Feeding Healthy Food to Kids Randomised Control Trial: three month analysis

Determining the impact of providing interactive nutrition and parenting resources to rural parents on their child feeding practices and the dietary intake of their two to five year old children.

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List of abbreviations

AGHE	Australian Guide to Healthy Eating
ANCOVA	Analysis of co-variance
ACAES	Australian Child and Adolescent Eating Survey
CFQ	Child Feeding Questionnaire
DAA	Dietitians Association of Australia
EDNP	Energy-dense, nutrient-poor (high in kilojoules, of low nutritional value)
FFQ	Food frequency questionnaire
FHFK	Feeding Healthy Food to Kids
HNE /AHS	Hunter New England /Area Health Service
LSAC	Longitudinal Study of Australian Children
NSW	New South Wales
NSWIRCST	New South Wales Institute of Rural Clinical Skills and Teaching
PIS	Participant Information Sheet
RCT	Randomised Control Trial
RHD	Research Higher Degree

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ABSTRACT

PROJECT NAME: Feeding Healthy Food to Kids randomised control trial: three month analysis

KEY WORDS: Child/ren, feeding, nutrition, resources, parent

AIM:

To determine whether the provision of targeted, self-directed nutrition and parenting resources to parents in rural northern NSW, results in changes to their child feeding practices, or the dietary intake of their child. This report details the baseline characteristics of study participants and results from the 3 month follow up.

METHODS:

Parents of children (n = 146) aged two to five years were recruited from rural northern NSW to the Feeding Healthy Food to Kids (FHFK) randomised control trial. Children's dietary intake and child feeding practices were reported by parents at baseline and three months, using a validated food frequency questionnaire and Child Feeding Questionnaire respectively. Parents were randomised to either the intervention group or control via standardised methods. The intervention group were provided with self-directed nutrition and parenting resources, in addition to a generic control group resources.

ANCOVA tests were used to determine differences between the control and intervention groups for selected dietary intake and child feeding parameters from baseline to 3 month follow up, after adjustment for imbalances at baseline.

RESULTS:

Baseline data was analysed for 146 children with a mean age of 4.0 ± 1.0 years (52% male, 48% female) Mean fruit consumption was 3.5 ± 2.0 serves (minimum requirement is one serve for a child aged four years). Mean vegetable consumption was 3.8 ± 1.6 vegetable serves, equal to the minimum requirement for a child aged four years. Baseline daily consumption of energy-dense nutrient poor foods was calculated as 4.3 serves, compared to recommended intake of zero to one serve daily for a four year old child.

Data analysis at three month follow up for 112 children revealed that fruit juice consumption was 15% lower in both the control and intervention groups, but no intervention effect. There were no significant intervention effects on consumption of vegetables, fruit or energy-dense nutrient poor foods from baseline to three month follow up between control and intervention groups.

Extremely low rates of perceived child overweight were reported (1%) relative to known rates of child overweight or obesity (28%) in the study localities. Child feeding domain scores were not significant different between baseline and three month follow up in either study group.

Seventy six percent of parents allocated to the intervention group had used both the *Tummy Rumbles* and *Raising Children* resources. Resource acceptability and utilisation was high, with over 25% using each resource more than once and 32% using *Tummy Rumbles* for more than two hours.

CONCLUSIONS:

Despite high CD and DVD utilisation and acceptability, provision of these resources to parents did not result in changes to child feeding practices or children's dietary intake during the initial three months of this study. The FHFK study provides detailed information about the dietary intake and child feeding practices of parents in rural NSW, and adds to the growing body of evidence about engagement of parents in population level nutrition interventions.

Implications

Young children in rural northern NSW are eating too much, especially energy-dense 'extras'

The dietary intake of young children in parts of rural NSW has been reported in the Feeding Healthy Food to Kids (FHFK) study. This study revealed excessive consumption of energy-dense, nutrient poor foods and energy-dense beverages, along with a high intake of fruit relative to vegetables, poor variety of vegetables, and preference for consumption of full cream rather than reduced fat milk. These results are not consistent with the Dietary Guidelines for Children in Australia [1] and therefore substantiate the urgent need for increased action in the field of childhood nutrition, particularly in rural areas.

Parents are generally unaware or unconcerned about their child's weight status

The FHFK child feeding analysis revealed that parents are potentially unaware of their own weight status or that of their young child/ren. This was evidenced by extremely low reported rates of perceived child or parent overweight relative to known rates of overweight and obesity in the study localities [2]. This anomaly, in association with very low 'concern about child overweight' has the potential to result in parents being ambivalent about the need for change to health behaviours. When added to the slightly restrictive feeding practices reported in FHFK, a need for further investigation of child feeding is evident.

Parents are willing to use self-directed nutrition and parenting resources

The response to both the *Tummy Rumbles* and *Raising Children* resources was overwhelmingly positive as evidenced by the 72% reported utilisation rate and supporting comments from parents. These results substantiate the evidence that parents of young children will utilise quality nutrition resources if they are appropriate and user friendly [3], even if disseminated as part of a low intensity intervention. This did not, however result in measurable behaviour change at three month follow up.

Engaging parents in food related behaviour change is complex and challenging

Changing the dietary intake of children or child feeding practices of parents is acknowledged as challenging [4], and was not achieved in the preliminary phase of this study. It is likely that observable changes to the dietary intake of children or the child feeding practices of parents require either: a longer time frame to allow for substantial changes to food related behaviours, a larger sample size to increase the power of the study, or a more intensive intervention.

Further research into childhood nutrition in rural NSW is warranted

The FHFK study outcomes to date provide evidence that more thorough and extensive investigation of the dietary intake of young children and the child feeding practices of their parents in rural NSW is justified. Specific recommendations for researchers, health care professionals and parents are outlined in detail below and in the full FHFK report.

Context

A childhood diet that is dominated by energy-dense, nutrient-poor foods, and low in fruit and vegetables is likely to persist into adulthood, to hasten and increase lifestyle disease risk [5]. The absence of specific dietary guidelines for Australian children under the age of four years is a limitation in analysis of dietary intake data collected for young Australian children. The two most commonly cited dietary inadequacies for young children in the limited number of studies within Australia or

internationally are: inadequate consumption (and variety) of vegetables [3, 6-11] and excess consumption of energy-dense, nutrient-poor foods and beverages, at the expense of core foods [7-13].

Childhood is a key timeframe for establishment of health behaviours [14], however relatively few studies explore development of food-related health behaviours [15-17]. Children's food-related behaviours are determined by a combination of child-specific factors [15-17], parent-specific factors [18-21], and the complex interactions between parent/s and child [16, 17, 22]. This study explores the capacity for engagement of parents in changes to health behaviours that have the potential to improve the nutritional status of their children.

The FHFK study investigated the efficacy of a population level, low intensity intervention to change the dietary intake of children or child feeding practices of their parents. This report examines the preliminary results from the baseline and 3 month data analysis of the FHFK study.

Approach

A randomised control trial (RCT) design was applied to evaluate the impact of providing parents with self directed nutrition and parenting resources on selected dietary and child feeding variables. Parents of children aged two to five years from the rural northern NSW were invited to participate in the study. Participants who returned baseline surveys were randomly allocated to either intervention or control group.

The validated Australian Child and Adolescent Eating Survey (ACAES) food frequency questionnaire (completed by parent proxy) and Child Feeding Questionnaire (CFQ) were used to measure changes in dietary intake or child feeding practices respectively. Questionnaires were sent out and returned by mail.

The intervention group received the interactive CD *Tummy Rumbles,* and the *Raising Children* DVD, in addition to the control group resources, that consisted of the *'Here's 3 steps you should know…'* generic three-fold brochure and the *Active Alphabet* parent and child physical activity resources. These resources were distributed to enhance blinding of participants to study group allocation.

Data collection was conducted at baseline in August 2009, and after an intervention period of three months in November 2009, for both control and intervention groups. Selected dietary factors (serves of fruit and vegetables, and energy-dense snack foods) and child feeding domains (eg. responsibility for feeding, monitoring and pressure to eat) were the primary outcome measures.

One-way analyses of co-variance (ANCOVA) tests were used to assess differences in means between groups over time after adjusting for any imbalances at baseline. Wilcoxon's Rank Sum Test was used for comparison of supplementary food related behaviours.

Results

The FHFK study results highlighted a number of key findings that have implications for public health nutrition practice. In summary:

o Reported fruit and vegetable intakes of children (mean age 4.0 years) in this study were approximately three times the recommended minimum daily number of serves of fruit, and the recommended minimum daily number of serves of vegetables for a child aged four to seven years, the closest comparative Australian reference age group for dietary intake.

o Reported fruit intake (in grams) was more than double the vegetable intake, a result that supports the rationale of this study to encourage increased vegetable consumption, rather than fruit and vegetables. The five most commonly consumed vegetables (carrots, potato, peas, broccoli and corn) were consistent with previously reported studies, but no significant intervention effect for increased vegetable variety was evident at three months follow up.

- Mean daily consumption of energy-dense, nutrient-poor (EDNP) foods was in excess of 4 serves, compared with the recommendation of zero to one serve per day for children aged four years. Significant contributors were energy-dense beverages (1.2 serves) and packaged snacks (1.2 serves).

- No significant intervention effects on consumption of vegetables, fruit or energy-dense nutrient poor foods were identified in three month data analysis. All variables remained constant for groups and time points, with the exception of fruit juice consumption, which decreased by 15% in both control and intervention groups at three month follow up.

- Child feeding practices of parents in the seven domains measured were desirably high for 'parent perceived responsibility', 'monitoring' and low for 'pressure to eat'. The domain of 'restriction' was undesirably high. 'Perceived child weight' and 'perceived parent weight' were almost unanimously 'average', an unlikely result that warrants further investigation, given the high known rates of obesity within study localities.

- A relatively low 25% of children were reported to usually consume reduced fat milk across groups and time points, despite dietary guidelines and intervention resources recommending consumption of reduced fat milk for children over the age of two years.

- An unexpected finding was a significant ($p<0.01$) decrease in television viewing time. Approximately 65% of the total cohort of children was reported to watch at least two hours of television per day at baseline, while at three month follow up this dropped to less than 50% of children, with a corresponding increase in the percentage watching zero to one hour per day.

Further research

Extend study timeframe to at least 12 months

The subsequent phase of this study will consist of repeating data collection after a period of at least 12 months, in order that dietary intake and child feeding can be re-measured and compared with baseline and three month data. This phase of the study will be completed as part of Research Higher Degree. An ethics variation to increase the intensity of the intervention exposure of the participants assigned to intervention group will be considered.

Expand study to include weight and height data

It is proposed that the next stage of this study include measurement or estimation of the weight status of study children. These results will be correlated with parent perception of child weight.

