



**University of
Reading**

Healthy Happy Family Eating:

**An investigation into the effectiveness of interventions aimed at
improving family eating behaviours**

A thesis submitted in fulfilment of the requirements for the degree of:

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Declaration

I confirm that this is my own work and that the use of all material from other sources has been properly and fully acknowledged.

Note on Thesis Structure

This thesis reports a programme of research investigating the effectiveness of interventions designed to improve family eating behaviours. It begins with a statement of the problem and a Systematic Review before describing the development of an intervention, the development of a measure used to assess parents' mealtime goals, and a Randomised Controlled Trial of the intervention. It comprises three papers published in peer-reviewed journals, one recently submitted to a peer-reviewed journal and additional commentary on aspects of the research that are not intended for publication but provide context and detail.

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Abstract

Unhealthy eating in children is a widespread problem, associated with poor cognitive and physical development. Increasingly, evidence indicates that poor eating habits in children track into adulthood. Parents' feeding practices are consistently found to predict children's eating behaviours and many interventions have been developed to target parents as the main agents of change in family eating interventions. However, parents cite time, stress and convenience as barriers both to implementing positive feeding practices and to participating in healthy eating intervention studies.

The research described in this thesis sought to investigate the effectiveness of interventions aimed at improving family eating behaviours, with a particular focus on enjoyment and stress reduction. The first paper is a comprehensive Systematic Review of family eating interventions delivered in the family home. The Review found that, in order to be effective, interventions should be robustly theory and evidence driven as well as engaging and burden-free for parents. The second paper describes the detailed development of a healthy eating intervention, the Healthy Happy Family Eating programme, which was delivered online and emphasised implementing enjoyable mealtimes. The design of a Randomised Controlled Trial is described in the subsequent three chapters. These describe measure selection and design, including the third paper which identifies the lack of and reports the design of a parental feeding goal measure; a report of the trial itself (the fourth paper) and supplementary analyses and information about the trial.

Throughout these studies, attention is given to parents' goals, motivations and engagement. Collectively, the studies indicate that future intervention studies should prioritise stress-reduction at mealtimes as well as paying careful attention to the theory and evidence base; parents' preferences for the type of help they receive with their

children's eating should be given more attention, as well as their feeding goals and the potential conflicts between these.

Chapter 1: Introduction

1. A Statement of the Problem

Children eat substantially fewer fruits and vegetables than the recommended daily intake; for example a recent Health Study for England indicated that only 18% of children between the ages of 5 and 15 years consumed five or more portions of fruit and vegetables per day (National Health Service, NHS, 2018). This trend is mirrored in the USA, where only 40% of children aged between 1 and 18 years met fruit intake recommendations, and just 7% met vegetable recommendations (US National Cancer Institute, 2010). Studies in both these countries indicate that children also consume substantially more fat, sugar and salt than guidelines recommend (Buttris, 1995; Wardle, Volz, & Golding, 1995). This equates to a diet that is unhealthy in that it is nutritionally deficient. According to the National Health Service (NHS, 2019), a healthy diet, on the other hand, means ‘eating a wide variety of foods, in the right proportions and consuming the right amount...to maintain a healthy body weight’.

Children need to consume a healthy diet for cognitive development and physical growth. Increasingly, evidence indicates that poor eating habits in childhood continue into adulthood (Nicklaus, Boggio, Chabanet, & Issanchou, 2005; Phares, Curley & Rojas, 2008). Health consequences of a poor diet in adulthood include increased risk of coronary heart disease, obesity, high blood pressure, cancer and diabetes (Vivier, 2008).

1.1 Parents’ feeding behaviours and children’s eating behaviours

There is robust evidence that indicates parents play a crucial role in shaping children’s eating habits and parents are sometimes referred to as the ‘gate-keepers’ of children’s eating environments (Daniels, Magarey, Battistutta, Nicholson, Farrell, Davidson et al., 2009). Some behaviours that parents exhibit around food choice,

mealtime practice and feeding behaviours are thought to contribute to children's healthier eating behaviours (Birch, 1999). Collectively, these can be interpreted as 'positive feeding practices'. Positive feeding practices include modelling, exposure to healthy food, ensuring healthy food is not only available but also accessible, and involving the child in food decisions. Modelling (or 'social modelling') refers to the idea that through watching their parents' eating behaviours, children learn how to develop their own eating habits. For example, studies have shown that parents' modelling of consuming healthful foods was associated positively with their children's consumption of these foods (e.g. Matheson, Robinson, Vardy & Killen, 2006). Exposure captures the idea of repeatedly exposing or showing a child a target food (usually in the absence of pressure to eat it) to increase their familiarity and eventually willingness to taste it. Studies addressing this feeding practice usually focus on target foods which are healthy and unfamiliar or disliked by the child. Exposure has been extensively researched and repeated exposure of healthy foods (in particular fruits and vegetables) is consistently associated with increased liking and consumption of these foods (Holley, Farrow & Haycraft, 2017). Availability in the context of parental feeding behaviours refers to the concept of healthy food being in the family home and offered to the child. Accessibility, meanwhile refers to whether the food is in a format and location easy to reach for the child. For example, carrots may be physically available in the sense that they are in the house and regularly offered at mealtimes. They become accessible to the child if they are chopped up, ready to eat and placed in a reachable location such as a low table. Both availability and accessibility are associated with children's healthful eating behaviours (Blanchette & Brug, 2005). Finally, there is some evidence that indicates involving children in healthy food decisions (e.g. helping with the shopping, preparing the food and/or setting the table) facilitates a more

balanced diet and decreased food neophobia (fear of new foods) (Allirot, da Quinta, Chokupermal, & Urdaneta, 2016).

On the other hand, parental feeding practices such as rewarding children with unhealthy food, covertly restricting the amount or type of food the child has access to and using food to soothe have been associated with unhealthy eating behaviours in children (Birch, 1999; Mitchell, Farrow, Haycraft, & Meyer, 2013; Pearson, Biddle, & Gorely, 2009).

Family behaviours and interactions are also likely to play a role in forming children's eating habits. Shared family meals, in particular, have been reliably associated with better family eating behaviours (Hammons & Fiese, 2011). Evidence indicates that family meals are more nutritious than 'ready-made' meals (Gillman et al., 2000; Mills, Brown, Wrieden, White, & Adams, 2017) and may serve as a protective factor against disordered eating (Ackard & Neumark-Sztainer, 2001). Positive communication at mealtimes is also associated with the healthy weight of children and adolescents (Fiese, Hammons, & Grigsby-Toussaint, 2012) and availability of healthy food in the family home (Dwyer, Oh, Patrick, & Hennessy, 2015).

Notably, the majority of this research has focussed on pre-school or primary school aged children with few studies considering parents' feeding practices with adolescents. Limited research indicates that adolescents may be their own 'agent of change' (McClean, Griffin, Toney & Hardeman, 2003), but little is known about how parents' feeding practices might impact on this age group.

1.2 Parents' barriers to healthy feeding practices

Some evidence indicates that even though parents are often knowledgeable about which feeding practices are positive, many do not implement these practices

(Lindsay et al., 2009). Given the impact that parental behaviours can have on children's health, it is important to understand the barriers to preparing healthy family meals and implementing other positive feeding practices such as offering a wide variety of food, modelling and exposure.

