviour, concentration and memory (Baldassarre, 2011; Georgieff, 2007, 2011; Riggins et al., 2009). On a positive note, simply supplementing to ensure adequate supplies of iron could reverse poor concentration (Lozoff, 2007).

There is mixed evidence to support the effects of zinc on cognitive functioning. A review by Black (2003) of ten clinical trials, one of which was on foetuses, six trials in toddlers and three in school-aged children provided some support for zinc deficiency decreasing cognitive and motor performance. Of the three school aged trials, two of them showed zinc supplementation benefited reasoning, a neuropsychological process. Gogia and Sachdev (2012) reviewed 13 zinc studies found in the Cochrane library that assessed whether zinc supplementation affected mental and motor development in infants and children, and found no conclusive evidence that zinc supplementation affected cognitive and motor development. These discrepant results align with Benton's (2010) review which concluded that further research was needed to understand the role of zinc in the brain and perhaps its interactions with other micronutrients. Nevertheless, zinc is a key co-factor in many biochemical pathways and physiological functions of the human body (Roohani et al., 2013).

Finally, iodine is one of the nutrients where there does seem to be consensus regarding the necessity of it to ensure cognitive development, functioning and

performance (Benton, 2010). Both a review of the literature and a double blind randomised control study by Zimmermann et al. (2006) of 310 Albanian primary school children aged between 10-12 years, concluded that iodine improved cognitive and motor function in children (Zimmermann, 2009).

2.2 Cognitive Functioning

If brain development is impacted by nutrition, then by extension the functioning of that brain will be impacted by nutrition. And if cognitive functioning relates to the mental processes involved in gaining knowledge and understanding and, as such, is the basis of learning, then learning can be impacted. If school performance and academic achievement are the observable outcomes of learning, then they too can be impacted (Hughes & Bryan, 2003). The mental processes of cognitive functioning include thinking, knowing, remembering, judging and problem-solving all of which constitute a continuous process of learning. These are higher-level functions of the brain and encompass language, imagination, perception, and planning (Cherry, 2019). These functions are commonly categorised into domains, which form the basis of Psychological diagnostic tests and standardised assessment tests of cognition (Bowden, 2017). According to the American Psychiatric Association's Diagnostic and Statistical Manual of Mental Disorders, 5th Edition: DSM-V (DSM-V), the neurocognitive domains are divided into six categories: perceptual motor function; language; learning and memory; social cognition; complex attention and executive function (Sachdev et al., 2014). These encompass Carroll's (1993) eight cognitive abilities, which also include Cattell's concept of fluid and crystallised intelligence (Cattell, 1987).

The domains are further divided into more specific functions or tasks. Perceptual motor functioning includes visual perception, where the brain makes sense of what the eye sees, visuo-constructional reasoning and perceptual-motor coordination, all crucial for gross and fine motor skills. The next category, language, includes object naming, word finding, fluency, grammar, syntax and receptive language. The learning and memory category, where learning is the acquisition of knowledge or a skill and memory is the expression of that which has been acquired, include free recall, cued recall, recognition memory, long term memory and implicit learning. Both language and learning and memory would encompass Cattell's crystallised intelligence. The social cognition category includes recognition of emotions, theory of mind and insight. The next category, complex attention, includes sustained attention, divided attention,

selective attention and processing speed. Finally, executive function includes planning, decision making, working memory, responding to feedback, inhibition and flexibility which includes Cattell's fluid intelligence - culture free, nonverbal reasoning and logical problem solving skills (American Psychology American Psychiatric Association, 2013; Cattell, 1963).

These cognitive functions, which form the basis of learning are often externally observed or measured by school performance or academic achievement. It is important to recognise though that these measures are embedded in cultures and while they can be and are used as cognitive function measures, one should be cognisant of cultural differences. Different cultures may place more or less emphasis on the importance or value of school performance and academic achievement (Bevan-Brown, 2001; Neisser et al., 1996; Yamamoto & Holloway, 2010), and these measures may even be considered too narrow a view of cognitive functioning in certain cultures or as a primary measure of cognitive function. Examples include: African American culture includes emphasis on experiences in aspects of spirituality, harmony, movement, expressive individuality, communalism and oral ability (Neisser et al., 1996) as opposed to competition within the typical American schools. Asian cultures place greater importance on school achievement through effort than specific talent (Yamamoto & Holloway, 2010). Māori culture believes in allowing children to reach development stages in their own time that is each child's individuality (Bevan-Brown, 2001), so assessing a person at a particular time may not be a worthy measure. Again though, caution is needed so as not to assume that everyone within a culture holds the same view. These examples highlight that cultures differ and even though evidence supports the impact of nutrition on cognitive functioning, parents of different cultures may value the importance of this relationship between nutrition and cognitive functioning differently and so exploring their views in light of their cultures is needed.

2.3 School Performance / Academic Achievement

School performance, or academic achievement, represents performance outcomes which reflect the extent to which a person has accomplished specific educational goals or milestones through their schooling (Hattie, 2009). Academic achievement is an observable outcome of a child's cognitive development (Hughes & Bryan, 2003). A child's ability to learn academic skills, such as reading, spelling and numeracy, underpins his/her ultimate level of academic achievement at school which in turn effects

their choices on leaving school. There are numerous variables that can influence school performance and academic achievement, such as teacher and student personality, peer influences, teacher skill and knowledge, curriculum interest, children abilities, resources and nutrition, nevertheless school performance and academic achievement are still seen as significant influencers on children's future productivity, health and social outcomes (Burrows et al., 2017). They are a marker that some see as indicative of opening avenues for future opportunities and pathways to success. Academic achievement is assessed through school grades and teacher ratings of school performance (Hughes & Bryan, 2003), but is not a robust indicator of assessing nutritional effects. Studies that attempt to measure the effects of nutrition on school performance or academic achievement have the enormous task of attempting to account for all the dependent variables and are unlikely to be able to prove their working hypothesis (Perlman et al., 2010). Of greater value would be to use tests that measure cognitive functions or abilities, so that if research is trying to determine the effect of a nutrient on cognitive ability or function, the test is able to be an accurate measure of this function.

2.4 Assessing Cognitive Performance

A number of cognitive tests have been designed with good psychometric properties, standardised for administration in the country or culture, and are sensitive to measurement of cognitive abilities or performance (Hughes & Bryan, 2003). Of these, Hughes and Bryan (2003) have found certain ones to be more appropriate for use in studies that assess nutritional effects in cognitive performance, as seen in Table 1.

Table 1.

Tests of Cognitive Abilities: Details of Norms, Sensitivity to Nutritional Factors, and Ability to Use across Cultures.

Cognitive Abilities and Tests	Norm Details	Prior Use in Nutritional Studies	Suitability for Use across Cultures
Attention			
Visual Attention	USA ¹³ 3–12 years	Similar task used to assess effects of zinc + micronutrients ²⁶	With minimal adaptation
Creature Counting	Finland ¹⁴ 3–12 years	None, but test sensitive to effects of ADHD and traumatic brain injury ¹⁶	Very minimal adaptation, if any
	Sweden ¹⁵ 4–7 years		
Digit Span Forwards	As for WISC-III	Iodine ^{18,27,28}	Translation of digits required
	Australia ¹⁷ 7–13 years	PUFAs ²⁹ Vitamin B ₁₂ ³⁰	
Speed of Information Processing			
Symbol Search	As for WISC-III	None, a modified test (visual search) has been used to assess effects of iodine ^{27,28}	Minimal modification, if any
Coding	As for WISC-III	Iron ³¹ Vitamin B ₁₂ ³⁰ Folate, vitamin B ₁₂ , vitamin B ₆ ³²	Minimal modification, if any
Learning and Memory			
Digit Span Backwards	As for WISC-III	Vitamin B ₁₂ ³⁰	Translation of digits, but repeating in reverse order may not be a familiar concept in some cultures
RAVLT	Australia ¹⁸ 7–15 years	Folate, vitamin B ₁₂ , vitamin B ₆ (in adults) ³²	Translation and some modification of choice of words required
	Australia ¹⁹ 7–14 years		
	France ²⁰ 5–16 years		
	Metanorms ²¹ All ages		
Executive Functions			
Block Design	As for WISC-III	Iodine ³³ Vitamin B ₁₂ ³⁰	Minimal modifications, if any
Verbal or Design Fluency	As for visual attention	Iodine ^{27,33}	Design fluency more suitable across cultures
Stroop Test	Canada ²² 7–12 years	Black-and-White Stroop only: Iodine ^{27,28} Vitamin A and iron ³⁴	Color names may be difficult to translate; cross-cultural versions developed
Intelligence			
WISC-III	USA ²³ 6–16 years	Iron ^{35,36}	Nonverbal subtests require minimal modification, verbal subtests may not be suitable
	Canada ²⁴ 6–16 years		
	France ²⁵ 6–16 years		

ADHD = attention deficit hyperactivity disorder, WISC-III = Wechsler Intelligence Scale for Children, PUFAs = polyunsaturated fatty acids.

(Hugh & Bryan, 2003, p. 415)

Table 1 lists the domains that can be affected by nutrition and the recommended cognitive tests to be used due to their effectiveness in measuring those changes. The

ones listed were assessed to be more sensitive to changes in cognitive functioning, they were also standardised and could be used across cultures with little need for modifications (Hughes & Bryan, 2003).

There is mixed evidence that attention can actually be influenced by nutritional supplementation. Osendarp et al. (2007) undertook two 2-by-2 factorial randomised controlled double blind trials on 396 Australian children and 384 Indonesia children, aged 6-10 years old. They found no significant improvement in Australian and Indonesian children being supplemented with multiple micronutrients for 12 months. Kumar and Rajagopalan (2008), however completed a trial of fifty-one 7-11 year old school children in Chennai, India along with a control group and found significant improvements in attention and concentration in these children who were also supplemented with multiple micronutrients for 12 months. Both studies used WISC-III¹ and NEPSY². Haskell et al.'s (2008) randomised, double-blind, placebo controlled study, also supplemented eighty-one healthy children aged from 8 to 14 years with a multi vitamin and mineral, found improvement in accuracy of attention and reaction time, although a different cognitive test was used. Osendarp et al. (2007) did however find significant improvement in other cognitive domains such as verbal learning and memory with micronutrient supplementation as seen below.

The RAVLT³, like the NEPSY Learning List, assesses memory performance such as immediate and delayed recall and recognition. The RAVLT successfully measured improvement in memory performance with supplementation (Bryan et al., 2002; Muthayya et al., 2009; Osendarp et al., 2007). Lam and Lawlis's (2017) review of 19 clinical randomised control trials on micronutrients, that is, the essential vitamins and minerals, impacting cognitive functioning in children, found mixed results on short and long term memory. It is not that memory did not improve with supplementing nutrients, but rather that the reviewers could not report on unanimous outcomes from the respective studies due to varying methodologies and assessment tests used across the trials.

Speed of information processing is another cognitive ability that can influence how well a child learns from their environment. It is thought to rely on the integrity of the neural communication of the central nervous system (CNS). The time taken to process

¹ WISC-III – Weschler Intelligence Scale for Children, third edition

² NEPSY – Neuropsychological Assessment

³ RAVLT – Rey Auditory Verbal Learning Tests

information develops throughout childhood. Tests widely used to measure speed of processing include WISC-V two subtests: Symbol Search and Coding. Both assess visuo-spatial (perceptual) speed of information processing. Historically these domains have not been found to be associated with deficiency or supplementation of micronutrients, such as iodine, iron or B vitamins (Hughes & Bryan, 2003) but more recent research has found improvement in processing speed for children supplemented with iodine (Gordon et al., 2009; Zimmermann et al., 2006).

Finally, executive functions refer to the cluster of abilities that deal with planning, implementation of strategies, monitoring performance and using feedback to adjust to future responding and vigilance. They are the “meta” cognitive functions and supersede all other cognitive activities. Widely used, valid cognitive tests that measure these executive functions are Block Design from WISC-V, Verbal or Design Fluency from NEPSY and the Stroop Test (Bryan & Luszcz, 2000; Sattler, 2014). Block Design assess visuo-spatial organisation, problem solving, non-verbal abstract reasoning and concept formation. The Stroop Test measures vigilance and the ability to ignore distractions. A comprehensive systematic review by Lam and Lawlis (2017) on 19 randomised controlled clinical trials on the effect of micronutrients on cognitive performance amongst school-aged children concluded that micronutrients positively impacted cognitive development and performance. There were multiple cognitive tests used to measure various cognitive domains, of which a few of the ones mentioned in Table 1 were used in some of these micronutrient/cognitive performance trials and showed positive improvements in executive functions (Kumar & Rajagopalan, 2008; Nga et al., 2011; Osendarp et al., 2007; Zimmermann et al., 2006). Overall Lam and Lawlis’s (2017) review concluded that the most significant cognitive improvement was in fluid intelligence, Cattell’s (1987) measure of culture free, non-verbal reasoning and logical problem solving abilities. This review spanned studies from 2000 to October 2015, extended across both developed and developing countries, with no language restrictions. It originally identified 1425 studies but ultimately narrowed the review down to 19 randomised control studies. The trials tested both individual micronutrients such as iron and iodine and a combination of nutrients. Individual trials within this review did identify improvements in other cognitive domains, such as short and long term memory, attention and cognitive processing speed but not consistently enough across the review (Lam & Lawlis, 2017). A standout key finding was that iodine and

iron deficiencies negatively impacted mental development and learning (Baumgartner et al., 2012; Gordon et al., 2009; Lam & Lawlis, 2017; Zimmermann et al., 2006).

2.5 Adverse Effects of Diet

Besides individual nutrients, the quality of a child's diet can potentially have adverse effects both physically and mentally. A poorer diet quality has been associated with worse cognition (Haapala et al., 2015) and poorer academic performance (Correa-Burrows et al., 2016). Correa-Burrows et al.'s (2016) study compared the diet and academic performance of 365 Chilean students aged 16 years and found that excessive consumption of energy-dense, low fibre, high fat foods was associated with reduced academic performance. Haapala's (2015) cross sectional study reviewed the association of diet quality and cognition in 6-8 year olds and found similar results to the Chilean study, that a poorer diet was associated with worse cognition in children. Their study adjusted for age, sex, parental education, socio economic status and household income. In Denmark, Sørensen et al. (2015) designed a cluster-randomised controlled cross-over trial with 8 to 11 year old children to prove whether a healthy diet (through school meals) influenced concentration and school performance. The trial concluded that although concentration did not seem to improve, reading performance did, which is a complex cognitive activity that involves inferences and there were increased errors due to inattention.

Studies have found that a diet high in fruit, berries, vegetables and fish, congruent with the Mediterranean diet, supported cognition in children whereas a typical "western diet" known to be high in salt, saturated fats and refined carbohydrates with a higher glycaemic index was linked with reduced cognitive performance (Francis & Stevenson, 2013; Haapala et al., 2017; Haapala et al., 2015). This improvement in cognition may be because the micronutrients, polyphenols and flavonoids, found in fruit and vegetables may protect the brain by decreasing inflammation and oxidative stress and by supporting cell proliferation (Haapala et al., 2015). Flavonoids also increase brain derived neurotrophic factor which has been shown to enhance learning and memory and the fatty acid, docosahexaenoic acid (DHA) in fish is directly associated with endothelial nitric oxide synthesis which dilates arteries and increase cerebral blood flow (Frisardi et al., 2010). The limitation in the Correa-Burrows et al. (2016) study, was that they did not consider aspects such as parental health and involvement in children's schooling which they recognised as important factors that could have influenced their

outcome. This highlights the need to understand parents' views, as parents play a significantly influential role in their child's dietary behaviour, either through role modelling their own nutritional habits or being gatekeepers to their child's diet (Brown et al., 2008; Correa-Burrows et al., 2016; Scaglioni et al., 2011; Scaglioni et al., 2008). It would also be worth knowing even if parents were not aware of specific micronutrients, what their view on their children's diet would be in general.

Along with quality of diet, the quantity of food eaten and timing of meals also plays a role in influencing cognitive performance. Children have a higher metabolism rate relative to adults, so they require more regular meals to sustain brain functions and hence skipping breakfast has shown to impair cognitive functioning (Adolphus et al., 2016). Breakfast eating relative to fasting has shown "short term positive domain specific effects on cognition" with improvements in attention, executive functioning and memory improving (Adolphus et al., 2016; Hoyland et al., 2009; Ni Mhurchu et al., 2010). Moreover, children who habitually eat breakfast are more likely to be more active (Sandercock et al., 2010), less likely to be overweight or obese (de la Hunty et al., 2013) and are more likely to have better micro and macro nutrient intake (Andaya et al., 2011; Deshmukh-Taskar et al., 2010).

2.6 Divergent Evidence and Challenges

Contrary to the advocates of nutrients enhancing cognitive performance, Perlman et al. (2010), Kuriyan et al. (2016) and Rauh-Pfeiffer et al. (2014) undertook double-blind, placebo-controlled clinical trials which concluded that although supplementation of micronutrients improved the deficiencies of those micronutrients in children with deficiencies, the supplementation had no significant effect on cognitive or physical performance.

Possible reasons for the lack of improvement in these trials may be that they were not targeting specific micronutrients, there were differences in dosages, different cognitive tests and outcomes were being measured or the quality of supplements was not equal. A study by See et al. (1999) measuring the efficacy and toxicity of nutraceuticals showed less than 3% of nutritional products available in the marketplace are worth buying. Kuriyan et al. (2016) results could come down to efficacy of the supplement or dosage. Kuriyan's trial used multiple micronutrients and a dosage of 60 micrograms of iodine whereas Gordon et al. (2009), who only supplemented iodine used a dosage of 150 micrograms. Gordon's outcomes showed a positive effect on non-

verbal perceptual reasoning which was supported by a randomised control by Zimmermann et al. (2006) and a review which concluded that iodine improved cognitive and motor function in children (Zimmermann, 2009). Perlman et al. (2010) study of 640 American children aged 8-12 year olds focused on a general multivitamin, measured school performance and used scores on Terra Nova and Grade Point Averages (GPAs), both of which may not be suitable for measuring the nutritional effects on cognition (Hughes & Bryan, 2003) and school performance can be affected by multiple variables. Rauh-Pfeiffer et al. (2014) study focused on supplementing B vitamins for three months to 237 German kindergarten children, using recommended cognitive tests to measure speed of processing or short term memory and their results showed no significant improvement in these domains whereas earlier studies out of Vietnam, India and Indonesia showed improvements in short term memory (Lien et al., 2009; Muthayya et al., 2009; Osendarp et al., 2007). The results could be due to quality of supplement (See et al., 1999) or what Benton (2010) review highlighted, that the inadequacy of a diet in developing countries may have more of an impact on cognitive performance as opposed to developed countries, such as Germany, in Rauh-Pfeiffer et al. (2014) study, where diet variations seem to be less influential.