Replicate data collection and analysis in different rural locations

This study highlights the need for ongoing action in the field of early childhood nutrition in rural NSW. It is recommended that similar dietary intake data be obtained from areas of a similar demographic profile in other parts of NSW or Australia in order to contextualise the study data. This will be possible if the validated tools and methodology used in FHFK are replicated in different geographic locations.

Publish results

This report will be publicly available on the NSWIRCST website and distributed to the NSW Nutrition Network and Hunter New England allied health professionals, in order for information about dietary intake of children and child feeding practices of their parents to be publicly available for comparative purposes. An associated Masters thesis will follow, and a literature review and several research papers will be submitted to appropriate journals for potential publication.

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INTRODUCTION

The engagement of parents is a vital component in any health behaviour change strategy that is intended to improve the nutritional status of children. This report describes the *Feeding Healthy Food to Kids (FHFK)* study, which evaluates whether providing parents located in rural locations with self-directed interactive nutrition and parenting resources can change the way parents feed their children. This research is particularly pertinent to dietitians and other health professionals who develop resources for dissemination at a population level to parents, particularly those who work in rural areas.

Dietitians and public health experts invest considerable time and effort in developing resources for parents of young children. It is critical to evaluate whether parents use these resources, and if use of the resources results in behavioural changes that are reflected in measureable changes to child feeding practices or dietary intake of the children.

If providing parent's with electronic resources proves to be effective in changing the way parents feed their children, it may direct future research and also the development of appropriate resources for parents. This research will add to the body of evidence about what does or does not work when trying to engage parents in nutrition strategies or interventions.

BACKGROUND

Why childhood nutrition is important

Childhood nutrition has been thrust into the health spotlight internationally as a result of the alarming increase in rates of childhood obesity since the mid 1980s [23, 24]. The demonstrated association between obesity and poor eating habits has resulted in a proliferation of childhood obesity focused research and treatment or prevention programs.

Despite the increasing volume of childhood obesity research being conducted, current understanding of the most effective means by which to address prevention of unhealthy weight gain in children remains relatively poor [10]. The focus on obesity is cited by some as negatively impacting on community health overall [25, 26]. The importance of childhood nutrition in the context of establishing healthy lifestyle behaviours, improving childhood health and preventing subsequent ill health, has been overshadowed in research, the media and in general community awareness and concern [27-31].

Optimal nutrition enhances wellbeing and reduces physical and mental health risks [5, 32-34]. Conversely, poor and over-nutrition are risk factors for lifestyle diseases that are endemic in Australian society [27-30, 35, 36]. A diet high in energy-dense, nutrient-poor foods tips the energy balance equation towards weight gain, that in the long term increases risk of obesity [5, 30, 36, 37], type 2 diabetes [28, 35], cardiovascular disease [5, 36] and some forms of cancer [27, 30]. Inadequate consumption of fruit and vegetables is linked to some cancers [27, 30] and cardiovascular disease [28, 38, 39]. Mental health conditions such as depression can be triggered or exacerbated by poor nutrition [29, 40, 41].

Given the generally accepted belief that eating habits established in childhood continue through to adulthood [15, 18, 23, 42], a childhood diet dominated by energy-dense, nutrient-poor foods, and low in fruit and vegetables is likely to hasten and increase lifestyle disease risk [27-30, 35, 36].

Determinants of child nutrition

What children need to consume for optimal health (and prevention of ill-health or disease)

The *Dietary Guidelines for Children and Adolescents in Australia* [1] and the associated *Australian Guide to Healthy Eating* [43] provide the current food and nutrition recommendations for children aged four and over in Australia.

> o   Encourage and support breastfeeding..
> o   Children need appropriate food and physical activity for normal growth and development..
> o   Enjoy a wide variety of nutritious foods, including plenty of breads and cereals, vegetables (legumes) and fruits.
> o   Low fat diets are not suitable for young children.
> o   Encourage water as a drink. Alcohol is not recommended for children.
> o   Eat only a moderate amount of sugars and foods containing added sugars.
> o   Choose low salt foods and eat foods containing calcium and iron.

The guidelines are limited by the absence of age-specific recommendations for children aged from birth to four years old. In the early childhood setting in NSW, current guidelines for early childhood nutrition are drawn from the Children's Services sector. Caring for Children [44], provides foundation recommendations for childhood nutrition from birth to five years. These were used as a basis for development of a range of guidelines and resources, including the 2005 Tummy Rumbles Early Childhood Nutrition Education Manual [45], the 2007 Good For Kids Good For Life Nutrition Resource Manual [46] and the 2009 Department of Health and Ageing Get Up and Grow resources [47].

In contrast, the US 2005 Dietary Recommendations for Children and Adolescents [48] provide specific recommendations for numbers of serves and portion sizes for children of all ages from birth to 18 years. Serving sizes are quantified in cup or weight measurements, and are much more practical for use. The values are similar to the 'child sized' servings used in Australia in Caring for Children [44]. Daily estimated kilojoule consumption ranges for each age group of children are listed. These detailed specifications are beneficial for researchers and health professionals, and allow for comparison with population intakes. Selected recommendations that are relevant to this study are summarised in Table 1, along with Australian recommendations for children aged four to seven years, the age group closest to the study age group of two to five years.

Table 1: Recommended vegetable, fruit and energy-dense nutrient-poor food intakes for young children in Australia and the United States of America

Daily recommendations for vegetables (1/2 cup vegetables = 75 grams)		Daily recommendations for fruit (1 piece of fruit = ~ 150g)		Daily recommendations for energy dense nutrient poor foods (1 serve = ~ 600kJ)	
Australia [43]	USA [48]	Australia [43]	USA [48]	Australia [43]	USA [48]
150 – 300g (4 – 7yrs)	150g (girls 2 – 6 yr, boys 2 – 4 yr) 225g (boys 4 – 6 yrs)	150 g (4 – 7 yrs)	150g (2 – 3 yrs) 225g (4 – 8 yrs)	0 – 1 serve daily eg. 1 muesli bar = 32g or small pkt crisps (600kJ)	~100 cals (2 – 3 yrs) to ~250 cals (4 – 8 yrs) activity- dependant

Dietary intake of young children

A literature review did not identify any studies that have used a validated food frequency tool to report food consumption of young children (aged two to five years) in rural NSW. This may be one explanation of the limited nutrition information specific to this age group of children.

In the limited number of studies of young children's dietary intake within Australia and internationally, the two most commonly cited dietary inadequacies reported: (1) inadequate total consumption (and variety) of vegetables [6-9, 11, 49-51], and (2) excess consumption of energy-dense, nutrient-poor foods and beverages [6-8, 11, 49, 51]. A summary of published studies that report either consumption of vegetables, fruit, energy-dense, nutrient-poor foods, or all of these foods, are presented in Table 2.

Table 2: Comparison of vegetable and energy-dense nutrient-poor foods reported in selected studies of consumption of food in children aged two to eight years

Study (Year)	Child Age, dietary assessment method	Vegetable consumption	Fruit consumption	Energy-dense nutrient-poor foods
Australian Children's Survey (2007) [7]	2 – 8 yrs 24-hour recall	1.3 serves / day (2 – 3 yrs) 1.6 serves / day (4 – 8yrs) (includes legumes and potato) 6% eat 2[+] serves / day (2 – 3 yrs) 1% eat 2[+] serves / day (4 – 8 yrs) (excludes potato)	Mean serves / day (2 – 8 yrs) 1.2 serves 68% eat 1[+] serve / day (2 – 3yr) 61% eat 1[+] serve / day (4 – 8yr)	1 serve / day (2 – 3 yrs) 2 serves / day (4 – 8yrs) (snacks, sugar products, bars, confectionery = 30g serve) 6.3% total energy (2 – 3yrs) 9.4% total energy (4 – 8yrs)
HIKCUPS (2008) AUS [49]	5 – 9 years ASES FFQ	5.1 serves *Top 5 vegetables* Carrots, (81%) Potatoes (75%), Broccoli (58%), Peas (49%) Lettuce (47%)	2.3 serves / day	40% total energy
Campbell et al (2010) AUS [51]	5 years EPAQ	2.1 serves / day (excluding potato)	2.4 serves / day	1.0 serves sweetened drink/day 1.2 serves / day (packaged snacks, chocolate, cake)
LSAC (2008) AUS [11]	4 – 5 yrs 24 hr recall	43% eat 2[+] serves /day	95.5% eat 1[+] serve / day	74% consumed 2[+] serves 80% consumed sweetened drink
High 5 for kids (2008) USA [50]	1 – 6 years FFQ*	1.5 serves / day	1.8 serves / day	Not reported
Dennison et al (1998) USA [6]	2 – 5 years 7-day diet record	0.4 serves / day (2 yrs) 0.6 serves / day (5 yrs)	0.8 serves / day (2 yrs) 0.7 serves / day (5 yrs)	1.0 serves fruit juice (2yrs) 0.83 serves fruit juice (5yrs)
Hudson et al (2005) USA [9]	Mean age 3.34 years FFQ*	0.9 serves / day 4.5 % eat 3[+] serves/day	60.4% eat 2[+] serves / day	Not reported
Feeding infants and toddlers (2004) USA [8]	19 – 24 months 24-hour recall	*Top 5 vegetables* Fried potatoes (25%), Green beans (17%), Corn (15%), Peas (11%), Tomatoes/sauce (9.4%)	67% eat some fruit each day	60% consumed cake, cookie or pastry 20% consumed confectionery 44% consumed sweetened beverage

FFQ = Food Frequency Questionnaire   EPAQ = Eating & Physical Activity Questionnaire   Cals = Calories   yrs = years   g = grams

The above studies consistently report low vegetable consumption, displacement of fruit with juice, some displacement of vegetables by fried potato and energy-dense nutrient-poor foods being consumed routinely, even amongst toddlers [8, 13]. The table highlights differences in classification of foods into food groups, minor differences in serving size and the use of different dietary assessment methodologies. The absence of best practice guidelines for reporting dietary intake makes direct comparisons between studies difficult. However, most studies shown in the table are recent, indicating that early childhood dietary intake is an emerging area of research.

Determinants of children's eating behaviours

Childhood is a key timeframe for establishment of health behaviours [14], however relatively few studies explore development of eating-related health behaviours [15-17]. Children's eating behaviours are determined by some child-specific factors [52], some parent-specific factors [53], and the complex interactions between parent/s and child [15, 52, 53].