Parents commonly cite time as a barrier to providing healthy meals (Fulkerson, Kubik, Rydell, Boutelle, Garwick, Story, et al., 2011; Norman, Berlin, Sundblom, Elinder, & Nyberg, 2015); and convenience, family preferences and low self-efficacy as motivators for providing ready-made or packaged food (Horning, Fulkerson, Friend, & Story, 2017). Time is also described as a barrier to shared family meals (Fulkerson et al. 2011). In contrast, surprisingly little research has been conducted to examine the reasons why parents find themselves adopting other negative feeding practices.

The barriers to healthy feeding practices that parents report indicate scope for interventions that can ease the difficulties they face. For example, interventions could target self-efficacy in cooking, offer time-efficient strategies to offer healthy food or consider ways of changing family and child food preferences. It is also likely that parents of different age groups might face different meal-related challenges. As noted above, there is little research in this area.

1.3 Parental challenges around mealtimes

Evidence indicates that parents, and especially working parents, find providing quick, healthy and enjoyable family meals challenging; qualitative studies that have considered attitudes towards family meals have found that working parents often find it difficult to balance the time commitment and hectic schedules arising from employment with providing healthy family meals (e.g. Fulkerson et al., 2011). One such study found that time pressures and the burden of pleasing other family members were particularly

likely to influence decisions around implementing family meals (Bowen, Elliott, & Brenton, 2014). Parents reported stress and anxiety around their children's food preferences, picky eating, the rejection of previously accepted foods and arguments around the table. Indeed, Hammons and Fiese (2011) note in their review that while shared family meals appear to be very positive, it is important not to persist with them at the expense of increased family conflict. A recent quantitative survey supported these ideas, finding that 63% of parents surveyed reported being frustrated by mealtimes and 58% tired and exhausted by them (OnePoll, 2018). Serving food everyone likes, selecting food for picky eaters and encouraging children to eat the food they have been given were the most commonly cited reasons for this exhaustion.

Another qualitative study which aimed specifically to look at stress in the context of mealtimes found that "disorderly" meals (e.g. in front of the television, eating too late), family interplay and lack of parental teamwork were all themes that emerged in the context of family mealtime challenges (Norman et al., 2015). Time spent working, variable work schedules, home environment and perceived difficulty of having family meals have all been found to predict the likelihood of their implementation (Dwyer et al., 2015).

In addition to encouraging healthy eating and feeding behaviours, interventions to improve family eating behaviours should therefore consider how to ensure that mealtimes are stress-free and pleasurable.

1.4 Enjoyable mealtimes

However, there is a notable gap in the literature; very few published studies describe interventions that seek to make mealtimes enjoyable and none describe interventions that appear to have a principal focus on family happiness in this context.

Using in-depth interviews, Berge, Hoppmann, Hanson and Neumark-Sztainer (2013) found that parents felt that making shared family mealtimes fun would support them and their families to increase the frequency of these meals. This indicates that there may be an appetite amongst parents for interventions that focus on stress-free, enjoyable ways to improve feeding practices and mealtimes.

1.5 Thesis research questions

Collectively, this evidence indicates that a fruitful next step would be to design an intervention that is easy for parents to access and that focusses on easy and fun ways to implement healthy eating in the family home. With this in mind, the research described in this thesis aimed to address the following questions:

- 1) What strategies to improve family eating behaviours are effective?**
- 2) What goals do parents have around preparing meals and do these relate to feeding practices?**
- 3) Can an online intervention, designed to support an enjoyable mealtime experience, help improve family eating behaviours?**

The thesis comprises eight chapters that present a combination of published peer-reviewed papers and supplementary analyses and information. It begins by providing a comprehensive Systematic Review examining the efficacy of healthy eating interventions that have been delivered in the family home (Paper 1 published in *Appetite*) before describing the development and testing of an online family eating intervention with a principal theme of ‘healthy happy family eating’ (Paper 2 published in *Health Psychology Update*). Further information about the design of a Randomised Controlled Trial (RCT) to test the efficacy of this intervention is then described, including the development of a new instrument to measure parents’ mealtime goals

(Paper 3 published in *Frontiers in Psychology*). Finally the RCT is described (Paper 4, recently submitted for review), followed by some supplementary analyses and a synthesis and discussion of the thesis.

Chapter 2: Healthy eating interventions delivered in the family home: A systematic review (Paper 1, *Systematic Review paper*)

Published in: *Appetite*

Snuggs, S., Houston-Price, C. & Harvey, K. (2019). Healthy Eating Interventions Delivered in the family home: A systematic review. *Appetite*, 141 114-133.

Chapter 1 outlined the rationale for developing and delivering healthy interventions in the family home. Building on this, Paper 1 (hereafter referred to as the Systematic Review paper for clarity) seeks to establish:

- a) what intervention studies have been conducted to try to enhance healthy eating behaviours in the family home; and
- b) what characteristics successful interventions exhibit

Parents cite time constraints, convenience and location as barriers to participating in healthy eating interventions (Alff et al., 2012; Virudachalam et al., 2016). Delivering such interventions directly to the family home (as opposed to imposing travel demands) should help address these barriers. Although a number of Systematic Reviews have examined healthy eating interventions targeting parents and children (e.g. Knowlden & Sharma, 2012; Van Lippevelde et al., 2012; Wolfenden et al., 2012), this review is novel in that it only considers interventions which were delivered exclusively in the family home.



Healthy eating interventions delivered in the family home: A systematic review



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ABSTRACT

Unhealthy eating habits have long term health implications and can begin at a young age when children still consume the majority of their meals at home. As parents are the principal agents of change in children's eating behaviours, the home environment is the logical location for the delivery of interventions targeting healthy family eating. Despite the recent proliferation of published studies of behaviour-change interventions delivered in the home, there has been little attempt to evaluate what makes such interventions successful. This review provides a systematic evaluation of all healthy eating interventions delivered to families in the home environment to date and seeks to identify the successful elements of these interventions and make recommendations for future work. Thirty nine studies are described, evaluated and synthesised. Results show that evidence- and theory-based interventions tended to be more successful than those that did not report detailed formative or evaluative work although details of theory application were often lacking. Careful analysis of the results did not show any further systematic similarities shared by successful interventions. Recommendations include the need for more clearly theoretically driven interventions, consistent approaches to measuring outcomes and clarity regarding target populations and desired outcomes.

1. Introduction

Food preferences and eating behaviours develop early in life (Savage, Fisher, & Birch, 2007). Healthy eating in the first five years is linked to current and future health (Branca, Piwoz, Schultink, & Sullivan, 2015, p. 351; Ogden, 2012; Rasmussen et al., 2006), and both dietary variety seeking (Nicklaus, Boggio, Chabanet, & Issanchou, 2005) and untreated overweight/obesity (Vivier & Tomkins, 2008) are likely to track from childhood into adulthood. Thus, it is important to address unhealthy eating as early as possible.