While there are those that have not found evidence for nutrients impacting cognitive performance, the interest in this topic remains. This author ran a search of the Cochrane Library clinical trials, using the keywords “nutrition” and “cognitive performance” and over 70 clinical trials were listed, 20 of which, were from the last two years. These trials range from looking at individual nutrients to multiple nutrients or diets and a number of these trials from countries such as the United Kingdom (UK), Germany, China, India, Vietnam, Philippines, Australia, Indonesia and South Africa provide evidence that nutrition positively impacts cognitive performance (Lam & Lawlis, 2017).

However, the challenge researchers in this field highlight in their conclusions, is the number of variables that can impact cognitive performance, as well as the appropriateness, consistency and sensitivity of the cognitive tests used as tools to assess this cognitive performance and the improvements of it and thus the need for further research (Hughes & Bryan, 2003; Lam & Lawlis, 2017).

2.7 Parent's Role in Children's Nutrition

Irrespective of the science or systems professing the benefits of nutrition for children's learning, parents' or caregivers' nutritional attitudes need to be understood for necessary resources, such as school feeding schemes or parental and child support groups, to be accessed or implemented, for children to maximise their full cognitive potential. Parents are both gatekeepers of their children's nutritional intake (Brands et al., 2012; Gage et al., 2014), and primary role models for their children's dietary behaviour (Aboud, 2011; Haines et al., 2019; Patrick & Nicklas, 2005a). A parent's mind-set or outlook on life (Crum et al., 2011; Crum & Zuckerman, 2017; Hammond, 2018; Lipton, 2020); their attitude towards health (Oakes, 2017); their food choices and feeding practices (Patrick & Nicklas, 2005b; Ronteltap et al., 2012); and their parenting style or practices embedded in their culture and family values, provide a foundation for children as they grow up and become more independent. A positive mind-set has been shown to influence one's health and health choices. An authoritative parenting style, which allows for self-regulation and children's exposure to, and observation of, healthy habits, is more effective than pressurising or controlling a child's food intake (Brown et al., 2008; Jansen et al., 2017; Savage et al., 2007; Scaglioni et al., 2011). There is also evidence to support that repeated exposure to vegetables promotes a child's liking of them (Anzman-Frasca et al., 2012; Savage et al., 2007; Wardle & Cooke, 2008). And responsive feeding practices as opposed to coercive feeding practices can promote life-long healthy eating patterns with the added benefit of reducing the conflict related to feeding children (Curtin et al., 2015; Daniels, 2019). While these strategies may be effective, Scaglioni et al. (2011), Wardle and Cooke (2008), Savage et al. (2007) and (Daniels, 2019) make the point that parents are not given much guidance on how to promote food acceptance, or promote eating behaviours related to appetite so even if they are knowledgeable regards nutrition, they may not be role modelling food acceptance or healthy eating or be able to transfer the knowledge about healthy eating. Perhaps there are other factors or greater priorities for parents, or barriers within their environments such as time constraints (Das, 2015), or cost considerations (Lea & Worsley, 2005), or family member health issues (Cohen et al., 2012; Lee, 2017; MacCormack & Lindquist, 2019; Neece et al., 2012; Yanek et al., 2013), that would then influence their view on the relationship between food and cognitive performance?

Recent research as to parents' attitudes to nutrition and mental or cognitive performance from studies out of Europe has shed some light on parental attitudes

(Brands et al., 2012; Gage et al., 2014). These studies were undertaken because limited research existed about parent perceptions or beliefs regards the concept that nutrition could impact cognitive performance. In addition, considering that parents are the primary providers and gatekeepers of a child's nutrition it would warrant reviewing their attitudes to this concept and in so doing provide data that could inform and design public health communication. Brands et al.'s (2012) study focused on establishing if parents were aware of a relationship between food and mental performance. They interviewed 124 parents of children aged 4-10 years from four European countries to reflect diversity in education and health systems and differences in family attitudes to food. Gage et al.'s (2014) study focused on identifying where parents thought food fitted on a scale of multiple determinants, such as school environment, physical, social, psychological, in affecting mental performance. Two hundred parents across four European countries (England, Germany, Hungary and Spain) with children aged 4-11 years old from varied socio economic groups took part in Gage et al.'s (2014) quantitative study. Of the 200 parents, 90% were mothers, parents from Germany were older and English and German parents had a higher education level than those from Hungary and Spain. Of the Spanish parents, less than 50% were in full-time employment. Parents who had children with special educational needs or a diagnosed medical or behavioural condition were excluded. The study asked parents to sort cards that were possible determinants for mental performance in order of importance for certain elements such as attention, learning, mood and behaviour. Brands's (2012) study confirmed that parents were aware of a relationship between food and mental performance, with food being able to influence mood and behaviour either positively or negatively. Gage's (2014) study found that parents' rated food as less important than physical, psychological and school environment in terms of affecting mental performance but did feel that food could affect mood and behaviour which could in turn hinder attention and thus affect mental or cognitive performance. The attitudes to nutrition and mental performance from the parents of Gage's (2014) study were more focused on regularity of food than the actual composition of the meals. Parents' lowered importance of food composition is concerning in light of the evidence to support the positive impacts of nutrition on cognitive performance (Lam & Lawlis, 2017). Could this simply be that the message about the cognitive benefits of nutrition are not clearly delivered, or received or understood or are there other factors at play? Gage et al. (2014) did find that parents had difficulty conceptualising what was meant

by mental performance and more easily understood the concept when using words like learning. There is also evidence to suggest that socio-economic differences may exist in parental knowledge about food, with higher income parents using contemporary nutritional or medical priorities to inform their knowledge of food, and lower income parents focused on food and its effects on functional capacity (Coveney, 2005). Gage et al.'s (2014) study reflected varied socio economic status and found no statistical significant associations between parents' age, education and employment status, but did note that those with a higher education felt that nutrition had more of a biological effect on mental performance. Neither study specifically highlighted factors that could contribute to what parents felt was important about food and feeding their families or why parents felt this way about the relationship between food and mental performance.

2.8 New Zealand Parents

As this study intends to explore the role of New Zealand parents in their child's nutrition, especially in the light of them being role models, a glimpse into understanding New Zealand adult dietary behaviours from the 2008/09 national nutrition survey may provide some insights (University of Otago & Ministry of Health, 2011). Almost 67% of adults eat breakfast, the rate at which improves with age. Unfortunately eating breakfast declined with increasing neighbourhood deprivation. The recommended three or more servings of vegetables was met by 72% of females which increased with women over 50 years of age. Concerning though, was the age group 15-30 females who were less likely to eat vegetables, especially considering that 28 years is the average for New Zealand mothers having their first child (Statistics New Zealand, 2012). Only 59% of males ate the recommended vegetable intake. A positive for New Zealand adults was 80% seafood consumption, an excellent result for obtaining one's PUFA's. This is supported by a study by Theodore et al. (2009) who found that the consumption of fish was beneficial to children's cognitive development.

Nutrients intake by the New Zealand adult population showed improvements in vitamin B6, B2 and selenium intake. Females, also increased their vitamin E intake and males increased their calcium intake. There were some dips in vitamin A, zinc and potassium. The drop in vitamin A was considered due to a decreased intake of both plant sources (β -carotene) and animal sources (retinol). Two important and concerning nutrient deficiencies were identified; iron and iodine. There was a 4% iron deficiency overall, with it being more common in women, with Māori women 15-18 and 31-50

having the highest prevalence. This iron deficiency in females has increased from 2.9% to 7.2%. Seventy nine percent of New Zealand adults were considered as having a mild iodine deficiency and 47% moderate iodine deficiency. The International Council for the Control of Iodine Deficiency Disorders (ICCIDD) suggests that no more than 20% of a population should have urinary iodine concentration below 50 µg/L (moderate deficiency) (Ministry of Health, 2008). Unfortunately the latest 2018/19 national health survey showed a decrease in fruit and vegetable consumption with only 53% of adults consuming them (Ministry of Health, 2019). So initially, while some statistics hold promise, some are concerning, especially the drop in vegetable consumption and the drop of iron and iodine, both of which have been shown to impact cognitive development and function as mentioned previously.

In terms of role modelling healthy eating habits, the statistics mentioned prior show that, although it could be better, New Zealand parents would be positive nutrition role models. There is often the argument that financial constraints impact food choices and yet, 80% of adults, said they could always afford to eat properly and 59% of household were classified as being fully/almost food secure with another 33% being moderately food secure. The assurance that one has reliable access to food [food security] did decrease with increasing neighbourhood deprivation with 7% of households having low food security (Gerritsen et al., 2008).

If parents are gatekeepers to their child's nutrition it would also then be worth reviewing the nutritional health of New Zealand children and reflecting on the some world health statistics. Some information about New Zealand children can be gleaned from a national children's nutrition survey in 2002 (Parnell, 2003). The children's survey showed 84% of children brought most of the food they consumed at school from home and they were more likely to bring food from home if they were younger thus reiterating the importance of the role of parents in diet decisions for their children in early years. This percentage of home food was higher in New Zealand European families (90%), followed by Pacific children (77%) and then Māori children (75%). As children got older less food was brought from home, nutrient deficiencies increased and obesity increased (Parnell, 2003). This increase in obesity is concerning on multiple fronts with the World Health Organisation listing obesity as being associated with chronic disease (World Health Organisation, 2011) and the Centre for Disease Control and Prevention citing various psychological and social issues due to obesity, extending into adulthood (Centre for Disease Control and Prevention, 2020). The survey provided

limited information on the type of food consumed, and details of what food they were bringing to school was not covered, nor did the survey gather parents' perceptions as the focus was on children's health.

2.9 Programmes to Support Children's Nutritional Needs

There are numerous health and wellbeing programmes that provide evidence for the multiple benefits of adequate nutrition in children. School meal schemes, are just one example of such programmes. These schemes are extensively used across the world, supporting the widely considered view that a nutritionally balanced diet is beneficial to a child's physiological (Field et al., 2005; Spray, 2020) and psychological performance, with consistent support for their short term effects on scholastic achievement (Jomaa et al., 2011; Ministry of Education, 2020a, 2020b).

New Zealand has a number of programmes to foster healthy eating habits with the underlying focus of these programmes being on supporting the family unit's (whanau) nutritional understanding and fostering a collaborative community in which children can thrive. These include government initiatives, corporate sponsored initiatives and charitable organisations.

Government initiatives include one that is provided by the Ministry of Health in collaboration with the Ministry of Education, called Healthy Schools Program (HPS). This is a school community led development approach, focused on the health and wellbeing of the students. Its purpose is to contribute to significant improvements in student outcomes at school, supporting both the student and their whānau "voice" and provide access to free support and tools (Leeson, 2017; Ministry of Health, n.d.). Sixty percent of New Zealand schools are HPS schools. Health and Physical Education is also part of the New Zealand educational curriculum (Ministry of Education, 2014).

New Zealand's nation-wide Plunket service, a not for profit national organisation, provides children [tamariki] services for one to five-year olds and their families [whānau]. Services include parent advice and support, child health promotion and health education, which includes the importance of healthy food and nutrients for optimal child development (Plunket, 2020).

Charitable organisations, some funded by the government, are involved in supporting health and wellbeing such as *5+ A Day* and the New Zealand Heart Foundation's *Fresh Made* initiative and the *Fruits in Schools* initiative. The *5+ A Day* encourages all New Zealanders, specifically children, to eat five or more servings of

colourful fresh fruit and vegetables every day. They work predominately in the education setting (The 5+ A Day Charitable Trust, 2013). *Fresh Made*, managed by the Heart Foundation, is a service involving the education, health and food industry sectors working together to encourage healthier food in schools and early learning services. There is a growing trend where many schools and early learning services have started to outsource their lunch programmes and meals are supplied by local food suppliers. *Fresh Made* supports food suppliers and school canteens to make these fresh made foods healthier because they recognise that consuming healthy foods every day not only improves students' overall health but can also improve their concentration and behaviour (Heart Foundation, 2020) The *Fruits in Schools* (FIS) initiative supplies one piece of produce each school day to decile one and decile two schools (Ministry of Health, 2017a; The 5+ A Day Charitable Trust, 2018). New Zealand schools are currently allocated a decile number that indicates “the extent the school draws their students from low socio-economic communities” and uses this rating system to allocate funding. The lower the decile rating (on a scale of one to ten), the higher the funding (Ministry of Education, 2020c).

Although there is no full state funded government school feeding scheme, some corporates are involved in sponsoring school breakfasts for decile one schools, while a parliamentary bill waits to be passed to allow for all decile one and two schools to be provided with school breakfasts (Ministry of Education, 2015). This school breakfast support varies, from supplying the meals, to providing resources, education material, and collaboration with communities supporting and advising parents/carers and students. This bill is supported by the New Zealand Principals' Federation who recognise that lack of food at the start of the day affects children at school and is a major barrier to their learning, social progress and development (Palfrey, 2011; Spray, 2020). Supply of breakfast is in line with some countries (e.g. United States, Norway, Sweden, and Britain), which have government funded school breakfast programmes. These programmes aim to provide a free healthy breakfast to school children, thereby improving nutrition and academic outcomes (Adolphus et al., 2016; Wade, 2020).

2.10 Cultural Considerations and Family Values

Understanding parental perceptions of children's nutrition would be limited without considering the cultural context of those families or the values that a family may place on food or family meal-times. Cultural influences and family values could impact what

people think and appreciate about food; such as the enjoyment of food; the importance of it; the energy and health value of food; the sociability of eating with others or how it serves as a means to other family or cultural learnings (Aboud, 2011; Groenewald, 2013; Ochs & Shohet, 2006).

Culture and cultural beliefs may influence what food is available to children in a household and what may be culturally appropriate or what decisions are made around food. For example in some developing countries in Asia and Africa breast milk is extended well beyond the 4-6 months with no supplementing of other foods such as fruit and vegetables or mothers believe that children with diarrhoea need less food and fluids. Some of these cultures believe because children don't work, they don't need as much food and so are only fed twice a day (Aboud, 2011).

Food and eating may be used within a household as a platform to socialise and embed family and cultural morals and values into children (Ochs & Shohet, 2006).

Children of different cultures may also get different messages regarding food. Ochs and Shohet (2006) found that in Italian families, there is a greater emphasis on the pleasurable qualities of a meal that is being shared together, whereas in the United States the dominant message at the dinner table is that children should eat their meal because it is nutritious and that if they do they can then receive a reward in the form of a dessert. Interestingly, this latter approach, frames meat and vegetables as food that must be eaten while dessert is cast as a food that children want to eat. This latter approach may also lead to protracted food negotiations and tensions at the dinner table.

Of importance in the New Zealand landscape, specifically from an indigenous Māori perspective, is the consideration of a more holistic view in terms of health and education. Two examples of this are, (1) a study that undertook to assess the nutrition of Māori children was seen as unfavourable because it excluded indigenous foods which alienated respondents and (2) a study measuring the health of New Zealanders by removal of symptoms was limited because a Māori perspective on health follows a more holistic interpretation; good health is seen as a balance between mental (hinengaro), physical (tinana), family/social (whānau), and spiritual (wairua) dimensions (Durie, 2004). Thus, trying to isolate the importance of nutrition on cognitive functioning may not be a worthy goal in the New Zealand context.

Along with the influence of culture on food behaviours/perceptions, culture also plays a role in the views and assessment of cognitive functioning or aspects thereof (Hughes & Bryan, 2003; Neisser et al., 1996) as highlighted in Section 2.2. When

viewing and assessing intelligence, a domain of cognitive functions, Neisser et al. (1996) caution that cultures differ in the meaning of it, or the value placed on it or the accuracy of the measurement of it. Attaining that high grade point average or measuring intelligence via standardised assessment rather than measuring performance may matter more to some than others. Neisser et al. (1996) also highlight the possibility of test bias in terms of language or exam administration considering that most cognitive assessment measures originate from an English American Western perspective. Hughes and Bryan (2003) corroborate the possibility of test bias and recommend which cognitive assessment tools would be better suited in the research of the impacts of nutrition on cognitive functioning in children. Another example of differing cultural views on cognitive functioning is Māori culture does not put a time frame over human development. Children learn in their own time and so attaining certain milestones within particular timeframes may not seem relevant (Bevan-Brown, 2001). Would this impact Māori parents' perceptions of nutritional impacts of learning then?

The research process and the gathering of in-depth, meaningful data also needs to consider cultural contexts. In New Zealand an understanding of Māori and Pacific Island culture is imperative to ensure accurate research and evaluation data with “the right person [asking] the right questions of the right people in the right way at the right place and time” (Bevan-Brown, 2001 p.139). Bevan-Brown (2001) has shown through her years of research experience that when interviewing Māori families, ideally the interviewer should be Māori; consent should have been asked face to face and given or agreed by relevant elders; interviews should be conducted in Te Reo (Māori native language) if required; with the interviews conducted only after culturally appropriate introductions have been established; questions and the language used needs to be appropriate to Maori culture and the interview location and time convenient and comfortable for the interviewee, whether that be in their home or in a neutral location. These factors would reflect cultural sensitivity and facilitate valid and reliable data. The above considerations are also needed for other cultures within New Zealand.

2.11 Social learning

People or children learn in various ways, one of them being through social learning, as theorised by Bandura's Social Learning Theory, Vygotsky's Social Developmental Theory and Lave's Situational Learning (David, 2019). According to Bandura, people learn through observation, imitation and modelling (Bandura, 2017; Bandura & Walters,

1977), hence children observing their parents nutritional attitudes, behaviours and feeding styles, or, parents modelling these nutritional attitudes, behaviours and feeding styles could lead to children potentially adopting that same behaviour (Hart et al., 2003; Oliveria et al., 1992; Patrick & Nicklas, 2005a; Skafida, 2013; Yvette, 2010). Yvette (2010) used three focus groups of parents whose children were aged between 6-12 years of age to determine what factors influenced the eating habits, food choice and food preparation practices of African American, Caribbean and Hispanic parents and thus impact their children. Interestingly these parents felt that their children ate more fast food than they did when they were children. Beside this outcome though, the food that parents ate was inevitably what their children ate with a continuation of taste patterns, food choice and cultural influences, even in light of parents being aware of the possible unhealthy food choices their diet may have entailed. Yvette's (2010) study thus supports how influential parents' choices and behaviour can be on their children's behaviour.

Skafida's (2013) study of 2190 five-year-old Scottish children also looked at multiple variables relating to children's eating habits within the family context. Amongst other factors, such as frequency of meal times or whether eating mealtimes together as a family were more beneficial for a child's diet, Skafida found that children eating the same food as parents were more likely to have healthier diets. This outcome seems to indicate that children could be observing their parents eating and thus adopting the same behaviour, however the argument could be that food targeted to children's taste in today's environment may be less nutritious (Lavriša & Pravst, 2019). As mentioned in Section 2.10, meal-times can also create a teaching opportunity, and not just for nutrition but for family communication, values and culture, where children can observe and participate and parents can model the behaviour they would like their children to adopt (Fiese, 2006; Fiese et al., 2006; Groenewald, 2013; Skafida, 2013).