Child factors

Factors that are intrinsic to the child that relate to their eating behaviours include temperament, neonatal history and feeding history [15, 52]. Taste preferences, appetite, growth and development are important related physiological factors [15, 52] that vary substantially between children. These intrinsic child factors become influenced by, and inextricably linked to environmental factors very early in a child's development [53-55]. For example, restrictive feeding practices of parents can result in

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children learning to overeat [42]. Conversely, food neophobia and food aversions can be minimised in an environment of positive role-modelling and repeated exposure to novel foods [52, 54]

Parent factors

Quantitative studies that have considered relationships between children's food choices and various environmental factors [18] have consistently shown that risk factors for poor childhood nutrition include poor maternal nutrition knowledge [18, 56, 57], parental television viewing, authoritarian or permissive parenting styles [20, 58, 59] and role modelling of non core food consumption [18, 19, 60]. Additionally, Birkett [56] has reported that: parents concern for disease prevention, home food availability, parental attitudes, beliefs and practices about child feeding, all impact significantly on a child's diet. Maternal self efficacy has recently been reported by Campbell as positively impacting on children's eating behaviours [51] and an authoritative parenting style is consistently associated with optimal child feeding [15, 55, 61].

Parenting style
Parenting styles have been conceptualised in terms of the amount and quality of two underlying dimensions – demandingness and responsiveness [53, 59, 62]. Demandingness refers to the extent to which parents show control, maturity demands, and supervision, in their parenting. Responsiveness refers to the extent to which parents show affective warmth, acceptance and involvement. Based on these two dimensions, a four-fold classification of parenting style has been described [59]:

o the authoritative style is characterised by parental involvement, nurturance, reasoning, structure, and is associated with optimal child feeding [15, 55, 61];

o the authoritarian style is characterised by restrictive, punitive, rejecting, and power-assertive behaviours;

o the indulgent style (also referred to as permissive) is characterised by warmth and acceptance in conjunction with a lack of monitoring of the child's behaviour; and

o the uninvolved style (also referred to as disengaged) is characterised by little control and involvement with the child.

Child feeding practices
Child feeding is considered one of the most challenging aspects of parenting [4]. Birch and colleagues have conducted extensive research into child feeding practices [15, 42, 63]. Their confirmatory factor analysis of the Child Feeding Questionnaire (CFQ) [15, 42, 63] validates seven child feeding domains; perceived responsibility, parent perceived weight, perceived weight of child, concern about child's weight, monitoring, restriction and pressure to eat. The child feeding domains are linked with the four parenting styles described previously [59]. A desirable profile of domains for optimal child feeding would include high mean scores for responsibility and monitoring, with low pressure to eat. Covert restriction is considered desirable compared with over restriction, but it is not possible to differentiate these using the CFQ tool [64]. Mean scores for each of the seven domains, from selected studies that have used the Birch's CFQ, are shown in Table 3. Means are calculated from five point Likert scales for each question in each domain.

Table 3: Child feeding domain mean scores in selected studies using the Child Feeding Questionnaire

Study / Paper (Year)	Child Age Study design	Perceived Parent responsibility	Perceived parent overweight	Perceived child overweight	Concerns about child overweight	Restriction	Pressure to eat	Monitoring
Faith [65] USA (2003)	5 – 7 yrs Low risk	4.08 ± 0.6	Not measured	2.90 ± 0.4	1.40 ± 0.6	2.98 ± 0.8	2.15 ± 1.1	4.02 ± 0.8
HIKCUPS [65] AUS (2006)	5 – 9 yr Control	4.2 ± 0.6	3.1 ± 0.4	2.9 ± 0.4	2.5 ± 1.3	3.2 ± 1.0	2.3 ± 1.0	4.1 ± 0.8
Birch [66] USA (2006)	5 yrs Low risk	Mot measured	Not measured	2.6 ± 0.1	2.0 ± 0.2 .	3.2 ± 1.0	2.2 ± 0.1	3.4 ± 0.1

Parent child interaction

The feeding relationship
The feeding relationship between parent and child is established at birth and represents both a powerful connection and potential foci for 'power struggles' or control issues between parent and child [16]. The theory of the feeding relationship, first presented in 1992 by Satter [16] is that a parent is responsible for feeding a child appropriate foods at appropriate intervals; the 'what' and 'when' of the feeding relationship. The child is responsible for the ultimate decision regarding whether to consume the food, and the portion they choose to eat of the food provided; the 'whether' and 'how much' of the feeding relationship. The 'parents provide, children decide' theory is often used in nutrition programs to assist with behaviour change [49, 53, 65, 67].

Parent engagement

Parents are important agents of dietary behaviour development as the 'gate-keepers' of children's eating environments [53]. This is particularly true for young children, as a large proportion of their food is consumed within the home environment. Engagement of parents is therefore critical in any childhood nutrition intervention. The success of nutrition interventions targeted at parents relies on promotion of the enablers, and offsetting the barriers to parent engagement in health behaviour change, particularly those related to child feeding and childhood nutrition. These factors, along with key requirements of resources and programs that 'reach' and 'engage' parents effectively, are outlined in Table 4.

Table 4: Enablers, barriers and resources for parent engagement in health behaviour change

Enablers of parent engagement in behavioural change	Barriers to engaging parents in behavioural change
o Collaborative, whole of agency approach and attitudes [67] o Recognition of mutual expertise [67] o Underpinning belief that parents are trying their best [67] o Use of strategies that target various stages of readiness to change, stage appropriate resources and support [66] o Importance of 'getting and keeping' or 'engaging' parents [67] o Multi component strategies, multiple referral methods [68, 69] o Short low level interventions for delivering facts, increasing knowledge and encouraging simple behavioural change [68, 69] o Programs to establish authoritative parenting styles and 'normalise' parenting support [69]	o Delayed response to identification of issues [67] o Feelings of isolation or victimisation [67] o Fear of being labelled a 'bad parent' [67] o Fear of failure [67] o Parents unaware of consequences of behaviours [67] o Parents ambivalent or unwilling to change own behaviours [66] o Inadequate allowance for time between exposure and expected adoption of health behaviour change [66]
Enablers of optimal child feeding and childhood nutrition	**Perceived barriers to optimal child feeding (parent cited)**
o Role modelling healthy eating habits [70] o Involvement of children in food preparation [70] o Availability of reputable resources in the public domain [71] o Early intervention and a theoretical basis for programs [24, 71] o Universal interventions for less severe needs, with increasingly targeted interventions for more severe needs [69] o Parents receptive to/capable of behavioural change [72, 73] o Targeting parenting skills in addition to nutrition [24, 74, 75] o Programs that encourage authoritative parenting styles, with or without a nutrition or child feeding focus [74, 75] o Multifaceted and community wide programs [3, 76]	o Lack of information about overcoming fussy eating and how to increase food variety [71] o Inadequate communication about nutrition from childcare [77] o Impact of food marketing [60] o Poor food availability and confusion about food labelling [78] o Food used as a reward despite parent knowledge [50, 78] o Perceived lack of appropriate nutrition resources [71] o Need for 'one stop shop' [71] o Need for quality resources related to healthy eating and good nutrition that are appropriate and user friendly [3, 71]
Effective health education resource/strategy components	**Ineffective health education resource/strategy components**
o Educational home visits or telephone education [79] o 'Parents as teachers' model [50] o Resources that are socially and culturally appropriate [79] o Educational resources are reading age appropriate [79] o Web resources to replace face-to-face education [56, 80] o Ensure ample 'dosage' of technology resources [81] o Use of internet for rural participants [80] o Optimal balance of regulation, legislation and education [82]	o Printed materials of limited value [79] o Didactic approach to teaching [50] o Lack of consideration for adult learning styles or principles [46] o Poor training of educators to work parents in paediatrics [74] o Resources not appropriate for target group [74]

Rationale for FHFK study

Rationale for use of 'web friendly' or self directed resources

Web-based and self directed resources have been suggested to replace face-to-face education to improve reach and engagement of health education strategies [56, 80]. Emerging evidence indicates that a quality education experience is possible in an on-line format via a student centred model. Mazurak [80] suggests that this method could be extended to allied health professionals and the general public.

Two studies from the US Supplemental Nutrition Program for Women, Infants and Children (WIC) program provide strong evidence for self-directed web or technology based educational approach [56, 83]. In a systematic review of effectiveness of web-based interventions for weight loss, Neve identified that a key component of e-Health interventions is ensuring ample use of the technology so each participant receives an 'optimal dose'[81].

The reported perceived benefits of self-directed learning from the literature including; more time for learning and reflection; potential for more participants, opportunity for those who cannot attend face to face education; greater flexibility; capacity for instant feedback; and the technology is readily available and accessible to a substantial majority of parents, both in rural and urban areas [80, 83]. From a locality perspective, 'the internet has reduced the barrier of distance somewhat' for two rural study participants in the Weight of Opinion study [3].

Due to a relative lack of availability of health services, particularly paediatric nutrition services for healthy children, and poor access to health services for some rural parents, a self-directed nutrition program has the potential to be very effective in a rural setting [84, 85]. Increasingly, rural people are becoming technology literate and have increasing access to computers, electronic home entertainment and the internet [80]. This only stands to increase in the future, making this method of health education feasible in the rural setting.

Interactive nutrition and parenting resources have the capacity to be provided to populations, either in the CD or DVD format used in this research or, with further development and evaluation, as an interactive web based program. This could potentially make an important contribution to reducing the public health burden of chronic disease.

Rationale for target group

Parents of children aged two to five years in rural northern NSW were selected for the study because:
(1) parents have a strong influence on the development of a child's dietary habits and have the capacity to provide children with a home environment that promotes healthy eating [85],
(2) role modelling by adults contributes to children's eating behaviours [18, 78]. The NSW Population Health Survey (2008) reported that only 12.5% of Hunter New England (HNE) adults consumed recommended vegetable intake and less than half usually consumed reduced fat milk [86],
(3) at the age of two years child feeding dynamics emerge and children begin to develop the dietary habits that, when established, are likely to persist into adulthood [16],
(4) the school entry age represents a transitional stage when external influences beyond immediate family food environment exert different pressures on a child's eating behaviours [18, 78],
(5) living in a rural area is a recognised barrier to accessing health resources and health education[84],
(6) nutrition data collected in the Lower Mid North Coast showed evidence of low consumption of vegetables and provision of excess energy-dense nutrient-poor foods in lunchboxes [87-89], and
(7) Before School Screening data analysis within the Lower Mid North Coast from 2005 – 2008 [2] revealed rates of overweight and obesity in four to five year old children ranging from 25 – 30%, significantly higher than the state average for five year old children in 2004, and higher than the 21% reported for four to five year olds in the 2008 Longitudinal Study of Australian Children [11].

Research question

The aim of FHFK was to assess changes in dietary intake or child feeding practices in response to the provision of self-directed nutrition and parenting resources to rural parents of children aged two to five years.

Null hypotheses:
- o There is no intervention effect of resource provision on consumption of vegetables or energy dense nutrient poor foods between baseline and three months in the FHFK study.
- o There is no intervention effect of resource provision on child feeding practices between baseline and three month follow up in the FHFK study.