Healthy eating refers to the consumption of a wide variety of foods in the correct proportions to achieve and maintain a healthy body weight (National Health Service (NHS), 2014). A balance of fruit, vegetables, complex carbohydrates and protein is considered beneficial (National Health Service, 2015), while high intake of processed food, sugar and/or salt reflects a substandard diet, and both over- and under-eating are considered unhealthy behaviours (World Health Organisation (WHO), 2015). Unhealthy diet in children is considered to be a widespread problem (World Health Organisation, 2015). Across the economically developed world, between a quarter and a third of children are typically overweight or obese (National Health Service, 2017; Rodd & Sharma, 2016; State of Obesity, 2017). Children also

consume fewer fruit and vegetable (FV) portions than the recommended daily guidance (Dennison, Rockwell, & Baker, 1998; Kim et al., 2014) and both obese and non-obese children are thought to consume inadequate nutrients (Gillis & Gillis, 2005). Many national governments have therefore introduced campaigns to address children's food choices, many emphasising the need for balance and variety in children's diets (e.g. Change4Life, 2015; Government of Canada, 2018; USDA, 2018).

A key focus for such interventions is what young people eat at home. In their first few, formative, years, and even once they have started school, children eat most of their meals in the home environment (Poti & Popkin, 2011). Inevitably, parents play an important role in shaping children's food choices, eating behaviours and habits. Evidence indicates that eating behaviour interventions for children should target parents as the principal agents of change (Golan, 2006) (although adolescents may achieve greater dietary change when treated directly; see McLean, Griffin, Toney, & Hardeman, 2003). This systematic review evaluates the evidence relating to interventions delivered at home that seek to support healthy eating in children who are both overweight and of a healthy weight.

There are a number of well-established home environment correlates to healthy eating and willingness to try new foods in children

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(Blanchette & Brug, 2005; Pearson, Ball, & Crawford, 2012). Children are more likely to consume and enjoy new foods if they are exposed to them repeatedly (Anzman-Frasca, Savage, Marini, Fisher, & Birch, 2012; Mitchell, Farrow, Haycraft, & Meyer, 2013; Patrick & Nicklas, 2005). This is thought to be due to learned safety of exposed foods (Kalat & Rozin, 1973) or exposure effects leading to positive attitudes to more familiar foods (Zajonc, 1968). Parents' modelling of healthy food consumption also influences children's food choices, both through social learning processes such as imitation and through greater exposure to foods parents are eating (Dickens & Ogden, 2014; Savage et al., 2007). For children to consume a food, it must be both available (in the home and offered to the child) and accessible (in a format easy to reach and consume) (Patrick & Nicklas, 2005). Exposure, modelling, availability and accessibility of healthy foods are consistently found to be strong predictors of children's healthy eating (Pearson et al., 2012). In addition, children's and adolescents' nutritional health is associated with the frequency of shared family meals (Dwyer, Oh, Patrick, & Hennessy, 2015), which is thought to be a protective factor against obesity and, possibly, disordered eating (Ackard & Neumark-Sztainer, 2001; Berge, Loth, Hanson, Croll-Lampert, & Neumark-Sztainer, 2012). Shared family meals are more likely to be home-cooked (rather than 'ready-made') and nutritious (Gillman et al., 2000), and provide parents with more opportunity to model healthy eating. Social learning may partly explain the link between family meals and positive eating habits.

Some parents struggle to implement positive feeding practices, however (Carruth & Skinner, 2000; Shloim, Edelson, Martin, & Hetherington, 2015), even when informed about strategies to encourage healthy eating (Lindsay, Sussner, Greaney, & Peterson, 2011). Parents cite time, budget and children's food preferences as interfering with their ability to follow relevant advice (Fulkerson et al., 2011). Interventions have been developed to support parents' behaviours and strategies around feeding children (both normal weight and overweight/obese) (Campbell & Hesketh, 2007; Knowlden & Sharma, 2012; Ling, Robbins, & Wen, 2016; Van Lippevelde et al., 2012), typically delivered through group or individual meetings held in schools (Evans, Christian, Cleghorn, Greenwood, & Cade, 2012; Mikkelsen, Husby, Skov, & Perez-Cueto, 2014) or community venues (Bleich, Segal, Wu, Wilson, & Wang, 2013). However, parents cite time, location and childcare considerations as barriers to participating in such eating behaviour interventions (Alff et al., 2012; Virudachalam et al., 2016).

To be effective, family eating interventions must be both practical and accessible for parents. Until recently, few interventions met these criteria; the majority were expensive and impractical to deliver on a large scale (Rudolf, 2012). For example, a Cochrane review conducted in 2012 (Wolfenden et al., 2012) identified only two home visit-based interventions that might be effective in increasing fruit and vegetable consumption in pre-school children. However, in recent years, more interventions have been delivered within the family home, which reduces the barriers to participation for parents; advances in technology also permit the development of cheaper, more accessible, health behaviour interventions (WHO, 2017). Many of these draw on Social Cognitive Theory (SCT, Bandura, 1986) which attempts to change behaviour by addressing social cognitions. In the context of healthy eating, this involves addressing expectancies such as the health consequences of eating specific foods or incentives, for example, how individuals might feel after eating particular foods. For example, the Health Belief Model (Becker, 1974) has been used to predict healthy eating amongst various populations (Deshpande, Basil, & Basil, 2009) while the Theory of Planned Behaviour (Ajzen, 1991) has been used to address the intention-behaviour gap (Sheeran & Webb, 2016) through manipulating parents' implementation intentions in relation to their children's sugar intake (Beale & Manstead, 1991).

This current review considers the full literature that has addressed the question *what is effective in changing eating behaviours in the family home?* Given the broad implications of unhealthy eating in children, the review will include obesity prevention studies, obesity reduction

studies and healthy eating studies in normal weight populations. It seeks to systematically review all intervention studies that have set out to change children's or families' eating behaviours and that are delivered exclusively to parents, children or families in the home environment and, in doing so, to address two questions:

- (1) What intervention studies have been conducted to try to enhance healthy family eating behaviours within the family home? Outcomes considered include both changes in child health (e.g. adiposity, weight) and other positive features of family mealtimes (e.g. family mealtime frequency, positive feeding practices).
- (2) What characteristics do successful interventions exhibit in relation to both their theoretical basis and more practical aspects of their design and implementation?

2. Method

The review protocol was registered with Prospero, the international prospective register of systematic reviews (<https://www.crd.york.ac.uk/prospero/>) on 5th July 2016, with a revision on 17th February 2017 (registration number PROSPERO 2016:CRD42016042387).

2.1. Search strategy

A search was conducted in three electronic databases (Medline, Web of Science, The Cochrane Library) for articles published from 1980 to the present day on 12th May 2016, and repeated on 22nd January 2018 to update the results. The following search terms were used:

- (1) Home*/house*/famil*/child*/toddler/pre-school*/preschool*/adolescen*/parent*
- AND.
- (2) Eat*/feeding practice(s)/meal*
- AND.
- (3) Intervention/prevention/program*/randomised controlled trial/randomized controlled trial/RCT/qualitative/course

Forward and backward citation searching, and additional hand-searching were also conducted. Reports outside academic peer-reviewed publications were not included.

PRISMA guidelines and checklist were complied with throughout (Moher, Liberati, Tetzlaff, Altman, & The, 2009).

2.2. Inclusion/exclusion criteria

Step 1. Initial criteria to determine whether articles would be considered were: 1) English language; 2) human participants; 3) peer-reviewed journal publication.