The environment of a child can also affect their learning and behaviour, so parenting style and practices could play a role in a child's view of food and their eating habits, if parents are seen as the gatekeepers to their children's nutritional needs. Baumrind (1967) identified three parenting styles: authoritative, authoritarian and permissive that can affect child development, with Maccoby and Martin (1983) adding a fourth style: neglectful. Support for these theories with regards to children's nutritional intake was found in research done by Brown et al. (2008) and a review by Scaglioni et al. (2008) that showed an authoritative parenting style was more effective than

pressurising or controlling a child's food intake. Skafida (2013) found that families, where mothers felt meal-times were an opportunity for quality time, had healthier diets, suggesting the environment created by parents could thus influence a child's view on food. While the current study is not specifically attempting to identify parenting styles, it is seeking to understand parents' perspectives on the influence of nutrition on their children's learning.

2.12 Summary

There is multiple evidence to support the importance of nutrition for brain development and cognitive functioning, with some nutrients being more impactful than others. If brain development and brain functioning can be impacted by nutrition then by extension cognitive performance or learning and the observable outcomes of learning - academic achievement and school performance, can also be impacted. Poor diet can also adversely affect learning. While there is sufficient evidence, through research or implemented public health and school programmes to support the importance of nutrition for health and wellbeing, there is limited research on what parents' understanding is regards the effect of nutrition on children's learning. And if parents are both role models and nutritional gatekeepers for their children's nutrition or diet, gaining insight into their understanding of this relationship between nutrition and learning, would provide valuable data to inform this field of research. There is some published research based in Europe but none within New Zealand. This exploratory study aimed to understand parents' perceptions of the effects of nutrition on their children's learning.

Chapter 3. Methodology

This chapter focuses on all aspects of the data collection for this research project. It starts with the rationale for the chosen research design and data collection instrument along with an explanation of the research site and the research participants that provided the data and how they were selected. Ethical issues are discussed and addressed, followed by how data quality was ensured. The challenges of collecting data from the field and how some of these challenges were mitigated is also highlighted. The focus of the chapter then moves to the analysis of the data that was collected. It explains the coding methods used and provides examples of the data displays created in order to establish common categories and themes in answer to the research question of what parents' views are with regards to the effects of food on learning. The chapter concludes with acknowledging and discussing some limitations of this study.

3.1 Which Type of Research?

In reviewing the literature, research on the impact of nutrition on cognitive performance seems to primarily fall under epidemiological, quantitative research in efforts to measure the various variables involved and determine the relationship between those variables (Punch, 2014). As the aim of this research was to understand the perceptions and attitudes of parents with regards to this topic, a qualitative approach was deemed more suitable as this approach lends itself to investigation of human behaviour, attitudes and views.

To help researchers understand the difference between qualitative and quantitative research, Punch (2014) and Braun and Clarke (2013) provide a simplified definition of quantitative research being about data gathered in the form of numbers and qualitative research being about data gathered in words. In contrast, Yin (2015) suggests not trying to simplify the definition of qualitative research but rather to consider five features that it embodies:

1. Studying the meaning of people's lives, in their real-world roles;
2. Representing the views and perspectives of the people in a study;
3. Explicitly attending to and accounting for real-world contextual conditions;
4. Contributing insights from existing or new concepts that may help to explain social behaviour and thinking; and

5. Acknowledging the potential relevance of multiple sources of evidence rather than relying on a single source alone (p.9).

Like Yin, Stake (2010) and Merriam and Tisdell (2016) highlight two points listed above, that qualitative research relies primarily on human perception, human understanding and how people make sense of their lives. These two points highlight a more constructivist epistemology (Yazan, 2015) where this current study can comfortably sit, as this study seeks to learn and understand parents' perceptions in their real-world roles and gain a better understanding and knowledge of those parent views.

3.2 Research Question

This study researched the following question:

- What are New Zealand parents' understandings about the effects of nutrition on children's learning?

The process of selecting the research approach and methodology for this research question is discussed below.

3.3 Why a Case Study and which Type of Case Study?

Within qualitative research there are a number of approaches, or what Punch (2014) refers to as "research strategies", that can be employed to undertake the research in order to answer the research questions at hand. Yin (2014) considers 12 "variants" of qualitative research, some examples being ethnography, action research, case study and grounded theory, each with their own merits and purposes. For example, in a grounded theory approach the aim is to generate theory from data whereas action research uses the data to build knowledge to solve practical problems. Ethnography is used to gain insight into a culture or social process in complex behavioural situations (Merriam & Tisdell, 2016; Punch, 2014). However, a case study approach may be better suited to this research question because the purpose of the data gathered is to understand the case in depth in its natural setting, recognising the complexity and its context (Punch, 2014).

Merriam and Tisdell (2016) highlight that a case study is an intensive, holistic description and analysis of that bounded phenomenon. This overlaps somewhat with Stake's four characteristics of qualitative case studies being "holistic", "empirical", "interpretive" and "emphatic" where interpretative means that the analysis of a bounded phenomenon utilises the researcher's knowledge, skills and intuition. For Punch (2014), emphatic means analysing the data within the participants' world, that is

recognising the data sits within a context. The researcher, therefore, needs to understand the context in addition to the phenomena of focus.

Stake (2010) distinguishes three types of cases: intrinsic, instrumental and collective where, in an intrinsic case study, the researcher wants a better understanding of the particular case being studied; in instrumental case study the researcher wants to examine a particular case to give insight into an issue or refine the theory and in a collective case study the researcher extends the instrumental case study to cover several cases. Other researchers, like Yin (2003) classify case studies in terms of: illustrative, that are primarily descriptive studies that seek to explain an unfamiliar phenomenon; exploratory (or pilot) case studies which usually pre-empt or inform a larger scale investigation; explanatory case studies that seek to explain how or why a phenomenon occurs; historic case studies and cumulative studies – the latter is synonymous with collective studies mentioned above.

The value of case studies is they allow for learning if the case is unique or the phenomenon being studied is not yet understood, thus building a clearer understanding (Punch, 2014). Case studies also provide understanding of the important aspects of a new or persistent problem with the potential to conceptualise them for further study which can make an important contribution in combination with other research approaches (Punch, 2014).

Reviewing the research question and purpose of this study, an exploratory case study would allow for deeper insight into what parents think about the impacts of nutrition on their child's learning. This new knowledge could subsequently inform a larger scale investigation and ultimately lead to positive changes to enhance children learning outcomes.

3.4 Data Collection

There is common ground between most qualitative authors in terms of drawing data from multiple sources to capture the case under study in its complexity and entirety (Merriam & Tisdell, 2016; Punch, 2014; Yazan, 2015; Yin, 2015). These multiple sources include documentation, archival records, interviews, direct observations, participant observation and physical artefacts (Yin, 2015), which could be broadly categorised into documentation, interviews and observations. With regards to case studies specifically, there are certain principles that Yin (2015) argues need to be followed in collecting data:

- a) multiple sources of evidence (evidence from two or more sources, but converging on the same set of facts or findings for the purpose of triangulation),
- b) a case study database (a formal assembly of evidence distinct from the final case study report which helps the novice researchers understand how to handle or manage data), and
- c) a chain of evidence (explicit links between the questions asked, the data collected, and the conclusions drawn which helps “follow the derivation of any evidence, ranging from initial research questions to ultimate case study conclusions” (p. 83).

These principles facilitate robust data collection in efforts to ensure empirical research.

Interviews

Interviewing is a good way of accessing people’s perceptions and beliefs from their world view (Punch, 2014; Yin, 2015). Patton (2002) characterises three approaches to qualitative interviewing: (a) the informal conversational interview, (b) the interview guide, and (c) the standardised, open-ended interview.

Informal conversation interview. In the informal conversational (qualitative) interview there is no predetermined set of questions, so the questions flow from the immediate context. Data gathered are different for each person interviewed. The value of this design offers flexibility, spontaneity, and responsiveness, as questions are personalised to gain a deeper insight into the conversation. These interviews are time intensive and require excellent interview skills (Punch, 2014; Yin, 2015).

Interview guide method. The interview guide method (semi-structured interview) provides a framework for the questions and provides topics within which the interviewer is free to explore, probe, and ask questions. The guide helps to make interviewing several interviewees more systematic and comprehensive by delimiting the issues to be explored (Patton, 2015). Some, but not all questions are designed ahead of time and they can be asked in any order during the interview. Wording can change if needed for the situation or to respond to the parents’ worldview or new ideas on the topic (Merriam & Tisdell, 2016). The advantage of this type of interview is it allows flexibility, while still focusing the conversation. It also allows for two-way communication so an interviewee can express their views. Reliable, comparable qualitative data can be gleaned. This interview type could be used to gain an

understanding of parents' perceptions while having the advantage of being able to delimit the topics covered.

Standardised open-ended interview. With the standardised open-ended (structured) interview, each question is carefully worded prior to the interview. Interviewers cannot deviate from the script and the interview does not permit the interviewer to pursue topics or issues that may arise at the time of the interview. This interview type is similar to Punch's(2014) structured interview where pre-established, open-ended questions are asked of interviewees in the same order. This style of interviewing would be unsuitable for this research because valuable insight would be lost if participants were not afforded the choice to express and elaborate on their views. There is also no New Zealand data to draw from regards parents' perceptions, so a potential bias could occur if questions were drawn from only the European data from where this research originated.

Focus Groups. Additional interviewing options include focus groups with the benefit of group participants stimulating ideas or differing opinions. These groups rely on the topic not being sensitive in nature as participants may be reluctant to voice their opinions. Considering this research is interviewing parents about their children and their family's food habits, this could be a sensitive topic with participants hesitant to disclose information in front of other participants. For this reason, focus groups have not been chosen, however it is highly likely that multiple family members may be in the same interview due to cultural nuances within some New Zealand cultural groups, so there is a possibility of differing perspectives being expressed within the same interview.

Observations and Documentation

In this study, observing parents, families or children eating their lunch in order to corroborate interview data were considered, but the practicality and validity of these observations was questioned. Children may alter their eating if they knew they were being observed; multiple observations would be required, so as not to draw any false conclusions, as so many factors could influence lunch choice on a day. Parents opening their homes for a researcher to observe their food habits was considered unlikely and had logistical and timing challenges. Therefore, observation as a data collection method was ruled out of this study. Documentation is another worthy data source (Yin, 2015), but because this is an exploratory study about parent perceptions, the research design did not lend itself to data collection from documentation at this time.

In summary, data collection options were reviewed in line with this research design. Structured interviews would not afford participants the choice to express and/or elaborate their views on nutrition and learning. An informal conversation (qualitative) interview would build a relationship between the interviewer and participants, allow for a two way interaction with open ended questions and would be more culturally appropriate, this type of interview is time intensive, so it was deemed not suitable for busy parents (Bevan-Brown, 2001; Yin, 2015). The semi structured interview was thus chosen to be the most suited, as it allowed for rapport building, pre-planning and preparation of interview questions to facilitate a focused, time bound interview. The interview questions that informed the interview guide were piloted to ensure suitable wording for the New Zealand context and cultural appropriateness, which would elicit quality data from interviews (Patton, 2015). Interview questions were guided by Patton's (2015) interview question types of experience, behaviour, opinion, value and knowledge questions (See Appendix D). Interviews were audio-recorded and transcribed and participant parents were invited to review these transcripts to ensure their perspectives were captured accurately, thus strengthening data quality.

3.5 Sampling

It was identified in the design phase of this exploratory case study that purposeful sampling would be used to gain the most information rich sources while catering to maximum variation (Yin, 2015), in light of the multicultural environment of New Zealand.

School selection

A multicultural primary school in a large metropolitan area in New Zealand was selected for its diverse cultural community and this researcher had no professional relationship to the school to mitigate bias. The school is a decile nine school and caters for students in Years 1 to 8, with 449 children on the roll. This school was selected particularly for its diverse ethnic composition – comprised of 48% NZ European/Pākehā, 10% Chinese; 5% Māori, Indian, other Asian, other European; 4% Middle Eastern; 3% British/Irish and Other Pacific and Sri Lankan; 2% Filipino and Samoan and 1% Cook Island Māori, Korean and Latin America. Accordingly, potential participants come from diverse cultural backgrounds and speak more than one language.

Rationale for Participant Selection

Respondents were invited on a voluntary basis (more details below). As this study was an exploratory case study of parents' views, a minimum of six parents was

considered appropriate for the sample size. Due to the multicultural environment of New Zealand, parents from different ethnicities were favoured. It was important to include parents who could express diverse views, thus reducing potential bias in this study (Yin, 2015). These parents had children aged 5-12. They would participate in a 45-60 minute interview with this researcher, at a suitable time and location for each parent to ensure their comfort. Consent forms would be signed by all participants (refer to Appendix B for an example).

Process of participant invitations

Potential participants were invited in the following sequence:

- a) The school principal was informally approached to ascertain if her school might be interested in participating in the research study. Approval was obtained from the principal on 26 September 2019.
- b) Provisional Ethics Approval for the study was gained on 10 October 2019 and Final Ethics Approval for the study was gained from the Massey University Human Ethics committee on Dec 18, 2019 (Appendix A).
- c) The principal was then contacted by email with details of the proposed study. As previously agreed, she was requested to approach the parents in the school to raise awareness of the study and give the parents an opportunity to respond directly to the researcher if they were interested in being involved.
- d) Information about the study was included in the school newsletter.
- e) Expressions of interest were received from three parents. These prospective participants were contacted by the researcher via phone and/or email to confirm their interest. They were provided with the information sheets on the research project and established their eligibility in meeting the criteria for the study (Appendix C). All three parents met the criteria and interview times were arranged.
- f) Information about the study was repeated in the school newsletter and Facebook page to gain further participants, following which two more parents who met the criteria were selected as participants. Table 2 provides a summary of the participants involved in the study.

Table 2*A Social Representation of the Participants in this Project*

Case Number	Participant Family set up	Age of Children	Work status of parents	Identifiable culture	Role of food in the family	Physical Effect	Behavioral/ Mood Effect	Learning Effect
1	Married Parent's responsibility	7,9	Mother - Full time Father - Full time	Mother – NZ Father - NZ	Chore, Stress, Fights, Fussy eaters, Prevent illness	++	+++	+
2	Divorced Mother's responsibility	8,10,12	Mother - Full time	Mother – Lebanese heritage , NZ citizen	Family togetherness, Pass down traditions	+++	+++	+
3	Married Mother's responsibility	6	Mother - Full time Father - Full time	Mother – NZ Indian Father – Indian NZ resident	Food cultural, celebratory	+++	+++	d/k
4	Divorced Co-parenting	10	Mother - Full time	Mother – SA, NZ citizen Partner – Samoan Father - SA	Family togetherness, Connect with old and new culture	+++	+++	++
5	Married Mother's responsibility	9,12	Mother - Part time Father - Full time	Mother – NZ Father- NZ	Wellness, Medicine, Health	+++	+++	+++

3.6 Ethical Considerations

The research was reviewed and approved by Massey University Ethics committee: Southern B, Application 19/51. Ethical issues were considered when designing this research. Researchers are bound by ethics. They should be virtuous, do no harm and consider the consequences of their actions while performing their duty (Punch, 2014). Within the New Zealand context, research is guided by both universal principles and the Treaty of Waitangi principles and obligations. These principles apply to all cultures within New Zealand.

This study was guided by Massey University's Code of Ethics taking the following principles into account:

- Autonomy
- Avoidance of Harm
- Benefit
- Justice
- Special relationships (Whakapapa)
- Purposefulness (Tika)
- Cultural and Social Responsibility (Manākitanga)
- Justice and Equity (Mana)

Each of these principles is discussed below with respect to their application in this research study. Given obesity is a current health issue in New Zealand, it was felt that some parents may feel vulnerable. In order to uphold the principle of non-maleficence and autonomy, participants were invited through a school, the school disseminated the information sheets regarding the study and only those willing to be involved in the research contacted the researcher. The study also aimed for a multicultural mix of parents thus avoiding targeting specific populations who may be more visible in nutritional related research. To further meet the principle of autonomy, informed, voluntary consent was gained from each participant (refer to Appendix B). Interviews were conducted on an individual basis. Interviewees were offered the option to include family members (whānau), although none of those interviewed took up that offer. These interviews took place with respect for parents and their time, allowing them to define their own space and meet on their terms.

Interviewing people from different cultures required cultural sensitivity in terms of engagement and language. Thus, the interview guide and the information sheets for this

research underwent a thorough peer review process that included cultural advisors, supervisors, and colleagues. Several iterations of the interview questions took place. The interview guide was also reviewed to mitigate possible researcher bias in terms of language or target questions.

Given engagement could differ across cultures and to ensure this research and researcher were cultural and socially responsible (Manākitanga), the method of informing participants about the research was discussed with the school principal and the researcher followed the recommendation of the principal to approach parents via their newsletter and social media.

This research sought to understand parents' views on nutrition and learning while being mindful of participants, school staff and university staff's time. While this research was part fulfilment of a Master's Thesis, it may also inform future research studies related to nutritional choices that influence children's learning.

Participant information remained private and confidential and only the findings of the research would be shared with participants and the school principal.

No conflict of interest was identified with the researcher having no special relationships with the school chosen nor prospective participants.

Some ethical issues occurred during the data collection process. The first interview highlighted the vulnerability of individuals sharing their views on a sensitive topic. To uphold the principle of non-maleficence and autonomy, the researcher let the interviewee speak without interruption. She was reminded of her right to decline to answer a question or participate and could also withdraw from the interview or research

3.7 Data Quality

Every research approach has limitations. However, for qualitative research case studies some limitations can be mitigated by adherence to the craft of qualitative research (Yin, 2015), that is, ensuring trustworthy data. Common criteria for trustworthy data include: credibility, transferability, dependability and confirmability (Lincoln & Guba, 1985). Credibility refers to the confidence in the "truth" of the findings of the research. Transferability refers to how well the results can be transferred to other contexts and dependability refers to how consistent and repeatable are the findings of the research. Finally, confirmability is the degree of neutrality or to what extent are the findings of the study shaped by the participants and not researcher bias, motivation, or interest (Lincoln & Guba, 1985). The findings of the research should be

based on evidence that has been collected and analysed fairly, that is, having made deliberate efforts to ensure the credibility and validity of the data, the interpretation and conclusions are based on that data (Yin, 2015). Several strategies, such as inclusion of the participants' voices, triangulation and member checking, contribute towards credibility. Member checking comprises iterative checking and interrogating of data interpretations. Dependability, or what Yin (2015) refers to as "transparency" and "methodic-ness", can be achieved through the use of audit trails where raw data are separated from the findings enabling the next researcher to clearly follow the research process and determine if the findings match the data (Bowen, 2009; Yin, 2015). Credibility can also be achieved through a code-recode strategy in which the researcher codes the same data twice, after a time interval between each coding, and then compares the results to determine any variations. Confirmability can be achieved through audit trails, triangulation and reflexivity. An example of reflexivity is a researcher's journal where the researcher assesses the influence of their background, their perceptions and interests of the research.