The objectives of the FHFK study were to:
- Establish baseline dietary intake data for vegetables (and fruit) and energy-dense, nutrient-poor foods for children aged two to five in selected rural NSW localities.
- Determine changes in serves per day of vegetable and energy-dense, nutrient-poor foods, over a 3 month intervention period within the control and intervention groups.
- Determine changes in child feeding practices of parents over a three month intervention period within the control and intervention groups.
- Determine whether there is a significant difference (p<0.05) between the changes to parent's child feeding and consumption of vegetables and energy-dense, nutrient-poor foods between the control and intervention group.
- Ascertain the acceptability and utilisation of resources to parents in the intervention group.

METHODOLOGY

Study Design

A randomised control trial (RCT) design was applied to measure the impact of providing parents with self directed nutrition and parenting resources on selected dietary and child feeding factors variables, following intention-to-treat principles.

Setting and participants

Parents of children aged two to five years (inclusive) were recruited from the rural townships of Taree, Gloucester, Forster, Cessnock, Kurri Kurri and Tamworth, and their local surroundings (Figure 1) to participate in the study. The demographic profile (rural, relatively low SEIFA and high percentage of aboriginal people) of selected towns was similar. For consistency, the study child selected was specified as the eldest child in the family within this age group.

Exclusion criteria:
- a chronic health condition such as food allergy, Coeliac disease or Type 1 diabetes, that significantly impacted on the child's eating habits, and/or
- additional child/ren from same family as a study child.

○ Study location

Figure 1: FHFK study localities

Ethics

Approval for the study was obtained from Hunter New England Human Research Ethics Committee in March 2009.

HNEHREC Reference No: 08/12/17/4.02   NSW HREC Reference No: HREC/08/HNE/403
HNE SSA Reference No: SSA/08/HNE/   UoN; ACTRN: ACTRN12609000356268

Four variations regarding the study process were accepted by the research governance officer over the course of the planning phase of the study.

Recruitment

Participants were recruited primarily from Children's Services (Long Day Care Centres, Pre Schools, Family Day Care, in-home care, Playgroups) and HNE Health services staff members that have direct contact with parents of children in target age group, and work in study locations. The primary recruitment strategy was reinforced by strategic dissemination of flyers and two newspaper advertisements in order to facilitate successive approximation, whereby potential participants are exposed to the study more than once, to increase likelihood of consent being obtained.

Randomisation

Participants were randomised to the control or intervention group in a blinded process, based on numbering of unopened returned baseline survey envelopes. A computerised random number generator was used to generate 75 random numbers between 1 and 149, which constituted the 'intervention' numbers, with the remaining numbers being the 'control' numbers. Randomisation numbers were only used to randomise the participants. Unique codes based on location, research phase and consent form numbers were used for all other purposes. Participants were blinded to group allocation throughout the trial.

Sample size

Vegetable and energy dense food (and beverage) consumption were primary outcomes of the FHFK study. Of these variables, vegetable consumption was used to determine sample size because evidence suggests this to be the most challenging dietary factor to change [3, 6, 18].

A sample size of at least 100 participants was required to allow for detection of 37.5 gram (0.5 serve) difference between groups in the reported consumption of vegetables with an 80% power at the 0.05 significance level. The recruitment of 147 participants into the study allowed for 25% drop out between consent and returning second survey at 3 months. This sample size approximates that used in the Childhood Asthma Prevention Study (CAPS), which required 112 participants (56 in each arm) to detect a 25% increase in vegetable consumption [53].

Selection of resources

The *Tummy Rumbles* interactive nutrition education CD is a self-directed resource that was developed in 2005 by the Nutrition and Dietetic Department from the Lower Hunter Cluster of HNE Health. The *Tummy Rumbles* CD was adapted from an early childhood nutrition education program for Child care staff and parents. The resource is divided into modules that include: the five food groups, dietary fats, fussy eaters, healthy lunchbox ideas food budgeting and reading food labels. It has been evaluated by users as a useful and effective resource for early childhood nutrition education [90].

Raising children is 'a guide to parenting from birth to 5', the content of which is based on the principles of the quality-assured Raising Children website [67], Australia's definitive parenting resource. It contains different sections for parents of newborns, baby and child. Participants in this

study were requested to view the DVD's child section, that contains sections on eating strategies, junk food, toilet training, encouraging behaviour, play and learning, choking and CPR.

The *Tummy Rumbles* interactive CD and *Raising Children* DVD were selected resources based on:
o A review of literature to identify key features of successful nutrition interventions (see Table 1)
o mapping of key questions against resource modules/sections; vegetable consumption: reducing energy-dense nutrient-poor foods: parenting skills: and child feeding practices (see Appendix 1)

Control group resources consisted of the *'Here's 3 steps you should know...'* generic three-fold brochure and *Active Alphabet* parent and child physical activity resources, were intended to increase retention of control group participants and blind the participants to study group allocation.

Timeline for intervention

The timeline for the study, including actions for research team and participants in both study groups are outlined in Table 5. Baseline data was collected prior to intervention which involved dissemination of resources and follow-up data was collected three months after resources were distributed. Data obtained included parent and child demographics, dietary habits of the study child and child feeding practices of the parent as detailed below.

Table 5: Time line and Participant requirements for FHFK study

Phase	Date	Study action (responsibility)	Intervention group parents	Control group parents
Promotion	Jun/Jul 2009	Distribute Flyers (KD, CB, KA, AHP)	Flyer received	Flyer received
Recruitment	Jul/Aug 2009	Distribute PIS + consent (KD, CB, KA)	Completed consent form	Completed consent form
Baseline data	Aug 2009	Distribute surveys (KD) Reminder call / text / email (KD) Collect surveys / Randomisation (KD) Baseline data analysis (KD)	Demographics ACAES, CFQ	Demographics ACAES, CFQ
Resources	Aug/Sep 2009	Distribution of resources (KD)	Raising Children DVD Tummy Rumbles CD '3 steps' brochure Active Alphabet	'3 steps' brochure Active Alphabet
3 month data	Nov 2009 -	Distribute surveys (KD) Reminder call / text / email (KD, KC) Collect surveys / data analysis (KD)	ACAES, CFQ Resource feedback	ACAES, CFQ
9 month data*	July 2010		ACAES, CFQ Resource feedback	ACAES, CFQ Resource feedback
Resources*	Sept 2010			Raising Children DVD Tummy Rumbles CD

PIS = Participant Information Survey   ACAES = Australian Child Adolescent Eating Survey
CFQ = Child Feeding Questionnaire   KD = Kerith Duncanson, CB = Carmen Burgess, KA = Kelly Ancuk
* Beyond timeframe of this report   AHP = Allied Health Profession

Outcome Measures

Consumption of vegetables, energy-dense beverages and energy-dense nutrient-poor (EDNP) foods

Children's dietary intake was assessed using the ACAES, a 137-item child specific semi-quantitative food frequency questionnaire (FFQ). This questionnaire was developed specifically for use with Australian populations and has been previously validated for use by parent proxy for primary school aged children [85, 91]. The ACAES tool is used by parents to record their child's frequency of consumption of a defined list of foods over the previous three month period. Each question contains between four and eight categorical responses. It is designed to incorporate food lists that are appropriate for Australian children [85, 91]. Parents completed the ACAES at baseline and three months.

Serves of fruits and vegetables were calculated by summing the weight of food items in the FFQ coded as fruits or vegetables and dividing by the serve size dictated in the Australian Guide to Healthy Eating

(fruits, 150 g and vegetables, 75 g). All other foods in the ACAES were quantified using multiples of standard children portions from the 1995 Australian National Nutrition Survey of children and Adolescents or Foodworks computer nutrition analysis tool (see Appendix 2).

Vegetable variety was measured by tallying the number of 'never' or 'less than once per month' responses for each vegetable item and comparing the proportions between groups and over time. Choice of milk was measured by calculating the difference from baseline to three month analysis in the proportion of responses for 'usual' consumption of reduced fat milk relative to full cream milk, but independent of other possible milk choices (eg. soy, rice).

Child Feeding Practices

Parents completed the self-report, 31 – item Child Feeding Questionnaire (CFQ) [63] at baseline and three months to identify whether the provision of resources influenced child feeding practices. The tool, designed for use by parents of children aged two to 12 years, measures parental beliefs and attitudes regarding child feeding practices in seven domains; perceived responsibility (three items), parent perceived weight (four items), perceived child weight, parents' concerns about child weight (three items), monitoring (three items), restriction (eight items), pressure to eat (four items). All items are measured using a five-point Likert-type scale, with each point on the scale represented by a word anchor.

Demographic data

Data used to establish the demographic profile of the study population was collected using a demographic data questionnaire at baseline (see Appendix 3). Categorical responses were reported for the following:
-   age group, education level and Aboriginal Torres Strait Islander status of parent
-   age group, type of child care, Aboriginal Torres Strait Islander and health status of study child

Data Analysis

Data entry for the demographic data, child feeding questionnaire and resource evaluation was conducted by the researcher, using STATA statistical software version 10, College Station, Texas USA. The ACAES surveys were manually prepared for computer analysis by the researcher, before being sent to the University of Newcastle for scanning into the STATA program.

All statistical analyses were performed by researcher using STATA. Advice and consultation was provided by Nicole Mealing, NSW Health Biostatistics Trainee, Dr Maya Guest, Lecturer in Occupational Health and Safety, and Dr Tracy Burrows, Lecturer in Nutrition and Dietetics, both at the University of Newcastle. Prior to further analysis, normal distribution of all variables was established.

The primary intention-to-treat analysis involved all participants who were randomly assigned and completed baseline and three month surveys, regardless of whether they reported using the resources. In order to compare the control and intervention groups for selected dietary factors and child feeding domains at three month follow up, one-way analysis of co-variance (ANCOVA) tests for each variable were used to assess differences in means between the two groups after adjusting for any imbalances between groups at baseline. Differences in proportions were measured by Wilcoxon's Rank Sum Test.

Conflict of Interest

Funding for this research was provided by the New South Wales Institute of Clinical Skills and Teaching (NSWIRCST) as part of the Rural Research Capacity Building Program (RRCBP) and a New Staff Grant from the University of Newcastle. The researcher selected resources to be used in this study by independent assessment against eligibility criteria.