Step 2. For articles that met these initial criteria, one researcher (SS) screened the titles and abstracts for inclusion using the following criteria:

- 1) relevance (i.e. titles were excluded if the topic was unequivocally irrelevant. Examples of irrelevant topics included smoking cessation, Alzheimer's disease and alcohol abuse);
- 2) home-delivered intervention (studies involving visits to sites other than the family home for data collection purposes were included if all aspects of the intervention were delivered within the family home; interventions *intended* to be delivered at home but that could be accessed elsewhere (e.g. through a mobile device, or if visit locations were rearranged for convenience) were included);

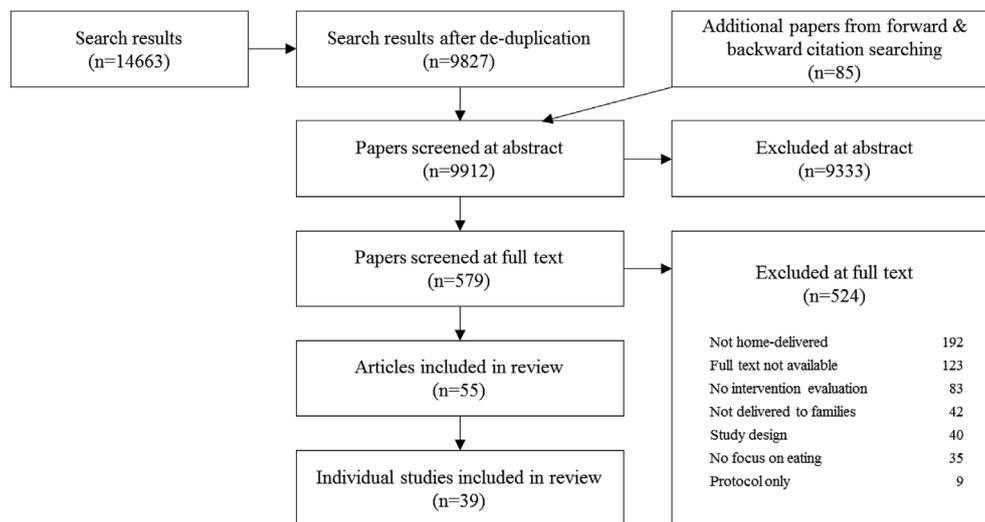


Fig. 1. Study selection process.

- 3) focus on eating (however, studies were excluded if the focus was on condition-specific eating (e.g. autism, cerebral palsy), eating disorders or malnutrition in developing countries);
- 4) randomised controlled trial/case-controlled trial/other controlled design/qualitative evaluation of intervention (reviews and meta-analyses were not included but were examined for relevant studies);
- 5) families had children aged > 6mo and < 16 yo (participants could be children and/or parents/carers; interventions were included if they were initiated before the child reached 6mo but continued beyond this age *and* were focused on eating, rather than breast-feeding);
- 6) health-related outcome measure (e.g. dietary intake, BMI, parental feeding practices);
- 7) outcome data are published.

Five research assistants ‘second-coded’ all articles using the same criteria. All articles included by at least one coder underwent full text screening (step 3), to double check that criteria were met. Any article with unclear inclusion status at step 3 was considered by a third researcher (KH). Where appropriate, study authors were contacted to clarify methodological details. See Fig. 1 for flow diagram of these steps.

2.3. Quality appraisal

The quality appraisal considered criteria laid out by the Centre for Reviews and Dissemination (CRD) (CRD, 2009), as follows: 1) Appropriateness of study design to research objective; 2) Risk of bias; 3)

Choice of outcome measure; 4) Statistical issues; 5) Quality of reporting; 6) Quality of the intervention; 7) Generalisability. The CRD recognises that elements of quality appraisal can be subjective and does not always recommend the use of checklists or scales to allocate quality scores (CRD, 2009 p.33–44). Thus, the above criteria were considered when evaluating studies but studies were not given quality ratings. Instead, studies were weighted equally and quality assessment is described in the narrative.

2.4. Data synthesis

A narrative summary technique was used to describe findings. Meta-analysis was not used as intervention formats, outcome measures and times of follow-ups varied widely between studies.

3. Results

The search strategy yielded 9827 unique titles, 9774 of which were excluded. Fifty-five articles were included in the systematic review, representing 39 unique studies (some studies were reported in more than one paper) (Fig. 1).

In all but three studies, participants were randomised or cluster-randomised to one or more Intervention Groups (IG) or to a Control or Comparator Group (CG). One of the remaining studies included a non-randomly allocated comparison group; two studies incorporated control through within-subjects designs. Three studies identified as pilot randomised trials.

A summary of the characteristics of included studies is provided in

Table 1
Intervention characteristics.

Study type (n)	Formative work/intervention development described or pilot work referenced: n (%)	Participant or process evaluation reported (or referenced): n (%)	Retention rate range ^a	Financial incentives used to engage in study: n (%)	Effect sizes reported in conventional format: n (%)	Intention to treat analysis employed n (%)
Home visit (15)	9 (60%)	5 (33%)	55%–100%	3 (20%)	3 (20%)	6 (43%)
Telephone (3)	2 (66%)	2 (33%)	55%–86%	1 (33%)	0	2 (66%)
Printed materials (9)	2 (22%)	4 (44%)	38%–100%	0	4 (44%)	3 (33%)
Video game (4)	4 (100%)	3 (75%)	87%–97%	1 (25%)	1 (25%)	2 (66%)
mHealth ^b (7)	6 (86%)	4 (57%)	35%–91%	3 (43%)	3 (43%)	1 (14%)
Other (1)	1 (100%)	0	100%	0	0	n/a
All studies	24 (61%)	18 (46%)	35% - 100%	8 (21%)	11 (29%)	14 (39%)

^a For studies with insufficient information, no retention rate has been reported.

^b mHealth refers to health interventions delivered through wireless technology (e.g. mobile phones).

Table 1. Included studies were conducted in the United States (US, $n = 15$), United Kingdom (UK, $n = 9$), Australia ($n = 4$), US/Mexico border ($n = 2$), Germany ($n = 2$), US and Canada ($n = 1$), Brazil, Hong Kong, Italy, the Netherlands, New Zealand and Sweden ($n = 1$ in each case). Where studies did not state the setting, it was assumed that this was the authors' country of residence.

The majority of studies targeted families with children of normal weight; one study targeted picky eaters. Just over half reported the theory or evidence base behind the intervention, with Social Cognitive Theory as the most commonly cited theory. A similar number reported evidence of formative work around the development of the intervention, although fewer than half reported any element of participant or process evaluation. Most studies did not report using intention to treat (ITT) analyses (i.e. including all randomised participants in analyses, regardless of completion status). Follow-up periods varied, from no follow up (i.e. immediate post-intervention data collection only) to four years.

Only eight studies reported effect sizes in a conventional format (e.g. Cohen's d); a further seven discussed the size of the effects found (e.g. increases in vegetable intake in terms of portions). No study reported a cost-effectiveness analysis, although one collected cost data for future analysis. No study blinded participants to condition; several explained that this was procedurally impossible, given the behavioural nature of the interventions.

The interventions discussed in the following section are divided into those that are person-delivered (face-to-face or telephone) versus information/technology-delivered (printed materials, video games and mHealth) and further categorised by intervention type and setting. Studies are first summarised and evaluated in detail, after which the evidence is synthesised and conclusions drawn.