Triangulation is a method of cross-checking data to ensure valid, credible data. There are different types of triangulation: (a) data triangulation; (b) investigator triangulation; (c) theory triangulation; and (d) methodological triangulation (Patton, 2002). Data triangulation refers to the use of different or multiple sources of data on the same topic (Yin, 2015). Investigator triangulation refers to multiple investigators on a study being able to triangulate the dataset, in other words, they compare interpretations of their respective data sets to ascertain similarity. The more similar the interpretations, the greater the validity of their data analysis methods. Theory triangulation involves different perspectives (or theories) about the same dataset and methodological triangulation refers to using different methods. The last three triangulation types do not suit this research design, but data triangulation can be achieved in this study through multiple parent interviews.

When researching cultures, which this study aimed to do, Yin (2015) recommends using Spradley's "Verbatim Principle" for recording data from interviews to ensure the data captures the essence and not stereotypes or any researchers' bias (Yin, 2015).

To strengthen this study and ensure rigour in the findings, the following data quality techniques were applied:

- a) Data were gathered from multiple sources by interviewing parents to allow for triangulation of data.

- b) Interviews were audio recorded and transcribed verbatim and the voices of the parents were included in the interpretations.
- c) A code-recode strategy was used during data analysis.
- d) An audit trail was maintained as well as a detailed description of the enquiry and the participants.
- e) Research procedures were documented digitally and stored. The study also followed its documented research procedures.
- f) Analysis was based on evidence gained from audio-recordings and transcriptions of all interviews with parents.
- g) Transcribed interviews were returned to interviewed parents for validation of accuracy and interpretation.

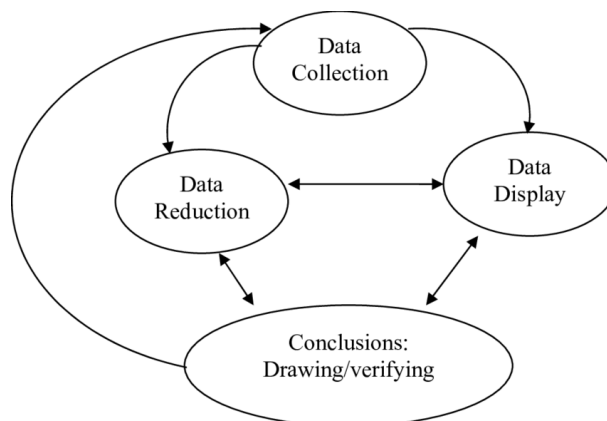
3.8 Data Analysis

Data analysis can be described as “the process of making sense out of the data”. This involves consolidating, reducing, and interpreting what has been said and what the researcher has seen, heard and read (Merriam & Tisdell, 2016; Yazan, 2015). Some authors stress the researchers’ impression and intuition in analysis (Stake, 2010; Yazan, 2015). A quintessential attribute of qualitative research design is that data can/should be collected and analysed simultaneously (Merriam & Tisdell, 2016).

An inductive data analysis methodology was used as well as following the Miles and Huberman Framework for Qualitative Data Analysis (Punch, 2014). See Figure 1.

Figure 1.

Components of data analysis: interactive model. From “Qualitative data analysis,” (p. 20) by M. B. Miles and A. M. Huberman, 1994, Thousand Oaks CA: Sage.



This interactive framework consists of reducing the data collected, through coding and memo-ing; creating displays of data to organise and further summarise the data and finally drawing and verifying conclusions, a process which is interactive, iterative and non-linear (Miles et al., 2014).

Miles and Huberman's (1994) method of analysis was chosen because the research topic was exploratory in nature. The views of parents with regards to the impact of nutrition on children's learning had not been explored in New Zealand and thus a deductive analysis of literature themes was not an appropriate analysis method.

Coding

Data from the interviews were initially coded using line by line coding (Charmaz, 2006) for initial or descriptive codes. Saldana, as described in Miles et al. (2020), refers to this initial round of coding as first cycle coding. Data were constantly compared with other data, following which, the descriptive codes were further reduced or grouped, compared and re-tested against the data. Some codes became redundant, while at times further codes were created. Frequencies of codes were recorded to give an indication of the extent of any emerging themes. Finally, grouping of codes allowed for the creation of categories or themes for further analysis. Figure 2 provides an example of the data coding table. (See Appendix E. Data Coding Table for the complete data coding table).

Figure 2.

Example of Data Coding Table

First Cycle Descriptive Codes	Final Descriptive Codes	Freq	Explanation/Context	Category
LC-Mother's responsibility/ DL- Mother's responsibility /FC- Mother's responsibility	Mother's Responsibility	3	Mothers are responsible for feeding their families	Parent can influence child behaviour towards food
DK- Beh Eff – comfort/emotional eater complicated relationship with dieting and food (teary), grateful it's not passed on to daughter KM –Stressed to point of tears	Mother's behaviour	4	Mother's behaviour or attitude towards food can impact child's behaviour	
FC - Acknowledge parent/genetic influences KM - Acknowledge parent/genetic influences DK - Father insists have to eat all food	Father's behaviour	3	Father's behaviour can influence child's behaviour	
Family togetherness, Family togetherness , Family togetherness Meals, Food is love, Food is love Family sharing day, Family Togetherness	Family togetherness	8	Food brings families together/share their day/family time/love	Value placed on family time and relationships
Family meal time NB ritual , Food is central to our lives Food is everything Duty bound/family values, Meal time important family time NB	Values	4	Food/meals are more about family values than the food	
Live to eat, Food celebration Food celebratory , Food is positive, Real foodie not limited to Indian food	Celebration	5	Food is celebratory/for every occasion /social	
Food for every occasion, Food is communication, Food social, Food social	Connection	3	Foods is a means of connecting families and/or communities	
Food traditional Pass on family traditions, Culture NB, , Food traditional, Food traditional, , Use NZ food/recipes to create a connection with NZ, Pass down traditions	Culture/Tradition	11	Food enables passing down of traditions	Food is central to cultural
Culture influences. Mostly Indian based food Child loves traditional food Food religious Food restrictions due to religion	Culture/Religion	4	Food is culture and religion based	

The descriptive codes used in this first cycle coding included various coding types such as in vivo, concept, emotions, values, attitudes and beliefs (Miles et al., 2020). They consisted of short phrases or words that represented information in the data that were similar or meant the same. For example, the code “family togetherness” was used to represent various examples from parents as to how mealtimes represented family time or sharing one’s day with the family. Some of the words used for coding were not necessarily the participants’ words or words that appeared in the interview data but were used to group data together according to the research topic. For example, healthy diet characteristics represented words that parents consistently used when they referred to a healthy diet such as moderation, balanced meals and all food groups. Other codes were participants’ words (in vivo codes) such as the code “crazy” which parents used to describe how children behaved after eating sugar. Prior coding was considered to be an option due to this study being adapted from Brands et al. (2012) European study, however the original interview questions were modified to account for New Zealand’s multi-cultural environment and agricultural history and hence responses were different. It was important to remain open to all possible theoretical directions, to construct short, simple, precise codes and preserve actions that came up in the interview (Charmaz, 2006). For example, an action identified was tearfulness which provided insight as to the level of stress and anxiety food choices could be for a family.

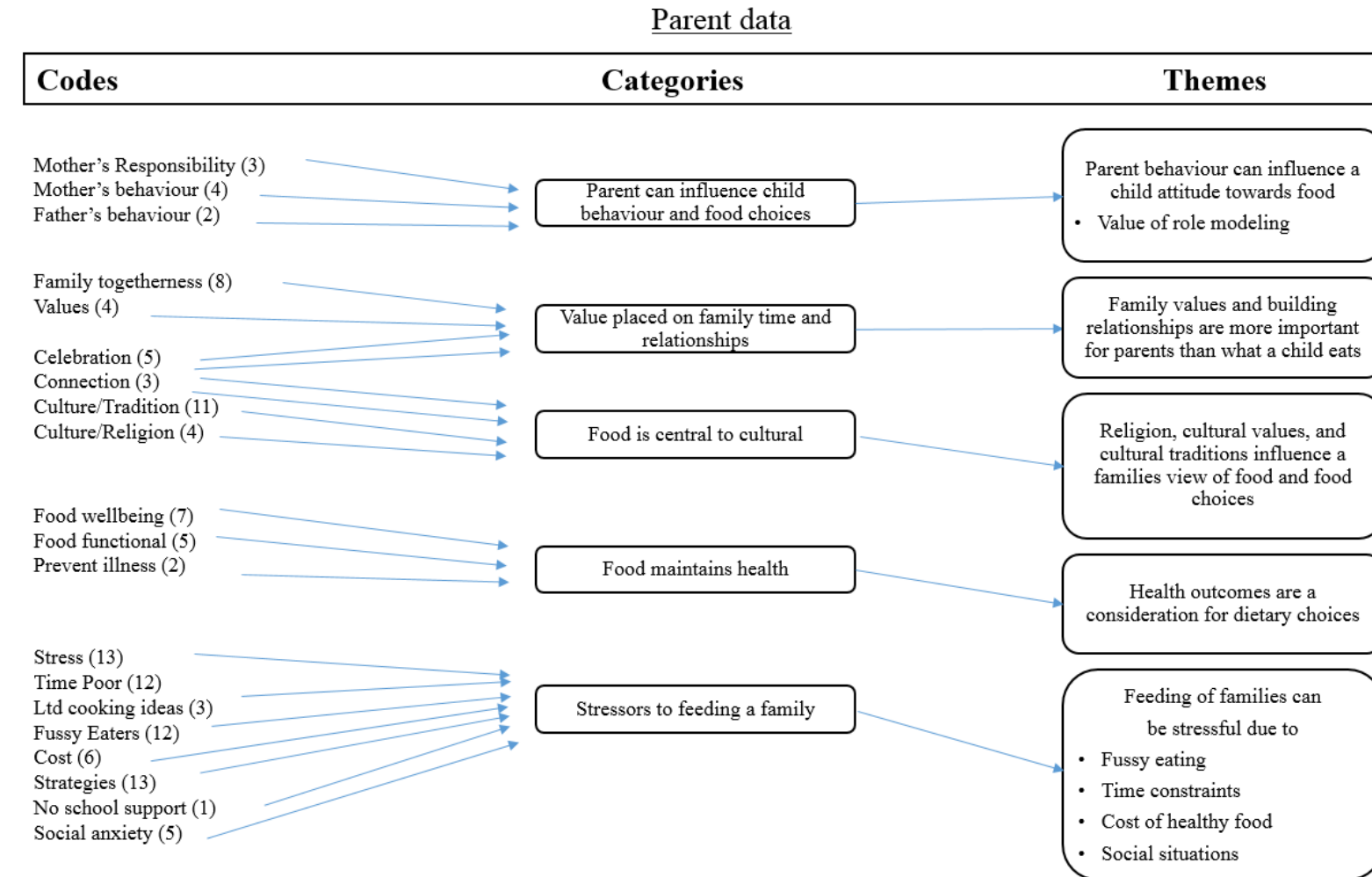
Once the first coding cycle was completed, codes were then grouped together into Pattern Codes (second coding cycle); a method used to identify more meaningful units of analysis (Miles et al.,(2020). This method of grouping codes into patterns helped to develop linkages between data (categories, subcategories, and themes), also known as axial coding (Charmaz (2006). Axial coding helps sort, synthesise and organise large amounts of data and reassembles them in new ways (Charmaz, 2006). Several categories were identified, for example the category of “the value placed on family time and relationships” was a synthesis of the codes “family togetherness”; “values” “celebration” and “connection”. This category reflected the importance of family values, which may influence food selection within a family. To establish if this category held true, it was subsequently tested across all the collected data again and highlights the iterative nature of data analysis. An emerging theme from this analysis was established, reflecting that family values and building relationships are, perhaps, more of a focus for parents than what their children eat or how that food affects them.

Data displays

Categories and themes were then displayed graphically. An example of these displays can be seen in Figure 3. These displays allowed for further analysis of the interconnectedness between the categories/themes. (See Appendix F for the comprehensive data display). This continual, iterative process of data reduction, data displays and drawing and verifying conclusions assisted in data validity (Miles & Huberman, 1994). As an exploratory case study, the emerging themes could provide a foundation for further research as opposed to possible theories being established at this early stage.

Figure 3.

Example of Data Coding Chart



3.9 Limitations of this Study

Covid-19 Pandemic

Data collection was affected due to the Covid-19 pandemic and subsequent lockdown of New Zealand from 25 March to 28 April 2020, which allowed only essential services to operate. An in-person interview had to be rescheduled to an online interview, and ended up being a phone call instead, thus potentially missing parent actions or behaviours that may have been observed in a face to face interview. Another interview, which would have fulfilled the minimum sample size of six, had to be cancelled. This parent was an essential worker, which meant her children were home bound as schools were closed, and thus the time required for an interview was no longer feasible. With the uncertainty of the country's situation, and possible time delays, postponing the interview was impractical. From the data analysed from these five interviews though, common themes were able to be established. Nevertheless, further research with a larger and more varied sample would verify these themes.

Voluntary Participation

Voluntary participation has the tendency to create bias within a research project. All the parents who expressed an interest were mothers, and so the views of fathers have not been "heard" in this study. All mothers interviewed were responsible for the decision making with regards to feeding their children and ensuring a healthy diet. Participants were New Zealanders from varying cultures, but no Māori parents volunteered. Within the New Zealand context, obtaining the views of Māori would be valuable, as the indigenous culture. There was a Pasifika parent in one of the family's interviewed. With culturally sensitive topics, building rapport prior to conducting the research and holding group interviews rather than individual ones may have been less imposing and could have encouraged participation. This researcher acknowledges that time spent building rapport prior to this research may have provided the connection needed for Māori participation. Future research would need to be cognisant of these design limitations.

Interview Technique

Semi-structured, in depth interviews, using an interview guide, were deemed to be the most appropriate data collection instrument. This technique allowed for rapport building with participants, for parents to feel comfortable enough to share their views on food and the effects of it on their children. Additionally, this interview type was more time bound than unstructured interviews and deemed more appropriate for busy

parents (Bevan-Brown, 2001; Yin, 2015). This interview format did have its limitations and challenges though. With the interviews being time bound, there were topics that perhaps sat on the cusp of the research question but could have informed the data such as their views on supplementation and learning. The challenge this researcher experienced with not having a completely structured interview was, in the first interview, the ability of the interviewee to veer off topic and the challenge to refocus them on topic without offending the interviewee. This was especially challenging as the interviewee was very emotional about food and her children, seen in this excerpt from the interview.

Researcher: Can you share with me a little bit about what food means to your family? Parent: (Teary) Fights all the time and stress. One of the girls is really, really fussy and the other one is fussy but not as fussy.

Researcher: Did food used to be a stress?

Parent: Not really. (Teary) Both our parents, our fathers had bowel cancer and that is why we switched to soy and linseed bread and said to the girls we are not having white bread (P1).

This exchange highlights the sensitivity of the topic of food and how food plays a central and often stressful role in parents' lives.

Subsequent interviews improved in adherence to the allotted time and ensured the interviewee provided relevant data to answer the research question at hand. This was achieved by greater confidence from the researcher and the realisation that the purpose of these interviews was to answer the research question and not waste participants' time. As each interview progressed, probes that were highly relevant to the research question helped gain deeper insight into the views of parents. For example, the first interview identified that children could be fussy eaters and the stress this created for parents, thus, in subsequent interviews, if fussy eating came up as a stressor to the family, the researcher probed further into this topic to understand how parents dealt with the fussiness. Being able to enhance the probes through the data collection process, while still maintaining the semi-structured interview schedule, allowed for richer data which informed the research themes identified.

Researcher Subjectivity

Researcher subjectivity or bias can be a limitation of case studies. This researcher has an education and nutrition focus having worked in the education industry and now employed in the health sector. This subjectivity was mitigated in various ways. Firstly, the ethical principles that framed this research as discussed in Section 3.5 were upheld. Secondly, at the data collection stage the use of a nondirective interviewing technique called “Grand Tour” (Yin, 2015) was utilised. This was used as an initial question in the interview, once rapport was established. The purpose of a “Grand Tour” question allowed for the interviewee to present a view on a more general topic, thus avoiding the interviewee being presented with specific research questions and providing answers that they thought the interviewer wanted to hear. This “Grand Tour” technique was implemented in the form of the first question being “What do you and your family feel about food in general?” Interviewees were able to discuss their view on food without worrying about the nutritional or health impact of it. Finally, at the data analysis stage this subjectivity, or risk of preconceived ideas, was checked through a series of questions suggested by Charmaz (2006). Some of these questions were:

“Do these concepts help you understand what the data indicate? If so, how do they help?”

Can you explicate what is happening in this line or segment of data with these concepts?

Can you adequately interpret this segment of data without these concepts? What do they add?” (p.68)

Language

Language can also reflect bias, which was mitigated by reviewing interview questions and recording and transcribing interviews verbatim to ensure the participants’ language was used and paraphrasing was avoided to remove any potential stereotypes or bias. In this study, interview questions were moderated by the researcher’s academic supervisors, as well as a Māori advisor and interviews were audio-recorded, following consent. A further language barrier was this researcher’s inability to speak Te Reo Māori, an official language of New Zealand. This limitation was mitigated as follows: Although not New Zealand born, this researcher is a New Zealand citizen and has resided in New Zealand for 15 years. This researcher also originates from a country with diverse cultures and has professionally trained and taught in multi-cultural environments, thus has experience in being aware of the need to be culturally sensitive. Interviews took place in English, the chosen language of all participants. The

transcriptions and notes from each interview were returned to the respective parents for confirmation of accuracy.

3.10 Summary

Based on the research question that guided this study, a qualitative approach, using an exploratory case study was deemed to be the most suitable. This was because an understanding of New Zealand parents' perceptions or views on the impact of nutrition on their children's learning was required. Semi-structured, in depth interviews, using an interview guide, served as the data collection instrument. Data were collected through interviewing five mothers of differing cultures; whose children attended a primary school in a large metropolitan city of New Zealand. Informed, voluntary participation met the ethical principles of autonomy, non-maleficence and avoidance of bias. Data quality was achieved through triangulation of data from multiple sources, avoidance of subjectivity and bias and following robust methodological processes such as audit trails, member checking and iterative coding strategies. The challenges of the data collection were highlighted, including an unprecedented country-wide lockdown due to the Covid-19 pandemic, impacting the sample size. While there were challenges in collecting data and some limitations to the study, such as participation based on response to a generic invitation via the school newsletter, researcher bias and language limitations, rich data were still gathered. Data were reduced into codes and reassembled into data displays in order to comprehensively analyse the data and identify possible themes. The findings of this data analysis provide some valuable insights into the realities of the world that parents live in and their views, attitudes, behaviours and beliefs towards feeding their family a healthy diet. These findings will be elaborated on in the next chapter.