RESULTS

Recruitment of participants to the FHFK study is outlined in Figure 2. Of the 180 participants who consented to participate in the study, seven were excluded prior to the baseline survey dissemination, and 27 did not return baseline surveys. The remaining 146 participants were subsequently randomised to the control or intervention arm.
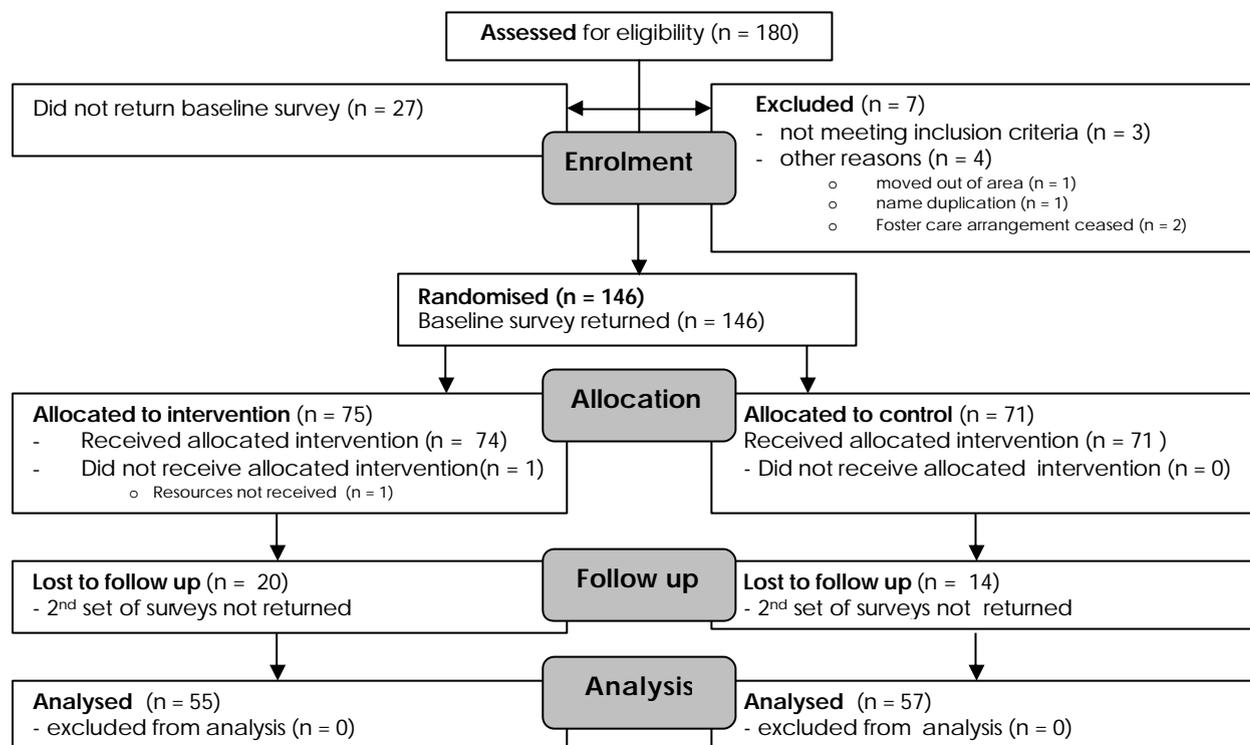

Figure 2: Flow of participants through the FHFK study from consent to 3 month follow up

Baseline characteristics of randomised participants in the FHFK study

Demographic Data

Of the 146 randomised in the study, demographic data was collected for 145 (99%). Characteristics of the participants in the intervention and control groups are displayed in Table 6. Parents in each group were highly likely to be female and aged 30 years or over. The percentage of parents over thirty years was higher in the control group (83%) than the intervention group (66%). Baseline mean child age was 4.0 years for both the intervention and control group. There were no differences in parent education, gender or Indigenous status or child gender, Indigenous status, health status or child care utilisation.

Table 6: Demographic characteristics of FHFK study participants at baseline (collapsed)*

| Demographic characteristic – child	Intervention (n = 75)	Control (n = 70)	Demographic characteristic - parent	Intervention (n = 75)	Control (n = 70)
Child health			Parent age		
- no chronic condition	74 (99%)	68 (97%)	- Under 30 years	20 (34%)	12 (17%)
- health condition	1 (1%)	2 (3%)	- 30 years and over	56 (66%)	58 (83%)
Child care			Parent education		
- in some form of care	69 (92%)	64 (91%)	- Secondary educated	33 (44%)	33 (47%)
- no formal care	6 (8%)	6 (9%)	- Tertiary educated	42 (56%)	37 (53%)
Child gender			Parent gender		
- male	40 (53%)	36 (51%)	- male	0 (0%)	1 (1%)
- female	35 (47%)	34 (49%)	- female	75 (100%)	69 (99%)
Child indigenous status			Parent indigenous status		
- Aboriginal	2 (3%)	3 (4%)	- Aboriginal	1 (1%)	2 (3%)
Neither Aboriginal or Torres Strait Islander	73 (97%)	67 (96%)	- Neither Aboriginal or Torres Strait Islander	74 (99%)	68 (97%)
Mean child age in years (SD)	4.00 (0.13)	4.04 (0.91)		*All results are n (%) unless stated	

Baseline Dietary Intake characteristics of all randomised FHFK participants

Dietary data and supplementary information was available for all 146 children and parent dyads that completed baseline surveys and were randomised. The dietary intakes of children as reported by parents from the ACAES Food Frequency Questionnaire are described in Table 7.

Table 7: Dietary intakes (in serves) of children as reported by parents at baseline in FHFK

Food group	Average serve (see Appendix 2)	Total (n = 146)	Intervention (n =75)	Control (n = 71)
Total vegetables	75g	3.77 ± 1.59	3.57 ± 1.36	3.98 ± 1.78
Fruit (excluding juice)	150g	3.53 ± 1.97	3.38 ± 1.99	3.70 ± 1.94
Energy-dense beverages (inc juice)	309ml	1.17 ± 1.44	1.30 ± 1.70	1.03 ± 1.11
- Fruit Juice	366.5ml	0.61 ± 0.86	0.70 ± 0.93	0.52 ± 0.77
Packaged snacks (total)	32g	1.18 ± 0.95	1.37 ± 1.13	0.98 ± 0.65
- Sweet snacks (inc. biscuits)	30g	0.67 ± 0.80	0.81 ± 1.01	0.53 ± 0.46
- Savoury snacks	33g	0.53 ± 0.40	0.59 ± 0.44	0.47 ± 0.34
Bakery	100g	0.35 ± 0.35	0.42 ± 0.42	0.28 ± 0.24
Ice cream and ice confections	109g	0.50 ± 0.51	0.52 ± 0.58	0.48 ± 0.42
Confectionery (lollies / chocolate)	39g	0.25 ± 0.27	0.30 ± 0.29	0.20 ± 0.24
Fatty meats	58g	0.37 ± 0.27	0.42 ± 0.30	0.30 ± 0.23
Take away style foods	146g	0.46 ± 0.28	0.48 ± 0.28	0.43 ± 0.28

AGHE = Australian Guide to Healthy Eating   NNS = 1995 National Nutrition Survey   ACAES = Australian Child Adolescent Eating Survey
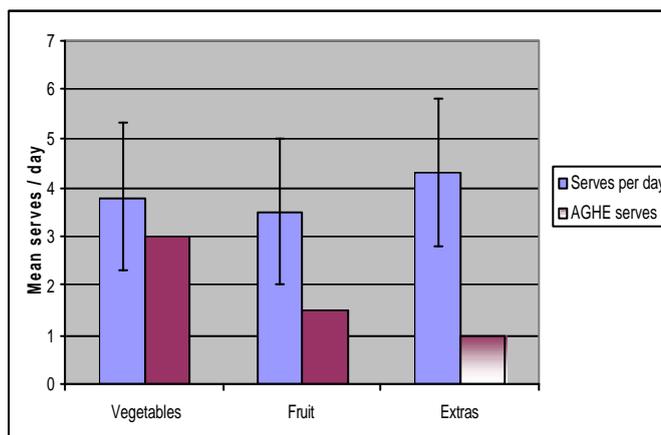
Mean daily vegetable intake (excluding fried potato) was 3.8 serves (283g). Mean daily fruit intake (excluding fruit juice) was 3.5 serves (531g). Mean total intake of energy-dense nutrient-poor foods was 4.3 serves. Energy-dense, nutrient-poor foods for which average reported intake exceeded one serve per day were energy-dense beverages (1.2 serves) and packaged snacks (1.2 serves). Mean reported intake of sweet snacks was 0.7 serves, with mean savoury snacks and ice cream or ice confection both 0.5 serves.

Figure 3: Consumption of fruit, vegetables and energy-dense nutrient-poor foods at baseline compared to AGHE recommended serves for a child aged four years

The variety of vegetables consumed by children was limited. Parents reported that children consumed 60% of the 21 reported common vegetables listed in ACAES at least once a month. The vegetables most frequently reported as being consumed at least once per month were carrots (96% of respondents), potato (90%), peas (87%) broccoli (87%) and corn (87%). The vegetables that were least frequently reported as being consumed at least once per month were legumes (20% of respondents), cabbage (32%), spinach (37%), capsicum (46%) and mushrooms (49%).

Differences in number of serves were found between study groups for five EDNP sub-groups (see table 7). Intervention allocated children were reported have a significantly higher intake of sweet snacks (0.28 serves, p = 0.03), bakery items (0.14 serves, p = 0.01), confectionery (0.1 serves, p = 0.03) and fatty meats (0.12 serves, p = 0.02) and savoury snacks (0.12 serves, p = 0.07) than children allocated to the control group. There were no significant differences reported in serves of fruit, vegetables, energy-dense beverages, ice cream/confection, takeaway foods or variety of vegetables.

Feeding healthy food to children randomised control trial: three month analysis

Baseline Dietary Intake Characteristics of FHFK 'Lost To Follow Up' Participants

Of the 146 participants randomised to the control or intervention groups, 34 were lost to follow up at the three month data collection. The characteristics of this group are displayed in Appendix 4. Notable features of the 'lost to follow up' group were the relatively high reported intake of takeaway foods, confectionery, icecream and fruit of the intervention 'lost to follow up' group, when compared with control 'lost to follow up' and to 'three month follow up' participants, and the relatively high reported fruit juice consumption in both 'lost to follow up' groups when compared to 'three month follow up' baseline data.

Comparison of Dietary Intake for FHFK '3 Month Follow Up' Participants

The dietary intake of both study groups are reported in Table 8. No significant changes to consumption of vegetables, fruit or energy-dense nutrient poor foods were identified in three month data analysis for either group. Fruit juice consumption decreased by 16% in both control and intervention groups, while all other variables remained relatively stable and consistent between the two groups.