3.1. PERSON-DELIVERED interventions

3.1.1. Home visits

Fifteen of the 39 identified studies involved home visits. [Table 1](#) summarises the characteristics of these studies. [Table 2](#) provides further details of the individual studies. Given that the cost, practicality and resources required by such interventions vary widely depending on who undertakes the home visits, studies are divided into interventions delivered by healthcare professionals, peer supporters and researchers.

3.1.2. Home visits by healthcare professionals

The *Healthy Beginnings Trial* ([Wen, Baur, Simpson, et al., 2012](#)) describes a longitudinal intervention in which parents were recruited and visited by a nurse in late pregnancy and then at other time-points coinciding with developmental milestones. Key messages included *breast is best, no solids until 6m, variety of FV every day, only water in cup, and active family*. No explicit theoretical rationale was provided for this intervention; instead it drew on evidence-based information and guidelines. Intervention reporting for this study is of high quality, with a separate paper reporting the study design and considerable transparency around eligibility, retention and long term follow-up (LTFU). Participants represent a wider socio-economic range than most other studies reviewed. At the end of the intervention, children in the Intervention Group (IG) had a lower BMI than the Control/Comparison Group (CG) (difference of 0.29 kg/m^2 , $p = 0.04$), although both were within the healthy range defined by the authors. IG parents also reported that their children were more likely to eat one or more servings of vegetables a day, were less likely to be given food as a reward and were less likely to eat meals in front of the television. Mothers in the IG were also more likely to eat more than two servings of vegetables a day, suggesting possible mechanisms for the effects of the intervention on children (i.e. modelling & exposure). This study was unique in attempting a cost-effectiveness analysis ([Wen, Baur, Rissel, et al., 2012](#)). It also reported one of the longest follow-up periods (3 years post-intervention); however, all significant differences between groups had

disappeared by the time children were 5 years old ([Wen, Baur, Simpson et al., 2015](#)).

Healthy Habits, Happy Homes ([Haines et al., 2013](#)) involved home visits and phone calls delivered by 'health educators', accompanied by educational materials. Motivational Interviewing was employed but no further theoretical detail was provided. The intervention, aimed at families with 2- to 5-year-olds, focused on routine setting, predominantly through reduction of television viewing and increasing family meal frequency (FMF). Despite apparent success on some measures (reduction of TV time; lower BMI in IG), no between-group differences were seen in FMF. The authors noted that the high baseline FMF in both groups, and/or the imprecise wording ('at least some of the family ate together') may have contributed to a ceiling effect on this measure. Nevertheless, it seems unlikely that FMF acted as a mechanism for BMI reduction in this study.

The *Healthy Immigrant Families* study ([Wieland et al., 2017](#)) drew on Social Cognitive Theory (SCT) and recruited families to an intervention involving 12 home visits by family health promoters, six of which focused on healthy eating. Families comprised at least one adult and one adolescent (10–18 years). Adults (but not adolescents) in the IG showed an increase in *Healthy Eating Index* scores after 12 months compared to a CG, and after 24 months compared to baseline. Changes were not reflected in other behavioural or physiological measures collected in both groups (BMI, weight, waist circumference, blood pressure).

3.1.3. Home visits by peer educators

The *High 5 for Kids* programme ([Haire-Joshu et al., 2008](#)) involved visits focussing on knowledge, modelling of FV intake, non-coercive feeding practices and FV availability. This intervention drew on a 'combination of theoretical models', including SCT, an ecological framework and reciprocal determinism. Educators and families were participants in an existing parenting and development programme in the U.S, 'Parents as Teachers' (PAT). Thus, the IG received PAT and High 5 for Kids, while control participants received PAT only, providing a more stringent control condition than studies with limited interaction with the CG. Parents in the IG significantly increased their intake of fruit but not vegetables, although effects were small (parental fruit intake was, on average, 0.16 servings higher in the IG than in CG); had intention to treat analysis been employed, such small effects might not have reached significance. The change in parents' FV intake predicted the change in child FV consumption (an increase of 1 serving for parents led to an increase of 0.5 servings for children), suggesting modelling or availability as mechanisms supporting the efficacy of such interventions. However, parents did not report increased modelling; rather, they reported increased coercive feeding practices. Importantly, intervention effectiveness varied according to child weight status; FV servings increased for healthy weight but not overweight children. Families of overweight children may need more intensive or longer-lasting interventions to effectively change feeding practices and eating behaviours.

[Harvey-Berino and Rourke \(2003\)](#) also based their peer-educator programme on a pre-existing general parent education program, *Women, Infants and Children (WIC)*, in the US. While the existing program was delivered with the CG, the IG received an adapted program in which all sessions were related to healthy eating. Although there was some focus on the concept of parents acting as mediators to change, there was no expansion of the theoretical underpinnings of the intervention. Forty three mother-child dyads participated in this pilot study; only pre- and post-intervention data were collected. The authors noted trends towards significance in between-group differences on weight to height z-scores and energy intake (with decreases in IG and increases in CG; $p = 0.06$ for both). IG mothers reported significantly lower use of restrictive feeding practices than mothers in the CG group. Although this was one of the study's aims, the authors appear unclear about whether this represents a positive change. No other differences were detected on a range of outcome measures (diet, physical activity, self-

Table 2
Home visit study characteristics.