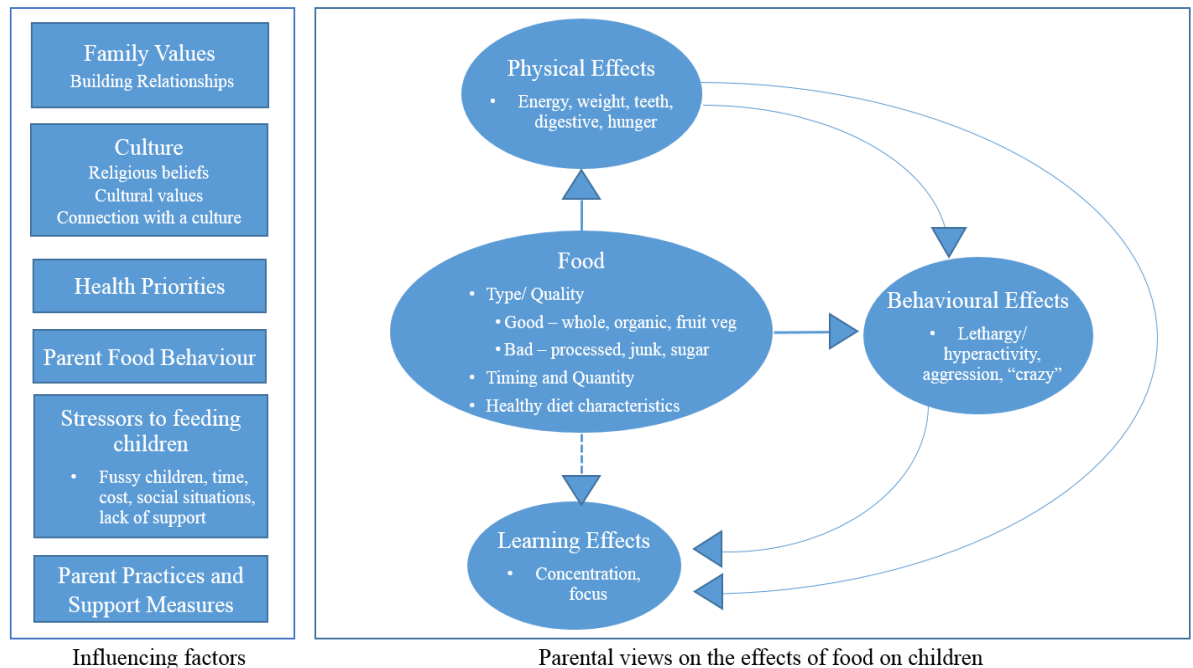
Chapter 4. Findings

This chapter presents the findings from the interviews with parent participants. The purpose of the research and thus these interviews was to gain an understanding of their views about the effects of food on children's learning. This chapter begins with a visual representation of the views that emerged from the interview conversations. Each of these views will then be explained with excerpts from parents referenced. For example, "P1", refers to the first parent interviewed. These excerpts allow for the voices of parents to be heard on the effects of food on children's learning.

A summary of the views of those parents interviewed about the effects of food on children is presented in Figure 4. Parents were aware that food played a role in affecting children physically and behaviourally and that these physical and behavioural effects could then affect learning. The timing and quantity of food as well as the quality of food, which parents labelled "good" or "bad", were the reasons given for these perceived effects on children. Parents were well aware of what constituted a healthy diet. Of significance though were the multiple influencing factors, such as family values, culture, health priorities, parent behaviour and the stressors and support measures that contributed to the task of feeding their children. These influencing factors impacted their views on the effects of food on their children. Each of these factors is discussed below.

Figure 4.

Parental views on the effects of food on children and influencing factors



4.1 Effects of Food

Before focusing on the potential effects of food on learning, parents were asked if they thought diet affected their child. All parents described their first-hand experiences of the effects of food on their children. Without prompting, parents provided examples of how food impacted their children, with energy, mood/behaviour and weight being most common.

I think what they eat has a massive effect on them. It can affect their energy levels, their weight and their mood. (P2)

It effects their energy levels and their behaviour or mood. (P3)

Their teeth and their weight really. (P1)

I believe that too much sugar or empty carbs definitely has an effect on mood and behaviour and energy levels. (P4)

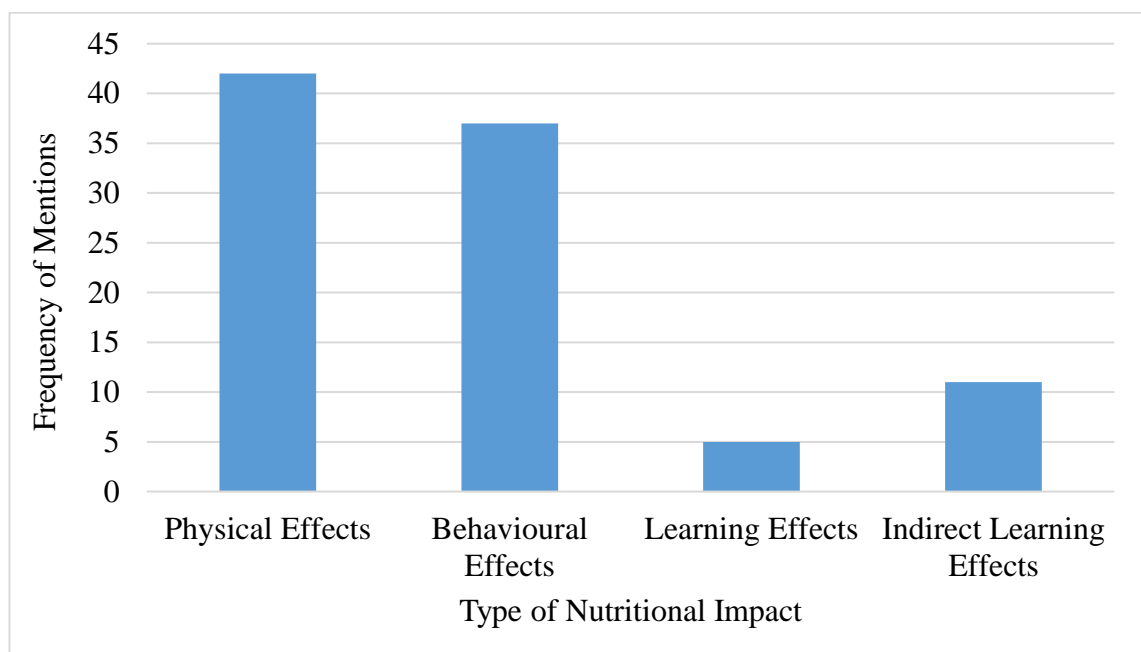
Absolutely, my youngest has got ADHD mildly... If you were meeting her you would never guess that there is an issue but I do think if she was going to school on coco

pops and eating white bread sandwiches and a highly processed muesli bar that we could be looking at a very different child. (P5)

All parents believed that what a child eats affects them both physically and behaviourally. When prompted, the majority felt that food could impact their child’s learning. Figure 5 illustrates these parents’ perceptions on the effects of food on children.

Figure 5.

Parent Perceptions on the Effects of Food on Children



Physical Effects of Food

The physical effects of food on children was mentioned by every participant - energy and weight being most common. Although weight was a physical effect, mothers were also aware of about the emotional sensitivity surrounding weight. One mother was relieved that her daughter “*[hasn't] picked up my emotional eating and weight concerns*” and another mother was conscious of not wanting to highlight her daughter’s weight gain.

I don't want to make it a thing and we don't really say anything about it at home. [Clothing] is getting a bit tight I just don't know what to do about it really. I feel I can't take her to the doctor and ask her, I don't want to hurt her. It's difficult

because you don't want to focus on it or make it an issue. (P1) (Researcher inserted clarifier.)

Other physical effects of certain types of food were digestive issues, sinus and allergies. One parent said her daughter “*definitely becomes bloated when she eats too much bread and gets very gassy*” (P2). She also felt that dairy impacted her children by it “*create[ing] mucous and sinus issues in one child but not another*”. The potential effects of dairy on the body was reinforced by another parent as her eldest child “*was lactose intolerant. She used to get really sore stomach cramps after having milk*”. She went on further to say that her children “*also don't have milk when they have got a cold because it is mucus forming*” (P5). One further comment supported the view that food could impact physically on children - “*digestive issues can cause discomfort and irritability from food that is difficult to digest properly*” (P3).

Behavioural Effects of Food

Parents also believed that food had a significant effect on behaviour (Figure 5). Again, as with the perceived physical effects on children, the quality and type of food was the focus of those behavioural issues. Parents' description of some noticeable behavioural effects were “*feral*” and “*crazy*” (P1) versus “*calming*” (P3 & P4) and “*even keeled*” (P5). “*Irritable*”, “*anxious*” and “*aggressive*” were others' descriptions of behaviour (P1 & P3). Most of these effects were the result of either the type or quality of food or the quantity or timing of food eaten as elaborated on below.

Effects of Food on Learning

It was interesting to note that unless prompted, no parent mentioned that food had an impact on learning, except for a family who had a child with Attention Deficit Hyper Activity Disorder (ADHD). ADHD is a developmental disorder where a child may have poor concentration, poor control of impulses and can be overactive (KidsHealth, 2020). This family was acutely aware of the impacts of food on children's learning as can be seen from the comment below:

If you were meeting her you would never guess that there is an issue but I do think if she was going to school on coco-pops and eating white bread sandwiches and a highly processed muesli bar that we could be looking at a very different child. (P5)

Once parents were prompted to think about possible effects of food on learning, they recognised that concentration could be impacted by food type, such as sugar or

hydration. For example, *“too much sugar at breakfast has a real effect on concentration as there will inevitably be a low at some point”* (P4) and *“drinking lots of water and keeping a person hydrated helps the brain not to be sluggish”* (P2).

The predominant view from parents on food and its possible impact on learning, was due to the physically and/or behaviourally effects of food on children (see Figure 4 and 5). For example, hunger was the primary example that could impact concentration as seen in the following comments. *“If they are hungry, they are not going to focus”* (P5) and *“many children don’t have access to a proper meal, and this has been proven to have a devastating effect on performance at school”* (P4). Other factors impacting concentration indirectly were overeating or eating food *“that makes them sluggish or bloated, [which] will affect their concentration and attention which would then affect their learning”* (P2). Sugar was again mentioned to *“create hyperactive[y] [leading to] a low and then [children] would not be able to concentrate”* (P3).

4. 2 Quality and Type of Food

In terms of quality and type of food, parents clearly differentiated between “good” and “bad” foods with “good” foods consisting of *“fresh, whole foods and fruit and vegetables”* (P2) as well as *“good protein, good fats”* (P4) and *“no additives no preservatives no colours and organic”* (P5).

At the top of the “bad” food list was sugar. Sugar was seen as the culprit to most negative effects. One description of sugar went so far as to call it *“poison”*. Sugar which included the likes of *“muffins, biscuits, sweets, cakes, cereal bars, cereals”* (P2) as well as *“junk food and fizzy drinks that are sugar”* (P3) was perceived to negatively influence behaviour. Too much sugar was believed to create hyperactivity or *“bursts of energy”* (P3) but could also create *“sluggish behaviour”* (P2) and once the sugar wears off leaves children *“tired and irritable”* (P3). One parent described this effect of sugar as creating *“peek[s] and trough [s] just like it did for adults at 3 o’clock in the afternoon”* (P5). The hyperactivity or lethargic behaviour were then perceived to subsequently decrease concentration and attention.

Other “bad” foods included salt, processed food, junk food, also described as *“instant energy and gratification foods”* (P2) or *“empty carbs”* (P4). One parent stated that *“just the colour of twisters and cheesies makes me worry, ... it just seems like it’s going to make them crazy”* (P1). These “bad” foods were reported by participants to have negative effects on their children’s behaviour, such as aggression, anxiety,

irritability, whereas the “good” foods were perceived by all parents to be more satiating and calming.

4.3 Quantity and Timing of Food

In addition to the influences of the type of food eaten, the amount of food consumed by children was also perceived to be an issue. Parents stated that being hungry or too full could have effects on a child’s physical, behaviour and cognitive performance. *“Lack of food makes her [child] grumpy”* (P3) and *“she gets really feral, really horrible when she is hungry”* (P1). For children, they may not necessarily realise that they are hungry. *“She doesn't usually know that it's happening”* (P1) nor how hunger impacts their behaviour, however for parents the aggression, lack of reasoning or anxiety are clear indications that a meal may have been missed.

If she hasn't eaten her lunch I know when I pick her up, she will be wound up like a cork screw and she will get violent with her sister, she will get antsy and you can't reason with her and I'll look in her lunch and it hasn't been eaten.
(P1)

The opposite of not eating also had an impact on a child with a parent mentioning that overeating resulted in physical and behavioural lethargy. The timing of meals could also adversely affect behaviour. *“At dinner time if we leave it too late, she is passed it and you can't get anything into her, and you can't get any sense out of her”* (P1).

4.4 Healthy Diet Characteristics

Parents were very aware of the general concept of a healthy diet. They all felt that a healthy diet involved *“balance”*, *“moderation”* and *“variety”*. A healthy diet also consisted of *“providing at least three meals a day”* (P2), *“a healthy packed school lunch”* (P1; P2 & P5), meals consisting of *“all the food groups”* (P2, P4 & P5), *“loads of fresh veggies and home-cooked meals”* (P4) and avoiding ready-made or convenience meals which contain processed or artificial ingredients such as *“additives and preservatives”* (P2 & P5). All parents did want these meals to be *“quick and easy”* though, considering how time poor they all felt.

4.5 Influencing Factors

As mentioned at the outset of this chapter, the findings revealed multiple factors, such as family values, culture, parent behaviour and the stressors and support measures that are a reality of a parent's world that contributed to their views on the effects of food on their children.

Family Values

Most parents spoke about the importance of mealtimes and being able to sit down and eat together, although this was not always possible, due to extracurricular activities. Food brought a family together and it was an opportunity to share the day's events with each other. Three of the five parents said food was about "love", "sharing" and "communication", mixed with some nostalgia.

The togetherness of sitting down at the table and sharing your day over a meal is really important to me. Because of this I persevere with the preparation of food for my family. We used to do this as a family. (P2)

We have always sat down to home-cooked dinners as a family for as long as I can remember. (P4)

Food is everything to our family. Food is love. It is [about] sitting and communicating. (P5)

Food was also an opportunity to connect socially, and build relationships whether that be with family, friends or communities which raised the theme of culture, discussed below.

Our families and community events generally revolve around food, so food is social and celebratory and for every occasion really. (P3)

Culture

Two cultural influencers for food and mealtimes were highlighted in the data: (1) food served a religious function and (2) it was also an important means of creating or perpetuating a connection with a culture and passing down family traditions and values.

Firstly, a family's religious beliefs influenced the type of food the family ate. "----- enjoy[s] food from all cultures. I like to try new things with my only self-imposed dietary restriction being on religious grounds" (P3).

From a traditional point of view, parents felt it important to have their families connect with their culture and to pass down traditions:

I want them to continue our cultural traditions with their families one day, so it is important for me to have passed on the tastes and flavours to my children. (P2).

Some cultural rules or values may also have dictated family behaviours.

My father was the real patriarch and my mother cooked delicious food. We would have to wait for him to come home and then we would all sit down together. He would ask us all about our days and share his. I try to do the same with my family. (P2)

For a family that were immigrants to New Zealand, local food provided a means for them to connect with a new culture, *“I like to get local ingredients because I want to encourage a connection with New Zealand”* (P4) while for another, their ethnicity or culture did not influence their food choices and said: *“not at all, because we eat such a wide variety of different cultures foods so it probably has no influence at all to be honest”* (P5).

Health Priorities

Another influencing factor in one family’s food choices was that of avoiding chronic illness, due to a history of cancer in the family - *both our parents, our fathers had bowel cancer and that is why we switched to soy and linseed bread and said to the girls we are not having white bread.* (P1). Another family saw food as both medicine and maintaining wellness. *“[Food] is a support for growth and well-being. I try and use food when the girls are sick to help cure them* (P5).

Parent Behaviour

According to some parents, a parent’s behaviour can influence how a child reacts to food. One mother spoke about how her partner may also experience “hangry” issues, that is, anger onset due to hunger. Fortunately, she said he mitigates this by *“the first thing he has to do is eat his breakfast... else he can't cope”*. This behaviour was noticeable in their child, with her mother stating that *“she's just wired the same way”* (P1). Another observation from a parent on her child’s behaviour was how her child *“will determine whether she will eat something based on the presentation”*. She feels *“she does this as it is sometimes what her father will do. She is her father’s child”*

(P3). One parent mentioned how thankful she was that her daughter had not picked up her trait of being an emotional eater although the child had the “*same sweet tooth*” as “*all the ladies in the family*”. In this mother’s words, “*I blame my mother*” (P4).

Stressors to Feeding Children a Healthy Diet

Parents were also asked what helped or hindered them in feeding their families. The purpose of this question was to understand any potential stressors involved in feeding their families. Noticeable was that all families had the intention of a healthy diet as a base outcome for their families and could articulate the challenges in constantly trying to achieve this baseline.

Fussy children. All parents acknowledged that feeding fussy eaters was stressful and various strategies were used to maintain a healthy diet for their children. One mother cut up carrots into slices and referred to them as “*carrot money*” to encourage her young child to eat them. She also kept fruit in the fridge so when her children were distracted watching television, she gave them a bowl of cut up apples to eat, which they willingly did. However, if apples were part of their school lunch boxes, they did not get eaten because they were not cold. Another mother disguised the vegetables in curries and another mother always had an alternative preferred vegetable on hand if the one on the plate was not eaten.

We offered it you try it you don’t like it that is fine you don’t have to eat it but you do have to try. You can’t say you don’t like it until you’ve tried it. There would always be the offer of the vegetables she would eat, so if you’re not going to eat the coleslaw you can eat grated carrots and the grated apple. (P5)

Another mother recognised that not providing a choice in the house could work. “*I think with the white bread if I just didn’t buy it my son would start to eat the brown bread*” (P2).

Time Poor. Being time poor was a common stress, with most parents both in full time employment. All but one family had two or more children.

I can be rather time-poor. We both work full time, so I need food that is quick and easy to prepare. (P3)

I am time-poor. I am a single parent and I work full time. (P4)

You just don't have time for the hassle. (P1)

More time was a goal and ways to gain that through either “*fresh food deliveries*” (P4), being “*super-organised*” (P5), or food preparation on weekends and quick and easy to prepare meals were strategies parents used to assist them. “*I am always after convenience. I like to get groceries delivered regularly and I love My Food Bag*” (P4).

These strategies applied to the families where parents worked either a typical nine o'clock to five o'clock Monday to Friday week or did shift work, with children that were younger or involved in many extracurricular activities. Food preparation on the weekend was necessary for the family that “*---- pretty much make(s) most [food] from scratch*” (P5) (Clarifier inserted by researcher). The motivation for making all her own food was to ensure they were free from preservatives and additives, thus supporting her view of food being for wellbeing and for managing her child's ADHD. The occasional convenience or take away meal did occur as parents were realistic in achieving this goal.