Table 8: Comparison of dietary intakes (in serves) of children at baseline and 3 month follow up

Food group	Average serve * (AGHE or NNS)	Intervention – BL (n =55)	Control - BL (n = 57)	Intervention – 3mth (n =55)	Control – 3mth (n = 57)
Total vegetables	75	3.45 ± 1.35	4.10 ± 1.88	3.30 ± 1.30	3.87 ± 2.00
Fruit (excluding juice)	150	3.26 ± 1.78	3.78 ± 4.04	3.08 ± 1.42	3.67 ± 1.93
Energy-dense beverages	309ml	1.03 ± 1.17	1.27 ± 1.79	1.00 ± 1.07	1.11 ± 1.14
- Fruit juice	366.5ml	0.55 ± 0.79	0.63 ± 0.90	0.46 ± 0.52	0.54 ± 0.70
Packaged snacks (total)	32	1.08 ± 0.59	1.32 ± 1.27	1.16 ± 0.67	1.21 ± 0.84
- Sweet snacks (inc. biscuits)	30	0.59 ± 0.45	0.84 ± 1.16	0.63 ± 0.51	0.68 ± 0.62
- Savoury snacks	33	0.50 ± 0.29	0.52 ± 0.37	0.55 ± 0.32	0.55 ± 0.38
Bakery	100	0.48 ± 0.46	0.28 ± 0.24	0.45 ± 0.46	0.44 ± 0.34
Ice cream and ice confections	109	0.39 ± 0.32	0.55 ± 0.64	0.33 ± 0.31	0.50 ± 0.64
Confectionery (lollies / choc)	39	0.16 ± 0.14	0.32 ± 0.38	0.22 ± 0.20	0.33 ± 0.31
Fatty meats	58	0.32 ± 0.19	0.40 ± 0.31	0.36 ± 0.23	0.36 ± 0.24
Take away style foods	146	0.34 ± 0.20	0.51 ± 0.26	0.39 ± 0.17	75.5 ± 0.38

AGHE = Australian Guide to Healthy Eating   NNS = 1995 National Nutrition Survey   * see Appendix 2

The type of milk consumed by both groups at baseline and 3 month follow up was consistent, with 65 - 70% of respondents in both groups reported routine consumption of normal (full fat) dairy milk, and a quarter of both groups reporting usual consumption of reduced fat or skim milk, with the remainder using non-dairy milk substitutes.

Supplementary food related behaviours

Supplementary questions regarding key food related behaviours were analysed for all 112 participants who completed baseline and three month follow up FFQ. Detailed tables of supplementary question responses about food related behaviours are shown in Appendix 5.

Reported television (TV) viewing habits differed between the intervention and control groups at baseline. A higher percentage of children in the intervention group watched TV at least once per week during the evening meal (40% intervention, 28% control), and also watched at least two hours of TV per day (73% intervention, 61% control).

A significantly higher proportion (p=0.002) of parents in the intervention groups reported their child watching TV 'never' or 'less than once per week' with the meal at three month follow-up, and a

significantly higher proportion of children watching zero to one hour of TV per day (compared with two hours or more) in both the intervention group (p=0.008) and control group (p=0.009).

More than 95% of parents for both groups reported that breakfast was consumed by children at home at least five days per week. The highest reported responses for both groups for other questions was one to two snacks per day (approximately 65%), two dollars or less per week to spend on food (92%) and over 60% of both groups reporting takeaway food consumption less than once per week.

Child Feeding Characteristics and Practices

Information regarding child feeding practices was available for 144 of 146 parents (99%) that completed baseline surveys. Mean scores for each domain were not significantly different between the control and intervention groups at baseline. Of the 144 parents that completed baseline CFQ, 117 (80%) completed three month follow up. Mean scores for each of the child feeding domains for all children by study sample are presented in Table 9.

Table 9: Child feeding practices of parents at baseline and three month follow up in the FHFK study

Group	Perceived Parent responsibility	Perceived parent overweight	Perceived child overweight	Concerns about child overweight	Restriction	Pressure to eat	Monitoring
Combined (n = 144)							
- baseline (all randomised)	4.43 ± 0.6	3.12 ± 0.4	2.95 ± 0.4	2.11 1.1	3.44 ± 0.8	2.61 ± 1.0	4.34 ± 0.8
Intervention (n= 62)							
- baseline	4.39 ± 0.6	3.11 ± 0.4	3.02 ± 0.4	2.01 ± 1.1	3.46 ± 0.9	2.51 ± 1.0	4.19 ± 0.9
- 3 months	4.39 ± 0.6	3.10 ± 0.4	2.98 ± 0.3	2.36 ± 2.2	3.37 ± 0.9	2.55 ± 1.0	4.25 ± 0.7
Control (n = 55)							
- baseline	4.39 ± 0.5	3.11 ± 0.4	2.87 ± 0.4	2.24 ± 1.2	3.46 ± 0.8	2.63 ± 0.9	4.49 ± 0.6
- 3 months	4.31 ± 0.5	3.08 ± 0.4	2.92 ± 0.6	2.21 ± 1.1	3.35 ± 0.8	2.54 ± 0.9	4.30 ± 0.8

Parents in both the intervention and control groups reported high mean domain scores for restriction, parent perceived responsibility and food monitoring. Low scores were reported in both groups for concern about child overweight and pressure to eat. Mean responses of approximately three were reported for both perceived child and parent overweight. These scores were remarkably consistent with mean scores for each domain at baseline in the combined sample of all randomised participants.

Resource utilisation and acceptability within intervention group

Resource specific questionnaires regarding *Tummy Rumbles* and *Raising Children* were returned and analysed for 57 of the 75 (76%) parents allocated to the intervention group, including 100% of parents who completed 3 month follow up. Of the 57 respondents, 72% had used both *Tummy Rumbles* and *Raising Children* at least once, with 28% using each resource two or more times. All respondents who had used either or both resources reported no technical difficulties in using the resources. The most common time allocation for using the resources was one to two hours for both *Tummy Rumbles* (43%) and *Raising Children* (54%) with 32% of respondents using *Tummy Rumbles* for more than two hours and 20% using Raising children for more than two hours.

Tummy Rumbles rated highly as a 'useful nutrition resource' for parents and as being 'easy to use, with 34% of respondents 'strongly' agreeing with these statements. Approximately 90% of respondents agreed or strongly agreed that *Tummy Rumbles* and *Raising Children* were "useful", "enjoyable to use" and "easy to understand". Suitability of the amount of information contained in the resources was ranked slightly lower for *Raising Children*, with 23% of respondents either responding 'neutral' or 'disagree' to this statement , compared to 6% for *Tummy Rumbles*. The respective rating of modules from each of the two resources is shown in Figure 1.

All seven evaluated nutrition modules in Tummy Rumbles and five evaluated sections of Raising Children were rated as 'useful' or 'extremely useful' by at least 80% of respondents. The sections that were rated as 'extremely useful' by the largest percentage of respondents were the 'Healthy Lunchbox' module (38%) and 'Eating on a Budget' modules (34%) of *Tummy Rumbles*, and the 'Encouraging Behaviour' (37%) and 'Choking/CPR' section (37%) of *Raising Children*.
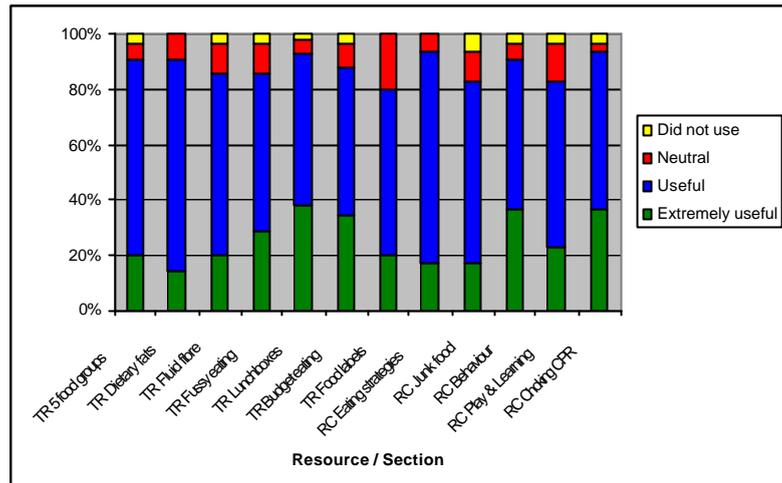

Figure 4: Rating of resources by intervention group participants

Qualitative information collected as a component of resource evaluation indicated that the resources met the felt and expressed needs of parents (see Appendix 6). This was reinforced by comments that included "should be handed out to all parents", "would be a great resource for grandparents" and "I liked how the information came from everyday parental experiences, I guess they are the experts"

DISCUSSION

This study investigated dietary and feeding practices changes as a result of implementation of self-directed resource dissemination to parents in rural locations. Results show that baseline consumption of fruit and energy-dense snacks are high relative to fruit and other core foods, and that this remained unchanged after and intervention period of three months.

Vegetable (and fruit) intake

This component of the study had two primary intended outcomes: (1) to report baseline dietary intake in the study population, a gap in existing literature and (2) to compare vegetable consumption (and variety) and energy-dense, nutrient-poor food consumption between the intervention and control groups at the three month follow up. The reported fruit consumption shown in Table 7 was three times the recommended minimum required each day for a four year old child. The additional fruit would contribute an estimated 750 kilojoules of additional energy per day. This has the potential to contribute excess energy in the diet of a child with low energy needs (not physically active), or to displace other food groups.

Reported vegetable consumption was equal to the recommended minimum number of serves of vegetables daily for a child aged four (to seven) years. Reported vegetable consumption was approximately double that reported as gram weight [78] or serves [92] in previous studies. Possible explanations for this discrepancy are the use of 24-hour recall in previous studies instead of an FFQ, or a less extensive FFQ that may not have included the same range of fruit and vegetables. The high reported fruit intake relative to recommendations and compared to vegetables supports the study rationale of encouraging increased vegetable consumption, rather than fruit *and* vegetables.

The most commonly consumed vegetables were highly consistent with previous literature [46]. However, no significant intervention effect for increased vegetable variety was evident. Increasing preference for vegetables amongst children is notoriously difficult [93], with in excess of ten exposures reported as necessary before children willingly accept a new vegetable [53]. The three month follow up timeframe may have not allowed adequate time for children to increase their vegetable preferences.

It is possible that due to the extensive nature of the ACAES, parents may over-report their children's dietary intakes, as is common when using a FFQ [94]. Over-reporting of fruit and vegetable consumption may result from; recall bias (reporting food provided, not food consumed), a 'halo' effect bias for perceived desirable foods, the use of parents as a proxy or overestimation of children's portion sizes within the ACAES FFQ (see Appendix 4).

Energy-dense, nutrient-poor foods

The over-reporting effect seen in fruit and vegetable consumption may not transfer to foods perceived to be less desirable, including the energy-dense, nutrient poor foods measured in this study. Mean reported consumption of energy-dense beverages and packaged snacks, each exceeding one serve per day, are above the recommended daily total of zero to one serves of 'sometimes or small amounts' foods in the Australian Guide to Healthy Eating [43], but consistent with previously reported studies [11, 13, 49, 51, 95]

The mean daily intake of 4.3 serves of energy-dense non-core foods in the diet of children aged two to five years is excessive, providing an estimated 2400kJ, or 33% (4 – 8 yrs) to 40% (2 – 3 yrs) of the mean daily energy requirement, as reported in the 2007 Children's Study [7]. This is consistent with previous studies [11, 49] and is indicative of either: displacement of core foods [30] or excess total energy consumption from core foods and energy dense nutrient poor foods. Excess total energy consumption, energy imbalance and risk of consequent overweight is the more likely explanation in *FHFK*, as there is no obvious displacement of core foods.