Home visit intervention studies										Theoretical framework	
Authors	Year	Home visitors	Other resources	n of visits (intervention length)	Length of visits	Target of intervention	Primary outcome (measure) ^a	Statistically significant difference shown on primary outcome immediate IPI?	Statistically significant difference shown at LTFU? (LTFU period)		
Corsini et al.	2013	Market researchers	Booklet with guidance around refusal to taste	1 (followed by 2wk intervention period)	NR	Liking & intake of previously disliked vegetable	Vegetable liking & consumption (5-point scale & weight of leftover vegetable)	Liking increased for exposure & exposure + reward groups (p = 0.002 & p < 0.001) but no significant difference between CG & IGs for consumption	No further change in liking at 4wks or 3 m (p value not reported for between group differences). Consumption increased in exposure + reward and CG groups (p = 0.013 & p < 0.001) but not exposure only. (3 m)	No LTFU	Not stated
Cravener et al.	2015	Researchers	Vegetable packages, granola bars, sticker incentives	4 (4 wks)	NR	Vegetable intake	Veg & Granola intake (Pre/post taste food weight change)	IG group increased vegetable intake at wk 2 compared to CG (p < 0.01) but this effect was not sustained to the end of intervention period (4 weeks). Granola intake decreased in IG relative to CG at wks 2 & 3 but NS difference at Wk4.	No LTFU	Behavioural economics	
Crespo et al.	2012	Promotoras	4 phone calls	7 (7 months)	1.5h	Healthy eating & weight gain prevention in children	Adiposity (BMI z-score)	No	No (3 years)	SCT (HBM)	
Haines et al.	2013	'Health educators' (no further description provided)	40 SMS messages, mailed educational materials	4 (6 months)	NR	Family meal frequency	Family meal frequency (FMF question)	No	No LTFU	Not stated	
Haire-Joshu et al.	2008	'Parents as teachers' (existing scheme)	Computer tailored nutrition newsletter, sing along storybook	4 (NR)	1 h	Parents' & children's FV intake	Child & parents' FV intake (Saint Louis University for Kids Food Frequency Questionnaire)	Increase in F intake in parents & normal weight children only (p = 0.04 & 0.05). No increase in V intake.	No LTFU	SCT; Ecological framework; Reciprocal determinism	
Harvey-Berino & Rourke	2003	Peer educators	n/a	11 (16 wks)	NR	Childhood obesity reduction	Adiposity (Weight fo height z-score)	No (p = 0.06)	No LTFU	Not stated	
Horton et al.	2013	Promotoras	3 phone calls, 'telenovela' DVD, family manual	11 (4 months)	1.5h	Childhood obesity risk behaviours	Child FV intake & variety (National Cancer Institute Food Attitudes & Behaviour Survey)	No	No LTFU	Not stated	
Leung et al.	2015	'Parent ambassadors' (local volunteer parents)	Illustration booklet	20 (NR)	1–2h	Feeding practices	Feeding practices (Hong Kong Parent Feeding Questionnaire, HKPFQ)	IG scored higher on HKPFQ than CG indicating improved practices, but practices not specified (p < 0.001)	No LTFU	Not stated	
McGowan et al.	2013	Researchers	n/a	4 (8 wks)	NR	Healthy feeding habits	Automaticity (habit strength related to feeding habits) (Self-Report Habit Index)	IG parents had higher scores for giving the child 5 FV per day (p < 0.01)	No LTFU	Habit theory	
Rodearmel et al.	2006	Researchers	Educational logs	1 (13 wks)	NR	Weight gain reduction in children & parents	Adiposity (BMI for adults, BMI-for-age change for children)	BMI lower in IG than CG in children & adults (difference -1.12 & -0.58, p = 0.03 & p < 0.001)	No LTFU	Not stated	

(continued on next page)

Table 2 (continued)

Home visit intervention studies										
Authors	Year	Home visitors	Other resources	n of visits (intervention length)	Length of visits	Target of intervention	Primary outcome (measure) ^a	Statistically significant difference shown on primary outcome immediate IPI?	Statistically significant difference shown at LTFU? (LTFU period)	Theoretical framework
Vitolo et al.	2012	Undergraduate students	Leaflet depicting 'healthy meal' image	10 (12 months)	1 h	Infants' consumption of energy dense food	Consumption of sugar-dense & lipid-dense food (Food frequency questionnaire)	IG infants consumed fewer sugar-dense & lipid-dense foods (p < 0.05)	Unclear as different measures reported (~ 3 years)	Not stated
Wardle et al.	2003	Researchers	n/a	1 (followed by 2wk intervention period)	NR	Liking & intake of previously disliked vegetable	Vegetable liking & consumption (3-point scale & weight of leftover vegetable)	Child liking, preference ranking & consumption for target vegetable increased in exposure group & increased by more than the other groups (p < 0.001 for liking & preference, p < 0.01 for consumption)	No LTFU	Not stated
Watt et al.	2009	Local mothers	n/a	21 (9 months)	1 h	Infant feeding practices at 12 m	Vitamin C intake (24-hr multiple pass recall method)	No	No (4 years)	Social support theoretical model
Wen et al.	2012	Community nurses	n/a	8 (2 years)	1–2 h	Infant feeding practices/family nutrition	Adiposity (BMI)	BMI lower in IG (p = 0.04)	No (3 years)	Not stated
Wieland et al.	2017	'Family health promoters' from a community based participatory research partnership	Up to 12 phone calls in the 2nd 6 months of the intervention	12 (6 focus on healthful eating) (6 months)	30–90 min	Parents' & adolescents dietary quality	Dietary quality (Healthy Eating Index, HEI/24 h recall)	Adults in IG had higher HEI score than CG at 12 m, but adolescents did not	No LTFU	SCT

IPI = Immediately post-intervention.

LTFU = Long Term Follow Up.

NR = Not reported.

SCT = Social Cognitive Theory.

HBM = Health Belief Model.

Promotoras = Community members trained to deliver health education.

^a If a PO is not explicitly stated in the study, it is selected according to the aims & objectives of the study. Where the study involves other health behaviours, the primary eating-related outcome & behaviour has been selected.

efficacy, intentions, other elements of child feeding questionnaire) but the authors concluded that the pilot study showed promise and warranted further research. To our knowledge, a larger evaluation of the intervention has not yet been published.

The *Healthy Start Visit Program* (Leung, Tsang, & Heung, 2015) aimed to improve parents' feeding practices as part of a wider program addressing health and well-being, which specifically targeted disadvantaged parents. 'Parent ambassadors' (local volunteer parents) were given 50 h of training to deliver the intervention by psychologists and social workers. One intervention session exclusively covered healthy diet and mealtime routines (Leung, Tsang & Heung, 2013). The theoretical framework is not stated in the paper for either the intervention as a whole or the healthy eating section. Participants in the CG attended a series of parent talks. Although no follow-up data are provided, participants in the IG had improved their feeding practices to a greater extent than those in the CG immediately post-intervention. The authors also present an interesting description of their completers and non-completers, showing that non-completers were more likely to be divorced, on lower incomes and receiving social-welfare benefits.

The *'Entre familia: reflejos de salud'* study (Horton et al., 2013) employed *promotoras* (typically Hispanic or Latino community members trained to provide health education) to deliver a healthy eating intervention to families living on the US/Mexico border. Formative work (focus groups and depth interviews with the target population) were referenced but no psychological theory was described as background to intervention design. Weekly fast food intake decreased in the IG, and a 'trend' towards an increase in monthly FV variety was reported but there were no between-group differences on other outcome measures (FV consumption, Sugar-sweetened Beverage intake). A dose-response relationship was present, such that children who had more contact with the *promotora* showed greater FV intake. A process evaluation (Schmied, Parada, Horton, Ibarra, & Ayala, 2015) indicated that number of visits and visit length predicted lower use of strategies to decrease fat intake, while sharing the manual with friends predicted higher use of strategies to increase fibre intake, which the authors attribute to over-reliance on the *promotora* and social support respectively. Greater satisfaction with the DVD (which could not be shared as it was taken away after each session) also predicted use of fibre-increase strategies. Retention rates and fidelity were high (almost 90% of families received the 11 planned visits), and the evaluation indicated high levels of satisfaction with the programme. Limitations of the study include the convenience sampling method (participants were likely to be highly motivated), self-report methodology, the possibility of contamination (IG members may have shared the manual with CG members) and the lack of follow-up data.

In the *Aventuras Para Niños* study (Crespo et al., 2012), mothers were allocated to a 'micro-intervention' (delivered by *promotora* in the family home), a 'macro-intervention' (delivered through school and community), 'micro + macro', or control (data collection only) conditions. This study drew on SCT (specifically, the Health Belief Model). The authors found no significant reduction in BMI z-scores for any of the groups over time. The micro-intervention (the condition meeting inclusion criteria for this review) had an initial effect on parenting styles; mothers in this group showed the largest increase in use of positive reinforcement. However, by the 2-year follow-up, the micro + macro group were reporting more positive reinforcement than other groups. Both these groups demonstrated a decrease in controlling strategies, indicating that home visits may be responsible for this.