I have to be honest, there are days where takeaways just have to do. (P4)

They love a Happy Meal. (P1)

Can we please get sushi? (P5)

Cost of Healthy Food. Parents also mentioned the cost of healthy food to be an issue. Eating fresh and buying organic food was considered expensive.

“Buying the best or freshest ingredients is very expensive in New Zealand.” (P4)

“I would love to feed us all organic food, but the price is just too high” (P2)

So, families, if they could, would eat more organic food, but the realities of budget constraints prevented them from doing so. No parent mentioned growing their own vegetables.

Social Situations. Another parent said that social situations with her children created anxiety and stress. She worried that people would think that her child was poorly behaved due to her specific food requirements.

[W]hen we go to other people's houses we find it quite stressful 'cos you think oh my god I have got to make sure that there's something for her to eat 'cos within a few hours, if dinner is a little late I get stressed about what she is going to be like. (P1)

Her efforts to mitigate the behaviour was less stressful than the stress of “*putting up with the drama*”. She did wonder though if her increased stress when entertaining affected her children’s behaviour as she felt her children “*get fussier... [they] tend to get more reactive to having more people*”.

Lack of Support. Lack of support and lack of understanding of the effects of food on children’s behaviour by others was also seen as a stressor. One family had the task of ensuring their child was well fed and at specific times in order to manage her behaviour and found that grandparents and friends were unsupportive, “*they are just a kid don't you remember having kids and what it was like*”. At the school, this lack of support was the school not understanding her child’s specific eating needs. Some examples include at a school sleepover she was “*not allowed to bring any of our own food*” and “*they have just started selling juices in here*” and “*I have emailed the teachers and asked can you please make sure they eat their lunch*”. *They eat whatever they want*” (P1).

The above stressors provide some indication of the challenges to feeding a child a healthy meal that parents navigate on a daily basis. The next section provides some strategies that parents employ to feed their children healthy meals.

Parent Practices

Another factor that influenced parents’ views on the effects of food on their children was the strategies or practices they employed to encourage or coax their children to eat healthy food options. Some strategies included disguising vegetables in meals, or creating a story around food for younger children, or providing a wide variety of healthy options in school lunch boxes. One parent said she “*limit[s] juice and [tries] not to keep any kind of sweets and biscuits in the house so that they only have healthy options available to choose from*” (P2). For two other parents it was about getting their children to try new things “*----tries to find food [her child] loves*” and “*[gets] her to try new things*” (P4). One parent dealt with her fussy eating child “*by not making a big deal of it, offering her the things we knew she would like*”. To explain this further “*say if she didn’t like the protein. I would offer her chickpeas instead so she got to make some of those choices herself*” (P5). Another strategy used by a parent was positive reinforcement. When her child mentioned that her stomach was sore if they had been to a friend’s house and eaten takeaway, her response was “*that’s your body telling you not to eat that kind of food and I’m really proud of you for noticing that*”. She said she

liked doing this “so [that her children] have a better mental and physical connection regards what they are eating”.

Support from Schools

A final influencing factor was how much support parents felt they received from school. Parents said they thought they could get more support from schools, either from nutrition programmes as part of the school curriculum or from classroom practices. Some parents said their children’s school was providing some support. For example, they mentioned that the school requests parents to limit sweets and lollies in lunchboxes. Parents did feel though that more school support could be forthcoming. One parent suggested the school to be more authoritative and check that lunch boxes were healthy. She also wanted teachers to ensure children remained seated for a longer period to eat their lunches before heading out to play. She felt that this way, children would get a chance to eat rather than being distracted with playing and forget to eat. Another parent suggested that the school offer nutrition courses as she felt it would ultimately be the children that bring the message home to all families about healthy eating. As she said, “*from my generation there are very few people who are educated regards nutrition*” (P5).

4.6 Summary

Analysis of the interview conversations show that the majority of parents believed that there was a relationship between what children ate and their physical, behavioural and learning performance, albeit an indirect effect for the latter.

The findings from the study also provided answers to the research question:

What are New Zealand parents’ understandings about the effect of nutrition on children’s learning?

The findings clearly showed that parents in this study were aware and understood the physical and behavioural effects of food on children. Parents observed that diet affected learning, specifically concentration, but that this effect was more an indirect effect, due to either the physical or behavioural effects of food on children. Parents distinguished between “good” and “bad” foods and what constituted a healthy diet and gave numerous examples of how “good” and “bad” food could affect a child. The quantity and timing of food consumed was also a factor that affected children. Parent

values, their culture, their health priorities, their behaviour, their parenting practices and the school support they did or did not receive, all contributed to this complex arena of feeding their children.

The discussion chapter will examine key findings from this research and investigate how they relate to the literature. It will identify where the findings align with or reinforce the literature; where it can add to the literature and areas where it is felt that further research may be beneficial to inform the New Zealand body of knowledge.

Chapter 5. Discussion

This study set out to explore what parents' views were on the effects of food on learning of their children. The literature reviewed indicated parental perceptions of the effects of food related mostly to physical and behavioural effects (Hart et al., 2003) with some published research on parent perceptions of the effects of nutrition on mental outcomes (Brands et al., 2012; Gage et al., 2014). Considering the volume of research supporting the positive effects of nutrients on cognitive performance (Baumgartner et al., 2012; Benton, 2010; Black, 2003; Eilander et al., 2010; Lam & Lawlis, 2017; Stonehouse, 2014), this study aimed to understand New Zealand parents' perception of the relationship between food and a child's cognitive performance. For clarification, in the discussion the words food and nutrition will be used interchangeably. The word "learning" was also used instead of "cognitive performance" for ease of understanding of prospective participants (Brands et al., 2012). For the reader's clarity, the study defined learning as the cognitive functions or mental processes involved in gaining knowledge and understanding (Hughes & Bryan, 2003), that which could be measured by cognitive assessment tools. This was not explicitly explained to participating parents as the intent of the study was to gain an understanding of parents' views about nutrition and learning and wanted to establish if, or how, they defined learning.

The key findings were that that parents were aware and had a sound understanding of the physical effects of food, particularly on the weight of their children. Their understanding of behavioural effects was the most noticeable, with parents being able to identify that quality, quantity and timing of food impacted their children's behaviours. The effect on learning was seen as reduced concentration by the parents, albeit as an indirect consequence of either the physical and/or behavioural effects of food on their children. Parents' views of the effects of diet on their children cannot however be viewed in isolation as family values, cultural influences, health priorities, stress factors and parenting practices were integral to understanding these views. This chapter discusses the key findings of this research.

5.1 Physical and Behavioural Effects of Food on Children

Weight was a predominant physical effect of food that was raised by parents. With 11.3% percent of New Zealand children aged 2-14 years being obese (Ministry of Health, 2019); obesity being associated with chronic disease (World Health Organisation, 2011) and higher weight in children being a predictor of an overweight or

obese adult (Field et al., 2005), it is understandable that weight could be a highly sensitive topic for parents. Besides the known health risk factors, the psychological and social issues associated with childhood obesity, such as bullying, social isolation, depression and lower self-esteem can be long lasting into adulthood (Centre for Disease Control and Prevention, 2020). One parent avoided raising the topic of weight in front of their child and another parent's teary relief that her child had not picked up her emotional eating weight concerns, highlights the sensitivity of this topic. These parents aimed to manage the weight of their children through a healthy, well balanced diet that restricted sugars or "instant gratification" foods and understood the need for children to be physically active.

Behavioural effects were predominantly explained in terms of mood fluctuations caused by either the quality or timing of food. Quality of food was categorised as "good" or "bad" foods where "bad" foods were considered to adversely affect a child physically and mentally and where "good" foods had a positive impact on children. This dichotomy is a common categorisation found in research on food evaluation and food product "healthiness" (Ronteltap et al., 2012), although recognised as not necessarily a constructive categorisation (Oakes, 2017). Viewing food as "bad" has the potential to be a source of anxiety, thus the preferred message may be that food is fuel and all food can nourish the body through variation and moderation. Well-intentioned parents who attempt to control their child's eating by restricting intake of "bad" foods and encouraging the intake of "good" foods may actually foster the eating patterns they are trying to prevent (Patrick & Nicklas, 2005a).

Parents associated "good" foods with a healthy, balanced diet, consisting of whole foods, lots of fruit and vegetables, good quality protein, fish and good fats. This diet is congruent with a Mediterranean type diet and reflects the findings of studies that show that this type of diet supports cognition in children (Haapala et al., 2015). Parents thus may not specifically be focusing on learning for a child, but they recognise that quality of diet does affect children. Although a small sample that cannot be generalised, it was of interest that all parents within the study held the ideal of a healthy diet for their family, whether they could achieve it or not.

Quantity and timing of food were viewed to affect children across the physical, behaviour and cognitive domains, the latter particularly affecting attention and concentration. Research shows that regular breakfast consumption, whether from home or from school breakfast programmes, and the quality of that breakfast, does positively

impact behaviour, and academic performance (Adolphus et al., 2013; Hoyland et al., 2009; Ni Mhurchu et al., 2010). In New Zealand, the recognition of the importance of feeding children to support their learning is seen in the government's school lunch programme which aims to provide lunch to children from communities facing greater socio-economic barriers. The aim is to feed 200 000 children every day by 2021 (Wade, 2020).

5.2 Effects of Food on Learning

The findings of this study showed that most parents did not naturally think that food directly affected learning, but it did have an indirect effect on learning due to either the physical or behavioural effects. Research on the views of European parents with regard to the relationship between food and mental performance also placed a greater emphasis on the physical, psychological and school environment determinants on mental performance than on food (Gage et al., 2014). A possible reason for this reduced awareness of learning effects may be because parents associate learning more with a function of schooling, than a broader definition of learning or cognitive performance. As such, with children being at school, the learning or effects of food on learning are out of sight and not a primary focus for parents. Alternatively, parents may place less emphasis on the effect of food on learning because as stated above, they rate other factors as more influential (Gage et al., 2014).

For a minority of parents that were aware of the effects of food on learning, this effect on learning was predominately on concentration and attention (focus). Attention is a major cognitive process, which underlies other abilities such as learning, memory and more complex mental abilities (Hughes & Bryan, 2003) and concentration can be interpreted as sustained attention. Support for food affecting attention was found in European parents in Brands et al. (2012) study, where attention was considered to be affected by what children ate. These European parents felt the effect on concentration was a consequence of either the behavioural effects of food or the physical effects of food with quality of food and the timing or quantity of food being the catalyst to these effects, which was supported by the parents' views in the current study.

Overall, parents in the current study perceived food to affect their children in various ways and although an ideal of healthy meals was a goal for the families, these effects of food were not necessarily the priority. Other factors contributed to the families' decisions around food choice and intake.

5.3 Family Values

Besides the daily task of fuelling children sufficiently, everyday meal-time interactions are an opportunity to nurture family values and instil and develop a family's cultural values and traditions. Family values give families an outlook on life, a way to view the world and an identity (Groenewald, 2013) and mealtimes can be used as a teaching opportunity for parents (Fiese, 2006). Research has also shown that the occurrence and regularity of the family meal is linked to a more nutritious diet (Andaya et al., 2011; Skafida, 2013), and mothers who felt that mealtimes were an opportunity for quality time also had children that ate healthier diets (Skafida, 2013). While mealtimes were seen as an opportunity to share one's day with each other in this study, by doing so, parents were unknowingly supporting healthier diets. Although all parents in the study were employed full time, parents wanted dinner time to be an occasion in which the family ate together, acknowledging this was sometimes rushed due to time constraints. It is suggested that mealtimes that are less rigidly focused on food choice and more focused on other aspects such as communication will likely present fewer opportunities for conflict, thus creating an environment to foster family togetherness. This togetherness creates a sense of belonging and helps a child integrate into the importance of this special group (Fiese, 2006; Fiese et al., 2006), which may be more valuable than what a child eats.

5.4 Culture

Mealtimes and family values also had a cultural influence that provided a richer context for understanding the views of these parents with regards to food. For some families, religious beliefs determined food choices and for most families, mealtimes were used as a time to nurture the cultural identity of the family. For one immigrant family, local food choice and mealtimes were an opportunity to instil new cultural values and traditions. Ethnographic evidence from various parts of the world supports the notion that food and eating are not just biologically significant, but are saturated with social significance (Ochs & Shohet, 2006). Ochs and Shohet's research identified that food and mealtimes can be rich cultural sites for the socialising of children into these cultures or for "reaffirming moral sentiments of the family and community" (Ochs & Shohet, 2006, p.42). Their research also recognised that the symbolic, moral, and emotional meanings associated with food and eating for cultures can be vastly different. Ochs and Shohet (2006) identified that at the dinner table of many U.S. families, for example, the dominant message is that children should eat their meal because it is good

for their health, that is, it is nutritious whereas Italian families emphasize the pleasurable qualities of the meal they are consuming together. These differing views about food were observed in the findings of this study. Although a small sample, and thus generalisation being inappropriate, it was interesting to note that families who focused on social and family connectedness seemed less stressed and anxious around feeding their families. A cautionary note is needed to not assume that cultural food choices are dictated by one's ethnicity though, as highlighted by the views of one parent within the study, who stated that her culture played no role in her view of food as her family ate foods from many different cultures.

5.5 Health Priorities

Prioritising family health was an interesting influencer in family food choices as well as a highly sensitive topic that would warrant further research especially in light of the opposing mind-sets that accompanied parents' view on health. From a more fear-based outlook, one family focused on restricting certain foods in efforts to prevent future chronic illness while another, more positive view focused on promoting wellness, with no foods being restricted, but rather controlled by being homemade. These differing views also seemed to be accompanied with a certain level of stress. Those families who focused on wellness, seemed less stressed about food choice when they fed their families. Food was a source of enjoyment, family time and providing nutrients to promote wellness. While a fear based view of preventing illness and a more positive view of promoting wellness of health both influenced family food choices in this study, a more positive mind-set has been shown to positively influence health (Crum et al., 2011; Crum & Zuckerman, 2017; Hammond, 2018). Thus, feeding a family a healthy diet may not necessarily have to be solely focused on eating only the "right" foods but rather include a positive mind-set. This positive mind-set may then help reduce stress levels of parents who are rigorously trying to maintain a healthy diet for their children. Reducing stress is important for health as stress has been shown to promote the development and progression of disease (Cohen et al., 2012; Yanek et al., 2013), thus in efforts to prevent disease and the potential stress these efforts create, the stress itself may be doing more harm. Crum (2017) proposes a different view of stress because her research shows that if stress is perceived to enhance the body then this positive perception improves biological markers. Crum's work supports American biologist, Bruce Lipton's work in the field of epigenetics and how the perception of the

environment impacts the body (Lipton, 2020). Lipton and Crum's views reiterate the importance of a positive mind-set which could be a useful tool for families, who are stressed about feeding their families a healthy diet.

5.6 Parent Behaviour

Parents recognised that their attitude or behaviour towards food could influence their child's attitude or behaviour. Parents play a direct role in children's eating patterns through their behaviours, attitudes, and feeding styles (Patrick & Nicklas, 2005a), and they are role models for their children when it comes to nurturing children's healthy eating habits (Aboud, 2011; Brown et al., 2008; Haines et al., 2019; Scaglioni et al., 2008). Research has also shown that eating the same food as parents is the aspect of family meals most strongly linked to better diets in children (Skafida, 2013). Knowing this fact could reduce the stress for parents who prepare separate meals. These research findings highlight the influence that parents can have on their children's diet and armed with this awareness of their behaviour, parents are well placed to influence their children's food choices.

5.7 Stressors to Feeding Children a Healthy Diet

Stress, or factors that create stress, influenced family food choice in their aim to provide healthy meals. Some stressors included food-fussy children, parents being time poor, the perceived cost of healthy eating and social situations.

Parents interviewed recognised how fussy eaters could affect food selection and in efforts to maintain their healthy meal ideal along with the myriad of other family meal-time objectives, how stressful the addition of this high food selectivity could be. This is a common concern with parents, especially mothers, as a review by Daniels (2019) showed that about a third to half of mothers reported that their child was difficult to feed or fussy and how this creates considerable anxiety (Daniels, 2019). Fussy eating is associated with mealtime behaviour problems (Curtin et al., 2015), so less rigid food choices along with not constantly battling with children over what food they should eat or pressurising them to eat can ensure a more amenable family ritual and result in less fussiness (Curtin et al., 2015; Jansen et al., 2017; Skafida, 2013). Parents may need to persevere however as research shows that new foods may need to be offered to and tasted by preschool-aged children ten to sixteen times before acceptance of that food occurs (Savage et al., 2007; Skafida, 2013). Being aware of this normal course of food acceptance is important because approximately one quarter of parents with infants and

toddlers prematurely draw conclusions about their child's preference for foods after two or fewer exposures (Savage et al., 2007; Scaglioni et al., 2011).

Full time employment by both parents within a family led to families being time poor which is a determining factor in food choice for children (Das, 2015; Yvette, 2010). To compound this issue of limited time, was how the timing of meals can affect children's behaviour (Adolphus et al., 2016). Full time employed parents thus emphasised the need for quick easy meals, with the occasional take away meal being more realistic than being concerned over the effects of food on children.

All parents perceived organic vegetables to be a pillar of healthy eating and that if given the choice they would choose organic, if it was not for the prohibitive cost. This view matches research findings on Australian consumer views of organic food, particularly women, who viewed organic as containing more vitamins and thus healthier than conventional food but expense and lack of availability were strong barriers to purchasing organic food (Lea & Worsley, 2005). Interestingly no family interviewed mentioned growing their own vegetables, which could be considered a cost-effective way of providing organic vegetables, especially in a country steeped in agriculture, like New Zealand. The location of the site chosen for this study, being more city based, or their time poorness may explain why parents did not raise the topic of growing their own vegetables. This may be a theme worth exploring in future research in New Zealand, as home-grown vegetables can be a cost-effective way for healthy eating. Consideration for the diverse immigrant population of New Zealand and their views on growing vegetables would be needed.

A final stressor highlighted by one family was trying to manage their child's behaviour in social situations due to her need to eat timely meals and her fussiness. This child's behaviour and anxiousness seemed to be exacerbated in social situations and thus created additional anxiety. To mitigate the potential negative behaviour due to food, her parents either chose to pre-prepare food, or chose to do the cooking when at family gatherings to ensure timely meals. Research shows that being "hangry" is a real affect experienced by many. Negative emotions can be heightened when a person is hungry due to a combination of biology and psychology (Lee, 2018). Interesting the extent of the negative affect can be reduced by acknowledging and labelling the emotion (MacCormack & Lindquist, 2019). This latter point may be helpful for families that struggle with members who experience "hanger" and anxiety issues. Caution may also be needed however, because, even though well-intended, over-control of a child's

environment and over involvement in a child's daily life are often responses that may actually maintain and exacerbate anxious behaviour (Lee, 2017). Research also suggests that reducing parent stress has the potential to reduce behaviour problems (Neece et al., 2012).