Milk preference

A disproportionately low percentage of children were reported as usually consuming reduced fat milk. Preference for regular milk remained similar in the intervention group at three month follow up, despite the consistent reference to dietary guideline recommending reduced fat milk for children over the age of two years in the Tummy Rumbles resource. This result is consistent with the relatively low proportion of adults in the Hunter New England who regularly consume reduced fat milk. It provides evidence of the need for a clear public health message to promote reduced fat milk for children over the age of two years. Existing product labelling merely cautions against use of reduced fat dairy foods for children under the age of two years. Further analysis of study child age and milk choice is warranted to determine whether the older 'study' children were more likely to consume reduced fat milk than their younger counterparts.

Supplementary food related behaviours

Changes in television viewing habits were an unexpected outcome of the study. There was evidence to support a reduction in frequency of children eating meals in front of the TV at the three month follow up in the intervention group. Given parents concerns about food advertising [36] and evidence of decreased attention to food consumption as a result of TV viewing [96], combined with the association between study participation and overall television viewing, this result was a positive study outcome.

All four resources used in the FHFK study: *Tummy Rumbles* and *Raising Children* plus the control resources, *Here's three steps* and the *Active Alphabet* resource contained recommendations to decrease sedentary behaviours. It is acknowledged that the association between study participation and TV viewing habits is possibly attributable to a combination of: increased awareness of television viewing as a result of answering the study questions, and the provision of resources aimed at increasing physical activity and reducing sedentary behaviour to both the control and intervention groups.

Snacking behaviour results are inconclusive but consistent with previous studies that use the Child Feeding Questionnaire [46]. Considerable confusion exists about the context and interpretation of the term 'snacking' [97], in particular if it includes or excludes morning and afternoon tea. This study reinforces the need for further investigation of this dimension of child feeding.

Intervention effects

Notwithstanding the inaccuracies in determining absolute fruit, vegetable and energy-dense, nutrient-poor food consumption, the relative consumption of these foods from baseline to three month follow up is comparable because the relative reporting bias inherent in the FFQ is transferred through all study stages.

There was little or no evidence of significant change to reported consumption of vegetables, energy-dense beverages or energy-dense nutrient poor foods were attributable to the intervention at the three month time point. This result supports the evidence that changing dietary habits of children is difficult [3, 98, 99], and attempting to do so with a low intensity intervention, over a short timeframe and for apparently healthy children, is even more ambitious. The most significant changes to dietary intake have been reported in studies involving children who have been identified as overweight or obese, with highly motivated parents [94] who have participated in face-to-face education over extended periods of time. Replication of similar results at a population level with less intensive interventions, are yet to be reported.

Child feeding practices

The child feeding domain responses at baseline were notably similar to the low risk or control (non-overweight) groups within previous studies [100]. Parents reported desirably high levels of perceived responsibility, monitoring and desirably low pressure to eat. Significantly high levels of restriction and neutral means for perceived child weight and perceived parent weight were of concern. Restrictive child feeding practices may contribute to sub-optimal dietary patterns [64]. For example, if children are not allowed to eat certain foods, they may be perceived as more desirable by the child. The parameters of this study do not allow for detection of desirable 'covert' restriction and undesirable 'overt' restriction.

Considering the increasing rates of adult and child obesity in rural NSW, the child feeding questionnaire results indicate a probable lack of awareness of weight status, or misinterpretation of the response of 'average' in the question asking the parent to classify their child as 'underweight' 'average' or 'overweight'. Only one percent of parents reported their study child as 'overweight' as a toddler or a preschooler. Within the Lower Mid North Coast, where the majority of the study population are located, the rates of overweight and obesity in preschoolers are known to be between 25 and 30% [2]. Although weight and height status was not measured as part of this study, this result clearly indicates a need for further research into the perceptions of weight status among parents of young children.

The absence of a significant difference in child feeding domain responses between control and intervention groups could be partly explained by the desirable feeding practices exhibited throughout the study in the domains of parent perceived responsibility, food monitoring and absence of pressure to eat. The possible lack of awareness of child weight status and inability to discriminate between overt and covert restriction may have been additional contributing factors.

Resource utilisation and acceptability

The positive response to both the *Tummy Rumbles* and *Raising Children* resources was encouraging and consistent with available literature about the felt and expressed needs of parents regarding nutrition resources. The 72% utilisation rates for the resources provided to the parents of well pre-school children reinforce the findings of previous studies, which have reported that parents will utilise quality resources related to healthy eating and good nutrition if they are appropriate and user friendly [3, 8, 71]. Also consistent with previous studies was the rating of resource modules, with healthy lunchboxes [7], eating on a budget [66] and encouraging behaviour [80] all having been cited previously as important components of a 'best bet' nutrition resource.

Reported non-compliance with the assigned intervention protocol by 24% of the intervention group may have resulted in the 'Intention-to-treat' analysis underestimating the potential benefit of the

intervention. Additional analyses, such as a per protocol analysis, may therefore be considered in future analysis of this data, despite not being considered as robust as 'intention-to-treat' analysis [56].

Limitations

The short timeframe, necessitated by the time parameters of the Rural Research Capacity Building Program, was a limitation in this study. Considerable time is required for parents to use the resources, move through stages of behavioural change [66] and repeatedly expose children to new foods [15]. It is unlikely that the full effect of resource utilisation on children's dietary intake and the child feeding practices of their parents would have been apparent within three months. This limitation will be overcome with subsequent survey dissemination after 12 months to all 146 randomised participants, and subsequent data analysis to be conducted as part of a Research Higher Degree.

Despite the validation of the ACAES Food Frequency Questionnaire for use by parent proxy with young children, a notable limitation of this study was the potential over-reporting bias that is associated with use of a FFQ, which may have be exacerbated by parents reporting socially desirable responses. An apparent limitation of the data analysis was the ACAES computer-program modelling of gram weight of foods, which was programmed to calculate 'natural' serving size from available Australian serving size data but may overestimate child sized portions of foods and drinks. This was overcome to an extent by use of the same portion sizes to convert gram weight data back to serves for comparative reporting purposes.

Statistical analysis was limited by very high standard deviations, which resulted from the previously described gram weight serves. Potential outliers were not excluded from data analysis because gram weight measures were modelled from plausible categorical responses. In some instances, the high standard deviations may have contributed to non significant outcomes.

Strengths

To the best of the author's knowledge, this is the first study to report the dietary intake of young children and the child feeding practices of their parents in rural NSW. The study used a randomised control design. Protocols recommended in the CONSORT statement [92] were employed to maximise the credibility, generalisability and transparency of the study. The sustainability of the study into the future as part of a Research Higher Degree will ensure that the information reported will ultimately make a valuable contribution to the understanding of the dietary intake of young children and feeding practices of their parents.

Conclusion

The dietary intake of young children in rural northern NSW has been established in the FHFK RCT. Consumption of energy-dense, nutrient-poor foods have been identified as excessive, and vegetables are apparently being displaced by fruit. Over the initial three months of the FHFK RCT there were no significant changes in consumption of vegetables or energy dense nutrient poor foods, or to child feeding practices, in response to the provision of self-directed nutrition and parenting resources to rural parents of children aged two to five years. This study has reinforced that changing the dietary intake of children and the child feeding practices of their parents is neither simple nor easy. Providing parents with resources that are perceived as useful and appropriate does not necessarily result in changes to their health behaviour habits, at least in the short term.

The results of this study suggest that the intervention will need to be extended, escalated or incorporated into a broader multi-strategy intervention in order to impact on parents' health behaviours. A considerable investment into evidence-based nutrition interventions and further research into early childhood eating and feeding appear warranted, in an attempt to improve childhood nutrition and stem the potential chronic disease consequences that would result from continuation of the observed dietary habits.

IMPLICATIONS AND RECOMMENDATIONS

Table 9: The implications, recommendations and suggested implementation strategies from the FHFK study

Implication (what is inferred or suggested by study outcomes)	Recommendation (what should happen to policy or practice)	Implementation (how to change policy or practice)
The dietary intake of young children in parts of rural NSW had been established, and is excessive.	There is an identified need for ongoing action in the field of early childhood nutrition in rural NSW.	An optimal combination of regulation and education regarding childhood nutrition is required.
Dietary intake data indicates excessive consumption of energy-dense, nutrient poor foods and a high consumption of fruit relative to vegetables.	Obtain comparative data from areas of a similar demographic profile in NSW and in other states of Australia to contextualise the study data.	This will be possible if the validated tools and methodology used in this study are replicated in different geographic locations.
Changing dietary intake of children or the child feeding practices of parents require either: a more intensive intervention or, a longer time frame to change established food related behaviours.	Repeat surveys after 12 months in order to measure initiation and maintenance of change and compare with baseline and 3 month follow up data. Include qualitative component investigating parents that did change, and investigate self-efficacy.	To be completed as part of RHD, with a possible ethics variation to increase the intensity of the intervention exposure of the participants assigned to intervention group.
Parents are potentially unaware of weight status of their young child/ren.	Determine weight status of study children and compare with parent perception of child weight in next phase of the study.	Submit ethics variation to allow for parent-reported weight and height to be collected from study sample.
Parents are potentially unaware of health implications of poor childhood nutrition	Increase awareness of parents / study participants of discrepancy between children's dietary intake and dietary guidelines.	Provide study parents with additional pertinent resources related to key messages eg. reduced fat milk consumption,
Comparison of results with previous literature and recommendations is limited by small number of studies and lack of dietary guideline for children less than four years.	Publish results in order for information about dietary intake of children and child feeding practices of their parents is publicly available for comparative purposes.	This report will be publicly available on the NSWIRCST website, and distributed to the NSW Nutrition Network, Dietitians Association of Australia and Hunter New England allied health professionals.
The full implications from the data gathered in this study have yet to be fully elucidated	Complete final data collection, compare child feeding practices with dietary intake data, and compare parenting data with child feeding practices data.	The continuation of this study as a RHD will allow for this study to be extended, and reported as a Masters thesis, in addition to any published papers.