Watt et al. (2009) used a 'social support theoretical model' and trained local mothers to deliver a home-visiting intervention covering exclusive breastfeeding, introducing solids, appropriate food and drink and when to cease bottle-feeding. New mothers, recruited through baby clinics, received four weekly followed by nine monthly visits, while CG participants received standard care from General Practitioners and Health Visitors. No between-group differences were detected in intake of Vitamin C or any other micro or macro nutrients at post-intervention

or 6 m follow-up. At post-intervention, IG children were less likely to be given goats or soya milk, more likely to have 3 solid meals a day and more likely to consume apples, pears, boiled potatoes and carrots. At 6 m FU, they were less likely to be using a feeding bottle, and more likely to consume pears, potatoes and (somewhat surprisingly) chips. There were no differences between groups in terms of mothers' FV intake. Further follow up was conducted at 4 years (Scheiwe, Hardy, & Watt, 2010), when the authors found no significant differences on their primary outcome measures. IG children were more likely to be given unsweetened fruit juice and less likely to drink squash and remained less likely to use a feeding beaker or bottle, or to take a bottle to bed after their 4th birthday. The authors concluded that the intervention had 'limited long term impact' and suggest that 'improving knowledge might not be enough to achieve behavioural changes' (p.334).

3.1.4. Home visits by researchers (researcher-led interventions)

Rodearmel et al. (2006) evaluated a dietary and physical activity intervention delivered through home visits by researchers. IG parent-child dyads (and other family members should they wish to take part) were asked to consume two servings of breakfast cereal per day (one for breakfast and another for a snack). No psychological rationale was provided for this, rather a biological explanation; that eating breakfast is consistently associated with successful weight management (although this depends on breakfast content, Spence, 2017), while cereal consumption can aid weight loss. The authors did not specify the cereal type, but did state that the manufacturer *Kellogg's* provided it. The IG was also asked to increase their daily step count by 2000. The study targeted families with children whose percentage BMI for age \geq 85th centile. Although the IG did not achieve two portions of cereal a day, they consumed a mean of 1 portion, double that of the CG (who participated only in data collection). There was no pre-/post-intervention change in self-reported energy intake but IG parents and children had lower % BMI and % body fat (but not weight) than CG participants post-intervention. The IG also significantly increased their daily step count, which is the more likely explanation for their health improvements. Furthermore, this line of research should be pursued with caution due to the high sugar content of many types of cereal.

The *Healthy Feeding Habits* intervention was assessed in an RCT with a no-treatment control group (McGowan et al., 2013). Parents of 2- to 6-year-olds worked through an 'intervention booklet' during researcher visits. The intervention focused on 'habit-theory' and habit forming around various feeding domains, plus self-monitoring and goal setting. At the end of the intervention, participants reported higher 'automaticity' (a measure of habit strength) and greater child fruit and vegetable intake (increases of 0.5 and 0.8 servings respectively). No follow-up data were reported. A second paper by the same group (Gardner, Sheals, Wardle, & McGowan, 2014) concluded that the habit-forming intervention was acceptable to participants, as reflected by the high retention rate (84%).

Vitolo, Bortolini, Campagnolo, and Hoffman (2012) evaluated an intervention delivered to new mothers through home visits by undergraduate students. Content focused on the 'Ten Steps to Healthy Eating' (Brazilian Ministry of Health, 2002) but no further theoretical rationale was provided. Six months post-intervention (children were aged 12–16 months), there were no differences between-groups in the number of children who were overweight but IG children were less likely to consume sweets, soft drinks, honey, cookies, chocolate and salty snacks. Similarly, at 3- to 4-years old, the IG had a lower prevalence of 'poor diet' (as measured by the Healthy Eating Index, Kennedy, Ohls, Carlson, & Fleming, 1995) than the CG (Vitolo, Rauber, Campagnolo, Feldens, & Hoffman, 2010). BMI was not reported at follow-up so no conclusions can be drawn regarding obesity prevention.

3.1.5. Home visits by researchers (parent-led interventions)

Wardle et al. (2003) trialled a parent-led intervention in which parents of 2- to 6-year-olds were allocated to one of three conditions;

Table 3
Telephone intervention study characteristics.

Telephone intervention studies							Theoretical framework			
Authors	Year	Callers	Other resources	n of calls (intervention length)	Call length	Target of intervention				
Makert et al.	2014	Trained prevention managers	Newsletter	14 (12 months)	20–30 min	Child obesity prevention	Primary outcome (measure) ^a Child adiposity (BMI-SDS)	Statistically significant difference shown on primary outcome immediate IPT? More of the IG reduced BMI-SDS by ≥ 0.2 than CG (P = 0.03 with PPA only)	Statistically significant difference shown at LTFU? No LTFU	Not stated
Tabak et al.	2012	Dieticians	Newsletter	2 (4 months)	34 min	Pre-school children's vegetable intake	Child vegetable intake (Block Kids Food Frequency Questionnaire)	No	No LTFU	SCT
Wyse et al.	2012	'Experienced health interviewers' (no further information)	Guidebook, meal planner, cookbooks, water bottle	4 (4wk)	30 min	Home food environment associated with children's FV consumption	FV intake(Children's Dietary Questionnaire)	FV scores higher in IG than CG at 2 m with ITT (p = 0.008)	FV scores higher in IG than CG at 6 m with PPA (p = 0.021) and at 12 m with ITT (p < 0.001)	Conceptual model of family-based intervention behaviour change techniques

IPI = Immediately post-intervention.

LTFU = Long Term Follow Up.

PPA = Per protocol analysis.

^a If a PO is not explicitly stated in the study, it is selected according to the aims & objectives of the study. Where the study involves other health behaviours, the primary eating-related outcome & behaviour have been selected.

exposure, information or control. This study did not provide a psychological theoretical framework, instead drawing from the evidence base around exposure to healthy foods as a predictor of healthy eating. The exposure group was asked to offer children a target vegetable (chosen for 'moderate' disliking by the child) every day for 14 days. The information group was given nutritional information in printed format and the CG was asked only to attend in-home data collection appointments. Using per-protocol analysis (i.e. including only those participants who followed the study protocol in analyses), the hypothesised effects were supported; liking, preference ranking and consumption of the target vegetable all increased in the exposure group. Although the CG also showed increased liking for the target vegetable, only the exposure group demonstrated a significant positive change on all three outcome measures. However, with ITT analysis, the increases in preference ranking and consumption in the exposure group were no longer significant, highlighting the challenge of persuading parents to engage in and persist with exposure strategies. This was also highlighted in post-intervention qualitative work, where several parents complained about the duration of the exposure period.

Another exposure-based intervention (Corsini, Slater, Harrison, Cooke, & Cox, 2013) employed a market research company to support parents in delivering the intervention. Parents who stated that they found it difficult to persuade their 4- to 6-year-olds to eat vegetables were randomly assigned to exposure, exposure + reward or control groups. Both intervention groups exposed children to a target vegetable (disliked at baseline) every day for 14 days. In the exposure + reward group, parents also gave children a sticker after tasting (children could choose a 'yummy', 'okay' or 'yucky' face sticker). Liking of the vegetable increased equally in the two exposure groups but not in the CG. Surprisingly, consumption of the vegetable increased in all three groups. The authors attribute this finding to demand characteristics, emphasising the importance of an authentic control group. Moreover, only children who achieved 9 or more exposures (79% of the exposure group, 60% of the exposure + reward group) were included in analyses. Fidelity of the intervention was therefore not fully tested. The authors acknowledge that intensive repeated exposure may be burdensome for many parents and that distributed exposure over longer periods might be more feasible.