5.8 Parent Practices

There were varying feeding practices among the parents in the study. The motivational reasons for these practices were to ensure that their children not only ate a sufficient, healthy diet, but that their children also learnt about healthy eating. The first motive for parent feeding practices is a common motive particularly that of ensuring sufficient quantities of food, perhaps emphasised too much, which then leads to increased parent anxiety, especially for those families with fussy eaters. This need for sufficient food intake, may be based on the evolutionary notion of food scarcity and that parents are "hardwired" to feed their children as often and as much as possible to ensure survival (Daniels, 2019). Feeding practices and strategies thus unknowingly may have this underlying premise. This motive may be very real for some families but for those families where it is not, having an awareness of this evolutionary "hardwiring" may assist in easing some parent anxiety around feeding their children.

The motive of ensuring a healthy diet was achieved through different parenting practices. Some parents used restrictive feeding practices by either not having "unhealthy foods" in the house or restricting the eating of "junk food" and while the intent is sound, parental control of feeding practices, especially restrictive feeding practices, have been associated with poorer self-regulation of energy intake by children (Daniels, 2019; Scaglioni et al., 2018). In addition, restricting children's access to "forbidden" foods also has a paradoxical effect on food preference and energy intake (Savage et al., 2007). Parents thus may have good intentions by limiting what food is available to eat or which food is allowed to be eaten, but both strategies may not actually encourage healthy eating. Opportunities for self-regulation, autonomy and the availability and accessibility of foods have shown to be more successful in shaping children's food preferences (Daniels, 2019; Scaglioni et al., 2018). Encouraging self-regulation and an understanding of the connection between food and the effects on the body, along with positive reinforcement were the strategies employed by one family in this study. Food was not restricted, repeated exposure and tasting of new foods was encouraged but not enforced, and healthy substitute food was the alternative choice in

the event a child did not like a new food. Take away meals were allowed but the children themselves chose healthier options and if they mentioned that they felt unwell after a particular meal they were praised for being aware of noticing the effects of food on their bodies. This praise was in the form of praising a process rather than a person which has also been shown to be more supportive of long term healthy eating (Daniels, 2019). Noticeably, the family of the parent interviewed that employed these strategies had sound nutritional knowledge. This observation would support the value of increasing parent awareness and knowledge of the effects of food on children.

5.9 Support from Schools

Parents interviewed had mixed views when it came to what support they needed to help them maintain a healthy diet for their children. They recognised their role in providing a healthy diet for their children, but some parents also highlighted that external support would be beneficial and welcomed.

The education system was thought to be a suitable platform to provide some support either by including nutrition in the curriculum or providing some classroom practices to encourage healthy eating because the inclusion of nutrition courses had the premise of teaching children who were likely to subsequently teach their parents. One parent interviewed felt her peers had limited nutrition knowledge from being part of an education system that did not provide nutrition education. Interestingly Health and Physical Education is part of the New Zealand Curriculum (Ministry of Education, 2014) so this awareness of health should, in theory, be prevalent in the interviewed parents who were educated in New Zealand. This perception raised by the parent that was interviewed would warrant further research to confirm its validity. As a country, New Zealand has a number of initiatives to support children's nutrition, from government supported initiatives, to community led or charities' initiatives, recognising the value of sound nutrition to support children's learning and by extension the negative effects of a poor diet on children. (Fueled 4 Life, 2019; Ministry of Education, 2020b; Ministry of Health, 2019, n.d.; Spray, 2020; The 5+ A Day Charitable Trust, 2013). These initiatives use the education system as one of their platforms for implementation, however the initiatives are generally targeted at disadvantaged children or lower socio-economic groups. The site chosen for this research was in a mid-range socio economic area and thus the school may not be eligible for these initiatives and the parents from this school, who participated in this study, may not be aware of such initiatives. The education of healthy eating may therefore need to default to parents but as Scaglioni et

al.'s (2018) review of the current data at the time highlighted, parents may not have been given much guidance in this regard. In addition, the discussion of the findings of this current research, which supports the literature (Brands et al., 2012; Gage et al., 2014), shows other factors and stressors may have greater influence on parental food choices than the specifics of the nutritional value of food, particularly when it comes to the effects of food on learning or cognitive performance.

Another possible support mechanism for assisting parents maintain healthy eating in their children may come from school governance or certain classroom practices. Some parents felt schools could promote healthy eating by ensuring only healthy options were available and encouraged at school. This “healthy only” option does go against the research which encourages self-regulation and autonomy (Daniels, 2019; Savage et al., 2007; Scaglioni et al., 2018) but perhaps when the opportunity for teaching or learning is not accessible in the limited time in the tuckshop queue, having only healthy options to choose from, may be a practical approach. The current school involved in the study did encourage the limiting of sweets in lunchboxes, but parents felt that after-care school lunches and options at the school tuckshop could be healthier. New Zealand's Ministry of Education does support nutritious school lunches, based on guidelines outlined by the Ministry of Health (Ministry of Education, 2020a) and applied in one of their 2020 Child and Youth Wellbeing Strategy initiatives called Healthy Active Learning (Ministry of Education, 2020b). This initiative provides toolkits and a health promotion work force to support the adoption and implementation of healthy food and water-only policies. Perhaps because the Child and Youth Wellbeing Strategy is in its infancy, these outcomes have yet to filter through the education system to be recognised by parents as schools supporting them in maintaining a healthy diet for their children. Finally, making time to eat lunches prior to going out to play was thought to be another way classroom practice could support a parent's effort to provide a healthy diet for their children as opposed to leaving children to just go and play. Future research might seek teacher and student perspectives on these aspects.

In summary, discussion of the findings of this research provided insight into multiple factors that influence parents' views on the effects of food on their children's nutrition. The findings show that parents are aware and understand the physical and behavioural effects of food, due to quality, quantity and timing of food. Parents felt learning was impacted because of either the physical and/or behavioural effects of food on children. An aspect of learning identified as being most affected was concentration.

These findings support the research from Europe (Brands et al., 2012; Gage et al., 2014). The insight gained from this exploratory study however highlights multiple influencing factors such as family values, culture and tradition, parent behaviour, stress factors and parenting practices that all contribute to parents' views on the effects of food on their children. These influencing factors support the literature and also provide evidence from a New Zealand context. The next chapter concludes with the implications of this research and recommendations for future research on this topic.

Chapter 6. Conclusion

This research set out to explore the perceptions of parents on the effects of food on learning as there was limited data on this topic in the context of New Zealand parents. As role models and nutritional gatekeepers for their children's diet, establishing parents' views about nutrition and cognitive performance would be key to ensuring a diet that supported optimal learning for a child's future attainment and success. The findings of this study added a New Zealand perspective of parents' perceptions of the effects of food on their children's learning to existing international literature in this field.

6.1 Key outcomes

Parents' views on the effects of food highlighted their awareness of the physical and behavioural impacts of food on their children, while the impact of food on learning was a secondary consideration. The physical effects of food on children's weight, along with the emotional sensitivity surrounding food, was a key theme in the study.

The goal for all the parents was to provide their children with a healthy diet, although that was not always possible. A healthy diet was characterised by them as being well balanced, consisting of whole foods, lots of fruit and vegetables, high quality protein, fish and healthy fats. Quality of food was characterised as "good" and "bad" with the perception that "good" foods have a positive effect on children and "bad" foods have a negative effect on children. Quantity and the timing of food were also thought to impact children's behaviour, particularly in terms of mood fluctuations. Concentration was the predominant learning effect mentioned by parents, but they felt this effect on learning was due to either the physical and/or behavioural effects of food on children.

The standout finding of this research though, was that parents' views of the effects of food on their children cannot be viewed in isolation. Family values, cultural influences, family health priorities, stress factors and parenting practices are key factors which are integral to understanding parents' views on food. These factors allude to a far more complex picture of parenting than a focus on the nutritional value and influence of food, which perhaps highlights why the effects of food on learning were a secondary consideration.

6.2 Limitations of this research

This study is not without its limitations. While efforts were undertaken to mitigate these limitations (see section 3.8), the findings of this research should be viewed in light of these limitations and future research would need to take the following limitations into

consideration. Due to resource constraints and time limitations, this exploratory case study was restricted to one school in a metropolitan city of New Zealand. The design of the study anticipated a small sample size. However this was further hindered by Covid-19 lockdown, thus limiting the representativeness of New Zealand parent views. In addition to the sample size, no Māori parents volunteered for this research, which further restricts obtaining a perspective on a prominent parent group of New Zealand. Participants were also all mothers, and while the responsibility for feeding their children may primarily lie with mothers in some New Zealand communities, greater diversity in participants could potentially have provided alternate parent perspectives.

6.3 Implications of this research

From this initial exploration, the findings suggest that focusing on nutrition and the impacts of it on learning may be too narrow a focus for parents, schools and potential policy makers or health promoting programme designers. Perhaps the view by the current New Zealand government in their Child and Youth Welfare Strategy, which is more generalised to health and wellbeing where learning is an outcome of good health, is a more feasible and achievable approach (Ministry of Education, 2020b). This study, though small has shown that the impact of food on cognitive performance as understood by parents is not a linear cause and effect situation, as the topic of a family's eating habits are influenced by multiple factors. Parents are both role models and gatekeepers to their children's nutrition (Brands et al., 2012; Gage et al., 2014; Haines et al., 2019) and research shows that, for example, increasing hydration or the addition of iron, iodine or polyunsaturated fats does impact the development of the brain and thus cognitive functioning (Benton, 2010; Lam & Lawlis, 2017), but these specifics may not be needed by a parent or a child. As long as there is a goal for achieving a healthy diet, by default, this healthy diet has been shown to improve cognitive performance (Francis & Stevenson, 2013; Frisardi et al., 2010; Haapala et al., 2017; Haapala et al., 2015). What may be of greater benefit is for teachers, schools, health promoters and policy makers to be aware of the specific effects of nutrition on cognitive performance (Benton, 2010; Lam & Lawlis, 2017) so they can help in their various fields of expertise. Teachers and schools could extend their nutrition education practices to the children they teach and potentially influence their parent groups. Health promoters and policy makers could create policies and initiatives that promote cognitive health, while not burdening the child or parent with the detail. There may be a greater

interest from individuals towards understanding and being able to potentially influence one's cognitive performance through nutrition choices as they progress to vocational or tertiary education on their way to their chosen careers.

6.4 Future Research

The design of this research was an exploratory case study to establish any potential new themes with regards to parent views on the relationship between food and learning in the New Zealand context. As discussed, these initial findings do support current literature, although caution is needed due to the small sample size. More research is needed before some definitive theories on this topic can be drawn. Along with a larger participant pool, future research must include Maori families so that findings can be representative of Aotearoa New Zealand whānau and families.

6.5 Value of this research

The findings of this research contribute to the literature and create a promising foundation for further research to validate the views of parents on the effects of nutrition on children's learning. If parents' priorities do not or cannot include the focus of the effects of food on a child's learning, and yet research shows the benefits of such knowledge, then this education may need to be placed elsewhere. Considering how current nutrition initiatives use the education system as one of their platforms for implementation, the education system seems a plausible fit for this increased awareness of the relationship between nutrition and cognitive performance (Ministry of Education, 2020a; Ministry of Health, n.d.; The 5+ A Day Charitable Trust, 2013). The complex mix of factors influencing food choices, may require a multi-pronged strategy which includes multiple audiences from the education arena, and not just parents. Future research may then need to delve into some of these audiences' such as school administrators, teachers and students, to obtain a more comprehensive understanding of their perceptions of the effects of food on learning, in order to inform any strategies.

The findings of this research did show that parents were interested in the topic of nutrition and the effects of it on their children and were open to further learning on the topic. Thus, understanding parent barriers could provide policy makers, or health promoting programme designers, insight into how to approach the topic of highlighting the impact of nutrition on cognitive performance, for maximum effect.

This research identified some practical parenting practices that seemed to help parents in their efforts to feed their children and create a less stressful environment.

These insights, although only from a small sample, may be of benefit to other parents in similar situations. For example, the families that seemed to place greater emphasis on food being about love, communication and family togetherness with mealtimes being about family values, and nurturing culture seemed less stressed and anxious about what their children ate, which also seemed to reflect in less fussy eaters. This insight would warrant further research.

This research may have set out to learn what parents' understandings were in regards to the effects of food on their children's learning, in light of the knowledge that specific nutrients do in fact impact cognition, however, a more complex picture emerged of what food and eating meant for families. Understanding that cognition can in fact be improved by diet may be a worthy goal but knowing the specifics of the individual nutrients is perhaps not that important for parents. Simply working towards the goal of a healthier diet around the family dinner table may lead to enhanced cognition in children.

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Appendix A. Ethics Approval



Date: 18 December 2019

Dear Lauren Horak

Re: Ethics Notification - **SOB 19/51 - Nutrition and Learning – what do parents say?**

Thank you for the above application that was considered by the Massey University Human Ethics Committee: Human Ethics Southern B Committee at their meeting held on Wednesday, 18 December, 2019.

Approval is for three years. If this project has not been completed within three years from the date of this letter, reapproval must be requested.

If the nature, content, location, procedures or personnel of your approved application change, please advise the Secretary of the Committee.

Yours sincerely

Professor Craig Johnson
Chair, Human Ethics Chairs' Committee and Director (Research Ethics)

Appendix B. Parent Consent Form



Nutrition and Learning – what do parents' say?

PARENT CONSENT FORM

I have read, or have had read to me in my first language, and I understand the Information Sheet.

All my questions have been answered to my satisfaction, and I understand that I may ask further questions at any time.

I have been given sufficient time to consider whether to participate in this study.

I understand participation is voluntary and that I may withdraw from the study within two weeks of the interview.

1. I agree/do not agree to the interview being sound recorded.
2. I wish/do not wish to have my recordings or summary of the interview returned to me.
 - a. If yes to 2, please provide email address OR postal address below.
3. I agree to participate in this study under the conditions set out in the Information Sheet.

Declaration by Participant:

I _____ hereby consent to take part in this study.

Signature: _____ Date: _____

Email Address: _____

Postal Address: _____

Appendix C. Parent Information Sheet



Research project: Nutrition and Learning – what do parents' say?

INFORMATION SHEET FOR PARENTS

Introduction

My name is Lauren Horak. I am a trained primary school teacher, but currently working in the health industry. I am doing a research project on the impact of nutrition on children's learning for my Master's in Educational Psychology.

Project Description and Invitation

Feeding our families and all the tasks involved with our children's schooling, form a large part of our daily ritual as parents. This project wants to explore what you as a parent think and feel about food and your children's learning. Can or does food affect your child's learning? Your views will provide information on what Kiwi parents' think about the link between the food children eat and their learning. Hopefully your views will lead to a bigger project to benefit children's learning.

Participant Identification and Recruitment

Your principal has kindly allowed me to share this research information with you. You are invited to join this study, which would involve a 45-60 minute interview, during the day, at the school. You can do this on your own or with a friend or a group of friends. Your participation is absolutely voluntary. Unfortunately due to limited time and funds, this interview would take place in English only. Because I am looking for information about children's food and their learning from a wide range of ages, both boys and girls and a mix of children from different cultures, with children that may or may not be sensitive to food or other stimuli, I may not be able to interview some parents if I already have someone in that category. If that happens I would phone you to let you know.

Project Procedures

Once you agree to participate, your interview will take place at a time that suits you, during Term Four 2019 or Term One 2020, at the school.

What does this mean for you?

- An initial meeting or phone call with me so we can arrange a time to meet in person.
- A 45-60 minute interview, that will take place at a time that suits you during the day, at the school. For example we can even talk when you arrive at school to drop or pick up your children.
- About 30 minutes to check the summary of my interview after a few weeks. We can do this via email or in person, whatever suits you.

Data Management

The information you as a parent gives that may identify you will be confidential and only known to me and my University Supervisors named below. Any other information that could identify you, including the name of the school, will be removed. The interviews will be audio recorded, if you agree to this, so that I can write up the interview afterwards. This will be stored on my computer until I complete my project in November 2020, after which the information will be deleted.

If you would like, at the end of my project, I can email you a summary of my findings.

Participant's Rights

You are under no obligation to participate. If you decide to participate, you have the right to:

- decline to answer any particular question;
- withdraw from the study (within two weeks of the interview);
- ask any questions about the study at any time during participation;
- provide information knowing that your name will not be used unless you give me permission;
- be given access to a summary of the project findings when it is finished.
- ask for the recorder to be turned off at any time during the interview.

If you have any further questions, please do not hesitate to contact me or my supervisors. If you would like to participate, please can you email me or phone me.

Project Contacts

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This project has been reviewed and approved by the Massey University Human Ethics Committee: Southern B, Application 19/51. If you have any concerns about the conduct of this research, please contact Dr Rochelle Stewart-Withers, Chair, Massey University Human Ethics Committee: Southern B, telephone 06 356 9099 x 83657, email humanethicsouthb@massey.ac.nz

Appendix D. Interview Schedule

The interview schedule to be used as a guide in qualitative, semi structured interviews with parents.

Interview Schedule:

1. What are your thoughts about food in general? Prompt: Why do you say this?
2. How does your family feel about food? Prompt: Why do you say this?
3. What are some of the positive features of food in your home/family?
4. What are some of the negative features of food in your home/family?
5. What is important to you as a parent with regard to feeding your children and how does it differ from when you were a child?
6. Can you please share some of your child's eating preferences? Prompt: Why do you think that is?
7. Thinking about school aged children, in your opinion in what ways do you think food could have an effect on their wellbeing and development?
8. You know you child/children best, can you think of any examples of when food has affected them and in what way? Prompts:
 - a. Any physical effects e.g. weight, sleep, energy levels
 - b. Any mood or behaviour effects, how would you recognise these effects (Alertness, restlessness, calm/excited, arousal, anger, fatigue, lethargy, confusion and irritability)
9. In your opinion in what ways do you think the food that children eat can affect their learning? Prompts: Academic performance, concentration, attention, memory
10. Do you think that what children eats affects them now or could it affect them in the future? Prompts: in what ways might food affect them?
11. Thinking about various types of food, are there any specific foods that you think affect children's learning in a good or bad way. Prompts:
 - a. Can you give me some examples of foods that affect children – good and/or bad effects?
 - b. How do you think these foods might have these effects?