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APPENDICES

Appendix 1

Mapping of resources against 'best bet' nutrition resource requirements

Appendix 2

ACEAS FFQ question coding for food groups and extra foods analysed in FHFK RCT

Appendix 3

FHFK study demographic information sheet

Appendix 4

Dietary intakes of children at baseline for participants that were 'lost to follow up'

Appendix 5

Supplementary question responses from ACEAS relating to food behaviours - baseline and 3 months

Appendix 6

Table of identified needs of parents and matching feedback from participants

Appendix 1

Mapping of resources against 'best bet' nutrition resource requirements
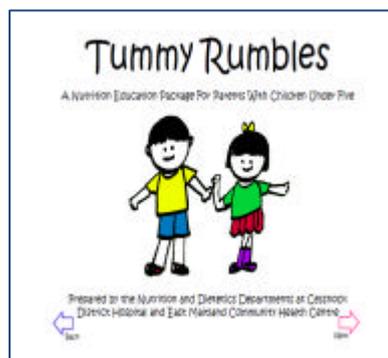
Mapping of Tummy Rumbles

Tummy Rumbles Module	Research component	Relevant question	Supporting references
2 - Food groups	Encourage water	D3	Dietary guidelines for children [1]
	Breads, cereals, grains	B1 - B10	Good For Kids Nutrition Manual [3]
	Vegetables and legumes	F3 - F24	Carruth [72], Dovey [71]
	Limit fruit juice	D4	Caring For Children [3]
	2&5 message/variety	F3 - FS5	World Cancer Research Fund [3]
	Reduced fat milk over 2 yrs	DF1	National Heart Foundation [1]
	1 adult serve extras / day	All category 6	Good For Kids Nutrition Manual [100]
4 - Fluid and fibre	Encourage water	D3	Dietary guidelines for children [1]
	Higher fibre choices	B4 + F3 - FS5	Dietary guidelines for children [1]
5–Physical Activity	Reduce sedentary behaviours	G, H	National Physical Activity guidelines [8]
7 – Fussy eating	Fussy eating	PTE, REST, MON	Carruth [7], Dovey [21] Webb [101], Fox [102], 2007 NNAPAS [59]
8 - Lunchboxes	EDNP snacks foods	Category 6 (1,3,4,5,8,9)	
9 - Budgeting	EDNP snacks foods	Category 6 (1,3,4,5,8,9)	Good For Kids Nutrition Manual [100]
10 - Labels	EDNP - all	Category 6	Good For Kids Nutrition Manual [100]
Add: Vegetables	Vegetables and legumes	F3 - F24	Dietary guidelines for children [1]

Mapping of Raising Children

Raising children	Research component	Relevant question	Supporting references
Nutrition	Variety of vegetables	F3 - F24	Dietary guidelines for children [1]
	Legumes	F22, F23, F24	Dietary guidelines for children [1]
	Limiting juice	D4	Good For Kids Nutrition Manual [100] Webb [101], Fox [102], 2007 NNAPAS [59]
	"Junk food"	Cat 6	
	Encouraging water	D3	Dietary guidelines for children [1]
Behaviour	Toddlers	Independence	Mitchell [21]
	Toddlers	Boundaries	Kane [101]
	Positive feedback	6+ve per 1 -ve	Rhee [102]
	Consistency	Meal times, routines	Hughes [59]
	Exclusion	Time out	
	Snacking behaviour	Frequency of snacks	Birch [15, 42]
	Eating in front of TV	F	National Physical Activity guidelines [8]
	Food rules	PTE, REST, MON	Satter [16] Hughes [59]
	Hunger	What, when, whether	Satter [16]
	Fussy eating	PTE, REST, MON	Carruth [7] Dovey [93]

Appendix 2

ACEAS FFQ question coding for food groups and extra foods analysed in FHFK RCT

Code / Food group	Question numbers in ACAES	Serve size (source)
2 - Fruit	F25, F26, F28, F29, F30, FS1, FS2, FS3, FS4, FS5	150g (AGHE)
3 - Vegetables	F4, F5, F6, F7, F8, F9, F10, F11, F12, F13, F14, F15, F16, F17, F18, F19, F20, F21, F22, F23, F24	75g (AGHE)
4 – Dairy foods	DF1 (categorical)	NA
6.1 Sweet drinks	D2, D5 (± D4)	280ml (NNS & FW)
6.2 Packaged snacks	S4, S5, S6/2, S7, S8, S9, S10, S11, S12 , O1, O2,	32g (NNS, FW and
- 6.2a Sweet	- S8, S10, S11, S12, S4, S5	product information)
- 6.2b Savoury	- S6/2, S7, S9, O1, O2	
6.3 Ice confections	DF4, DF5, DF6, O3, O4, O17	109g (NNS)
6.3a Confectionery	O5, O6	39g (NNS)
6.4 Bakery	S1, S2, S3	100g (NNS)
6.5 Take away style	M8, M16, M24, M25, M26, M27, M28, M29, F1, F2	146g (NNS, FW)
6.6 Spreads / condiment	O7, O8, O11, O13, DF10,	NA
6.7 Energy dense meat	M23, O14, O15	58g (NNS, FW)
6.8 Diet soft drink	D3	NA
6.9 Fruit juice	D4	NNS

NNS = National Nutrition survey   *FW = Food Works*
AGHE = Australian Guide to Healthy Eating   *NA = Not applicable*

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Appendix 3

DEMOGRAPHIC INFORMATION

1. How old are you?

O Less than 19 years
O 19 – 24 years
O 25 - 29 years
O 30 - 34 years
O 35 - 39 years
O 40 - 45 years
O Over 45 years

2. What is your highest level of education?

O Did not complete Year 10 (or equivalent)
O Completed Year 10 (or equivalent)
O Completed Year 12 (or equivalent)
O Commenced Higher Education Degree
O Completed Higher Education Degree
O Completed Post Graduate Course

3. Are you?
O Male
O Female

4. Are you?
O Aboriginal
O Torres Strait Islander
O Neither Aboriginal or Torres Strait Islander

5. How old is your child?

O 2 – 2 ½ years
O 2 ½ - 3 years
O 3 – 3 ½ years
O 3 ½ - 4 years
O 4 – 4 ½ years
O 4 ½ - 5 years
O 5 – 5 ½ years
O 5 ½ - 6 years

6. Child care (can tick more than one)

O Child not in child care
O Child in long day care
O Child in pre school
O Child in Family Day Care

7 . Is your child?

O Male
O Female

8. Is your child?
O Aboriginal
O Torres Strait Islander
O Neither Aboriginal or Torres Strait Islander

8. Child health factors:
Has your child been diagnosed with any of the following conditions that may exclude participation in this study?

	Yes	No	Comments
Severe food allergies (nut, egg, shellfish etc)			
Cystic Fibrosis			
Failure to thrive			
Coeliac disease			
Type 1 diabetes			
Other chronic illness (please list)			
1.			
2.			

9. Would you like a copy of the results of this study?   O Yes O No

Appendix 4

Dietary intakes of children at baseline for participants that were 'lost to follow up'

Food group	Average serve (AGHE or NNS)	Intervention grams (n =15)	Control grams (n = 18)
Total vegetables	75	4.07 ± 1.39	3.85 ± 1.45
Fruit (excluding juice)	150	3.96 ± 2.76	3.4 ± 1.7
Energy-dense beverages (inc	309ml	1.15 ± 1.35	1.38 ± 1.10
juice)	366.5ml	0.69 ± 0.99	0.73 ± 0.87
- Fruit Juice			
Packaged snacks (total)	32	1.17 ± 0.85	1.09 ± 0.76
- Sweet snacks (inc. biscuits)	30	0.55 ± 0.41	0.52 ± 0.37
- Savoury snacks	33	0.63 ± 0.67	0.58 ± 0.51
Bakery	100	0.51 ± 0.33	0.37 ± 0.20
Ice cream and ice confections	109	0.57 ± 0.48	0.62 ± 0.51
Confectionery (lollies / choc)	39	0.31 ± 0.33	0.23 ± 0.31
Fatty meats	58	0.45 ± 0.33	0.34 ± 0.32
Take away style foods	146	0.51 ± 0.33	0.44 ± 0.27

AGHE = Australian Guide to Healthy Eating   NNS = 1995 National Nutrition Survey

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Appendix 5

Supplementary question responses from ACEAS relating to food behaviours at baseline and 3 months

Most common Response Category	Intervention		Control		Most common Response Category	Intervention		Control	
	pre	3mth	pre	3mth		pre	3mth	pre	3 mth
How often do you eat breakfast					Where do you usually eat breakfast?				
o 5 or more per week	99	96	96	99	o Home	100	100	100	100
Usual type of milk					How much money are you given to buy food?				
o full fat	66	68	65	67	o Less than $2 each week	93	95	92	96
o reduced fat or skim	23	25	29	23	How many times per week do you eat in front of TV?				
How often do you eat takeaway foods?									
o Less than once per week	61	64	69	62	o Never or less than 1/wk	60	80 #	72	76
o 1 – 2 per week	35	29	30	32	o At least once per week	40	20	28	24
How many times do you eat vegetable with meal?					How much time each day do you watch TV?				
o 3 – 4 per week	24	38	18	25	o 0 – 1 hour	27	47 #	39	51#
o 5 or more per week	68	54	73	66	o More than 2 hours	73	53	61	45
How many pieces of fruit do you eat?					How many times per day do you eat snacks?				
o None	3	2	2	2	o One to two	64	60	65	49
o One per day	20	24	14	20	o 3 – 4 per day	16	22	14	23
o 2 – 3 per day	56	51	58	54					

# p < 0.01

Appendix 6

Table of identified needs of parents and matching feedback from participants

Identified need	Tummy Rumbles	Raising Children	Supporting feedback
Targets respective stages of readiness to change	✓	✓✓	#128 as a mum of 6 I found some of the info was already known to me, however I learnt a great deal (TR and RC)
Web based or technology approach	✓✓	✓✓	#1 a handy resource to have (TR)
Readily accessible to rural participants	✓	✓	100% of intervention group participants had no difficulties using resources (TR and RC)
Universal interventions for less severe needs	✓✓	✓✓	#55 should both be handed out to all parents (TR and RC)
Socially & culturally appropriate	✓✓	✓✓	#1 a useful resource for all parent levels. Would be great for grandparents who have contact with their grandchildren #68 would be particularly good for first time parents (TR)
Reading age and health literacy appropriate	✓✓	✓✓	#1 a handy resource to have (TR) #68 would be particularly good for first time parents (TR)
Appropriate for different learning styles	✓	✓✓	#35 I really liked the interactive elements of the DVD. I'm more of a visual person so the DVD appealed more. (RC)
Includes overcoming fussy eating and how to increase food variety	✓✓	✓	
Quality nutrition resources that are appropriate and user friendly	✓	✓	#124 a great resource. As a teacher, I used some of the information in my lessons at school (TR)
Need for 'one stop shop' of credible nutrition resources	✓	✓	#137 informative and educational. Watched dietary fats twice to absorb info (TR)
Underpinned by theoretical basis or model eg. Social behavioural theory	✓	✓	# 143 It was great to hear from parents who I guess are the experts (RC) #101 I liked how the info came from everyday parental experiences (RC)
Addresses food labelling and food marketing	✓	✗	#137 informative and educational. Food labelling useful.

✓✓ Full   ✓ Partial   ✗ Not included / not adequately covered

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