Appendix E. Data Coding Table

First Cycle Descriptive Codes	Final Descriptive Codes	Frequency	Explanation/Context	Category
LC-Mother's responsibility/ DL- Mother's responsibility /FC- Mother's responsibility	Mother's Responsibility	3	Mothers are responsible for feeding their families	Parent can influence child behaviour towards food
DK- Beh Eff – comfort/emotional eater complicated relationship with dieting and food (teary), grateful it's not passed on to daughter KM – Stressed to point of tears	Mother's behaviour	4	Mother's behaviour or attitude towards food can impact child's behaviour	
FC - Acknowledge parent/genetic influences KM - Acknowledge parent/genetic influences DK - Father insists have to eat all food	Father's behaviour	3	Father's behaviour can influence child's behaviour	
Family togetherness, Family togetherness, Family togetherness Meals, Food is love, Food is love Family sharing day, Family Togetherness	Family togetherness	8	Food brings families together/share their day/family time/love	Value placed on family time and relationships
Family meal time NB ritual, Food is central to our lives Food is everything Duty bound/family values, Meal time important family time NB	Values	4	Food/meals are more about family values than the food	
Live to eat, Food celebration Food celebratory, Food is positive, Real foodie not limited to Indian food	Celebration	5	Food is celebratory/for every occasion /social	
Food for every occasion, Food is communication, Food social, Food social	Connection	3	Foods is a means of connecting families and/or communities	
Food traditional Pass on family traditions, Culture NB, , Food traditional, Food traditional, , Use NZ food/recipes to create a connection with NZ, Pass down traditions	Culture/Tradition	11	Food enables passing down of traditions	Food is central to cultural
Culture influences. Mostly Indian based food Child loves traditional food Food religious Food restrictions due to religion	Culture/Religion	4	Food is culture and religion based	
Food is growth Food is well being, Food is medicine, No cultural influence	Food wellbeing	7	Food is for wellbeing/medicine/ growth	Food serves health functions
Food not all consuming, Don't enjoy kitchen, Not creative, Eat to Live, Food Functional	Food functional	5	Food functional/ Eat to live	
Motivation for healthy food – multiple cancer deaths in family	Prevent illness	2	Avoiding unhealthy foods prevents illness	

Phys Eff - digestive issues - grains & excess carbohydrates Phys Eff – dairy - digestive issues Phys Eff – Fermented dairy no digestive issues Phys Eff – difficult to digest food - digestive issues Phys Eff – processed food - digestive issues, Phys Eff – ice cream - digestive issues,	PE Digestion	6	Digestion can be affected by grains, excess carbohydrates, dairy, processed food	Food type effects physical
Phys Eff - dairy – mucus forming , sinus issues, Phys Eff - dairy – mucus forming	PE Mucus forming	3	Diary is mucus forming and can affect sinuses	
Phys- Eff – nuts- allergic reaction	PE Allergy	1	Food allergies e.g. nuts	
Phys Eff –ice-cream – hyperactive , Phys Eff sugar - sluggish and not satiated from sugar, Phys Eff – junk food, sugars – lethargy	PE Energy	3	Energy levels can be affected by sugar	
Beh Eff – colorants in processed food -“crazy”, Beh Eff – ice cream /lollies – crazy, Beh Eff – junk food – crazy , Beh Eff – sugar, coco pops, white bread, muesli bar– alters beh negatively, Beh Eff – sugar – negative, Phys Eff & Beh Eff – sugar and salt – burst of energy then tired and irritable, Beh Eff – sugar creates highs and lows	BE Crazy/high/low	9	Colorants, ice-creams, lollies, junk food creates highs and lows, tired and irritable and crazy	Food type affects behaviour
Learn Eff – loss of concentration – high sugars, Learn Eff – loss of concentration – sugar/junk food – lows, Learn Eff – sugar – decreased focus, Learn Eff – avoid sugars, sluggish, Learn Eff – avoid processed food – negative, Learn Eff – avoid sugars, sluggish, Learn Eff – avoid sugars – sluggish - negative	LE Concentration	5	Sugar and junk food leads to loss of concentration and decreased focus	Food type affects learning
Awareness of eff on learning due to Phys Eff. D/K specifics on improving learning Learn Eff – concentration, Learn Eff – loss of concentration if bloated or sluggish , Learn Eff – loss of attention – if bloated or sluggish , Learn Eff – increase water - prevent sluggish brain, Learn Eff – avoid overeating – sluggish Learn Eff – don’t know	PE Concentration	7	Concentration is affected by physical effects of food	Learning indirectly effected due to physical effects of type of food
Organic /Organic /Quality/ Clean (no additives, preservatives). More Fish /Fresh, good quality ingredients/ Good quality protein/ Regular grocery delivery, No processed food, Avoid processed and junk foods, All meals lovingly home-cooked Less red meat	Quality/Type of food	24	Organic, clean, good quality, avoid processed and junk foods	Quality/type of food
Lots of vegetables/ Fruit and veg to counter carbs, veggies in curries	Fruit and Veg	8	Fruit and vegetables form part of healthy diet	
Limit sugars /No sugar /Restrict sugar intake	Restrict Sugar	13	Avoid/reduce sugar	

Food is stressful, Food involves fights Time poor, Eating was social but not since children, Food stress, Food involves fights. Perceived stigma of poor child behaviour in social situation creates stress, Parent anxiety to avoid poor behaviour if eating delayed	Stress	13	Food is stressful/involves fights/ anxiety	Stressors to feeding a family
Not enough time Time poor Time Poor Time Poor Time Poor Time poor Time to experiment Single parent, Full time Occasional takeaways for convenience, Super Organised / Pre- preparation of food, Mother more efficient	Time Poor	12	Parents work full time and are time poor	
Don't know what to cook / not creative /Lack of cooking ideas/ Variety	Ltd cooking ideas	3	Lack of creativity/cooking ideas	
Fussy children, Limited Palate, Food Intolerances, Difficult feeding fussy eaters, Fussy eaters, Fussy Eaters, Fussy eaters dealt with through parenting practices, Given choices but still within food group	Fussy Eaters	12	Fussy eaters are difficult to feed	
Organic food cost issue / Healthy meals within budget/ Best and fresh expensive in NZ	Cost	6	Healthy, organic food is expensive	
Food strategies to cater to fussiness, Food strategies to avoid behavioural issues / Timing important, Strategy – early dinner feeding to avoid behavioural issues creates parent stress, Pre –preparation of food, Strategies for fussy eaters – disguise veggies in curries	Strategies	13	Parents develop strategies to ensure children eat healthily	
Lack of school support	No school support	1	Limited nutritional support from school	
worse when we have visitors/get embarrassed cos they won't eat what they have got ready for everybody else/ I get stressed about what is she going to be like	Social anxiety	5	Social situations create anxiety due to poor behaviour of children	
Awareness of effect of food Awareness of effect of food - ADHD Awareness of effect of food, Awareness of effect of food - "massive effect"	Awareness	5	Awareness of food effecting children	Awareness of food effecting children
Mood /Mood /Mood	Mood	3	Food affects mood	
Behaviour /Behaviour,	Behaviour	2	Food affects behaviour	
Energy Levels /Energy Levels /Energy	Energy	3	food affects energy	
Weight	Weight	3	Food affects weight	

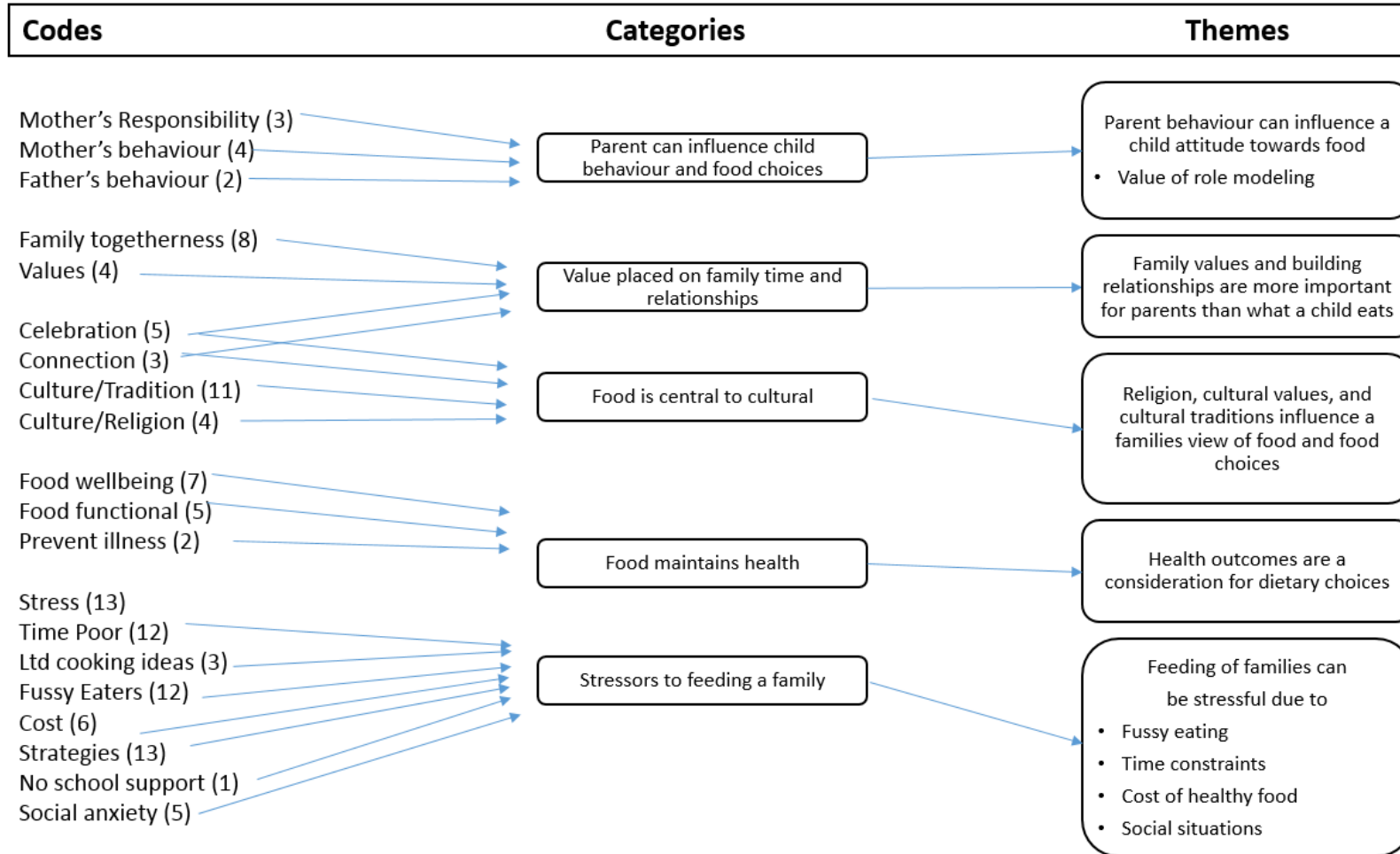
<p>Phys Eff - Healthy food satiating – limits snacking, “Instant Energy and Gratification foods”, Phys Eff - Lack red meat and veggies – iron deficiency</p> <p>Phys Eff - Protein sustains energy longer than carbohydrate, Phys Eff - teeth.</p> <p>Phys Eff – weight (teary), Phys Eff – poor health –white bread, Phys Eff – weight</p> <p>Awareness of long term effects of food, Food affect long term, hormone use, earlier maturity</p> <p>Phys Eff – early years toxins disrupt growth and strength , Awareness of chemicals, genetically modified, processed foods may affect future</p> <p>Long Term eff – diets limiting food groups may be detrimental long term</p> <p>Phy Eff - Poor Nutrition – effect brain development</p> <p>Phy Eff - Sugar/carbs – tooth decay</p>	PE Quality/type	12	Quality of food affects physical performance	Quality of food – affects physical
<p>Beh Eff – empty carbs – negative, Beh Eff – good proteins, good fat – calming, Beh Eff – veg, protein, starch meal – calm, Beh Eff – eaten well – calm, happy, Beh Eff - Low GI Foods – even keeled, Beh Eff - Whole grains – even keeled, Beh Eff – Protein – even keeled</p>	BE Calming	8	Good proteins, fats, low GI foods are calming	Quality of food good/bad – affects behaviour
<p>Learn Eff – whole food, fruit, veg positive</p> <p>Learn Eff - empty carbs – decreased focus</p>	LE Whole foods	3	Whole foods, fruit and veg affects learning	Quality of food affects learning
<p>Phy Eff – activity depletes energy reserves, Phy Eff – sugar excess – insomnia,</p> <p>Phys Eff – lack of food – fidgety</p>	PE Quantity of food	4	Quantity of food affects physical	Quantity and timing of food affects physical
<p>Beh Eff – lack of food – unsettling, Beh Eff – lack of food – anxious, Beh Eff – lack of food – aggressive, Beh Eff – lack of food - lack of reasoning, Beh eff- lack of food – irritable, angry, Beh Eff – lack of food grumpy, Beh Eff – lack of food - feral/ horrible/ snap</p>	BE Lack of food	7	Lack of food leads to irritability, lack of reasoning, anxious “feral”	Quantity and timing of food affects behaviour
<p>Beh Eff – delayed eating results in poor behaviour</p>	BE Delayed eating	8	Timing of food impacts behaviour	
<p>Learn Eff – loss of concentration – if hungry</p> <p>Learn Eff –if hungry – “devastating effect” on school performance</p> <p>Learn Eff – not focus if hungry</p>	LE Hungry	4	Hunger affects concentration and focus	Quantity and timing of food affects learning

Healthy school lunch, Healthy school lunch Provide healthy options only, Greater healthier choices , Greater awareness of good eating choices – media, daycare school, Healthier school lunches, Greater healthier choices	Healthier Choices	7	Parents provide healthier diet choices for children	Healthy diet characteristics
Lunch box variety Food variety NB Variety NB Variety important Variety, Variety	Variety	9	Variety is important for healthy diet	
3 meals a day /All food groups/ Balanced meals, all food groups, All food groups, Don't eliminate a food group, Well balanced, Balanced meals,	Balanced	8	Well balanced meals requires a balance of all food groups	
Moderation	Moderation	2	Healthy diet consists of moderation	
Preference for easy, fast meals, no stress, Quick preparation, Easy Preparation, No stress, Quick meals, Easy preparation, Convenience, avoid stress	Quick and Easy	5	Preference for easy, fast meals but still healthy	Quick and easy healthy meals
Supports school being more dictatorial in healthy food choices/ Schools to offer nutrition courses/ Nut Allergy – teach children rather than ban from school/ Ltd nutrition info from school, except regards no lollies/ After school care - poor food choice / Schools restrict lollies in lunchboxes	School support	6	Schools can play a supporting role in helping parents with healthy eating	More school support
Education changed nutrition outlook, Parenting changed food outlook, Parenting practice, praise for awareness of food effects on body, Children to lead the nutritional change in parents, Children prefer healthy food over McDonalds, Parenting Practice – choices within boundaries reduced fussiness, Parenting Practice - provide healthy options only , Parenting Practice - Exposure to food variety early on leads to reduced fussiness, Parenting Practice - Encouraging child to try new , Parenting Practice - finding food child loves, Parenting practice - fussy eaters given choices but still within food group, Parent awareness - age reduced fussiness, parent awareness - father's fussy eating behaviour influences daughter's food choices, Parent Practice – finish what is on plate - creates anxiety	Parent practice	15	Parents have various parenting practices to ensure healthy eating	Parents have various parenting practices/strategies to ensure healthy eating

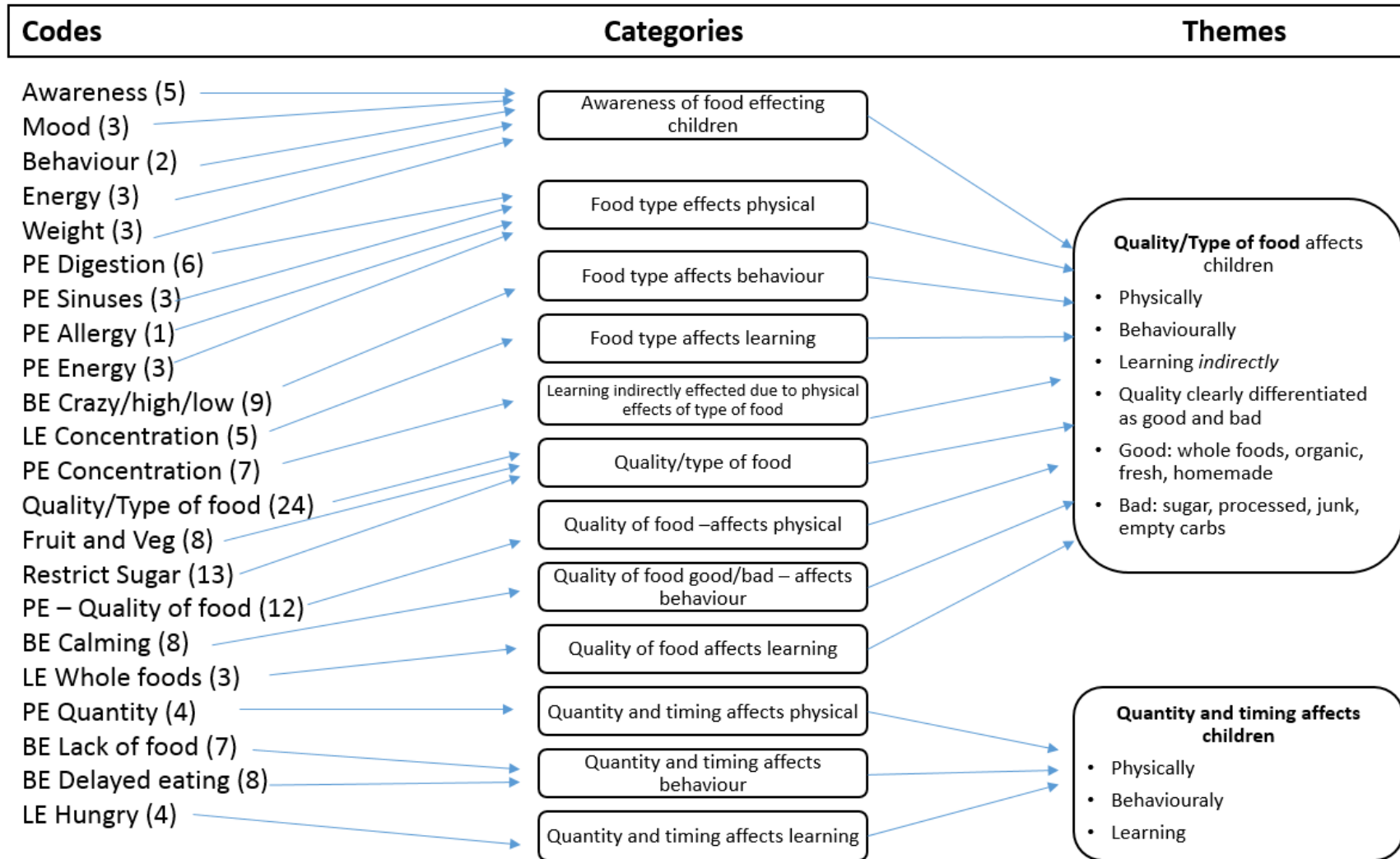
Appendix F. Data Charts

Parent data

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Parent data



Parent data