Cravener et al. (2015) also used home visits by researchers to support a 4-week parent-led intervention based on behavioural economics. Participants were parents of pre-school children who consumed fewer than two vegetable portions per day and were considered at risk for obesity. After a baseline period in which vegetable consumption was measured, the IG were given vegetables in packaging with cartoon characters, stickers to use as incentives for consumption and unbranded granola bars. At snack times, children were offered the vegetables and told that, if they waited 5 min, they could alternatively have a granola bar. If children requested the bar but started to eat the vegetables while waiting, the granola bar option was removed on that occasion. However, as parents were allowed to offer snacks and children were allowed to request these as often as they liked, children could presumably request the granola bar immediately after consuming the vegetables. IG parents were also given some instructions around feeding practices (e.g. no pressuring, bribing, non-study rewards or pleading). CG participants were provided with the same vegetables and bars but with plain packaging and no instructions about how to offer snacks. IG children's vegetable intake increased post-intervention by approximately 1 serving per day, compared to no increase in the CG. Both groups' liking for vegetables increased over time, likely due to exposure. Because of the complex nature of this intervention, the unclear purpose of the CG (i.e. to control for feeding practices, branding, incentives or both of these) and confusion around when children were allowed to consume the granola bar, it is difficult to determine which elements of the intervention might have been effective. The sample size was also very small (N = 24). A larger sample and more precise control groups would be required to confirm the benefits of this approach to increasing

vegetable intake.

3.1.6. Telephone-based interventions

Three studies involved interventions primarily delivered through telephone calls. Two studies targeted FV intake in normal weight preschool children, while one study targeted children with obesity. Table 1 summarises the characteristics of the telephone interventions, while Table 3 provides details of individual studies.

The widely-reported *Healthy Habits* intervention used an RCT design to test the efficacy of a telephone-based intervention to increase preschoolers' FV intake (Wolfenden et al., 2014; Wyse, Campbell, Brennan, & Wolfenden, 2014; Wyse et al., 2010, 2012; Wyse, Wolfenden, & Bisquera, 2015). Telephone calls were delivered by trained and supervised telephonists using computer-assisted telephone calls (CATI). The intervention drew on Golan & Weizman's conceptual model of family-based interventions (Golan & Weizman, 2001) and used a number of behaviour change techniques (e.g. goal-setting). Interviewers were discouraged from deviating from the script to ensure standardisation. The CG received one booklet on dietary guidelines through the post. The study was followed up at 6, 12 and 18 months (5, 11 and 17 months after completion of intervention, respectively). Both parent and child FV intake increased as a result of the intervention. FV increase was significantly higher for children in the IG than those in the CG one month post-intervention. At 6 months, this difference remained significant in analyses using all available data and per-protocol analyses, and approached significance with sensitivity analysis using baseline observation carried forward (BOCF) ($p = 0.069$). Effect sizes are not reported, but the main analysis shows that the IG increased by 2 points at both 1 month and 6 month assessments; each point denoted an additional portion of FV or a newly-trying FV in the past 24 h, suggesting a meaningful change. However, mean scores for both groups at baseline were > 14 , indicating that children were already meeting Australian Dietary Guidelines. Furthermore, parents in the sample were more educated and had a higher household income than a random sample of parents from the region, indicating that the intervention did not reach the families most in need. Nevertheless, subgroup analysis indicated that the intervention was effective for children in the sample who were not reaching the recommended daily allowance at baseline, and that these effects lasted for at least 12 m (although the between-group difference was no longer significant at 18 m), suggesting that there would be merit in re-testing the intervention with a disadvantaged sample.

Tabak, Tate, Stevens, Siega-Riz, and Ward (2012) evaluated an intervention comprising two motivational telephone calls and four newsletters. Parents of 2- to 5-year-olds were asked to select one of four target areas: picky eating, vegetable availability, modelling and family meal frequency. The authors stated that these areas were specifically chosen because of their relevance to Social Cognitive Theory. No participant chose modelling or family meal frequency, suggesting that they did not see a need for improvement in these areas or consider such improvements to be important. Increased vegetable availability was detected post-intervention in the IG (although group was not a significant predictor of availability, there was a significant group difference in change in availability), along with increased offering of FV as a snack and decreased cooking of separate meals due to the child demanding something different. There were no significant differences between the IG and CG groups' vegetable intake immediately post-intervention; it is feasible that more time may have been needed for changes in parental behaviour to translate into changes in child intake. No evidence of any dose-dependent effects was seen, although the study had a very small sample and was underpowered. The authors acknowledge that their sample was also relatively high in socio-economic status and that parents' reporting of children's diets might have been inaccurate due to the time children spent in childcare. However, the finding of effects within such a small sample indicates that the intervention warrants further investigation.

The *Telephone-Based Adiposity Prevention for Families with Overweight*

Children (TAFF) study (Markert et al., 2014) also used CATI and supporting printed material (a newsletter delivered by post or email). This obesity prevention intervention focused on medical aspects of obesity, dietary habits, eating behaviour, physical activity, leisure activity, psychological support and stress. Its design drew on therapy approaches (specifically family therapy and solution-focused systemic therapy) but the authors did not expand on the theoretical rationale beyond this. Parent-child triads were recruited where young people were aged between 4 and 17 years old and had a BMI-SDS $\geq 90^{\text{th}}$ centile. Strengths of this study included its duration and the pragmatic nature of recruitment (through Cresnet, a German association of independent paediatricians, with whom participants were registered). Unfortunately, a significant intervention effect identified with per-protocol analysis disappeared with ITT analysis. The authors also note that most young people ≥ 10 years old (who were interviewed separately from their parents) claimed to have 'very good eating habits' at baseline, which, given the children's adiposity, raises questions around the validity of self-report dietary measures in young people. Also of concern, of 3387 eligible families contacted by paediatricians, only 13% expressed an interest in the study, and 9% consented to take part. Coupled with the high attrition rate within the IG (63%, compared to 22% in the CG), the intervention clearly failed to appeal to families. Predictors of non-participation included believing that the family already practiced a healthy lifestyle, being unwilling to make lifestyle changes, greater subjective physical wellbeing and eating irregular breakfasts (Alff et al., 2012). The authors concluded that 'even a low-threshold intervention program does not reach the families who really need it' ($p.1$). A further limitation is that data was collected immediately post-intervention with, to our knowledge, no subsequent follow up. Given the small effect of the intervention and the fact that most other studies see a decrease in effects over time, it is unlikely that this telephone intervention would achieve long-term benefits.

3.2. Information/technology-delivered interventions

3.2.1. Printed materials

Nine studies involved interventions delivered through printed materials alone. Studies were included in this section of the review if printed information was the active intervention under evaluation; studies using printed information as the control condition are reported elsewhere. Three studies included more than one intervention; in each case, only the printed materials condition qualified for inclusion in the review. Table 1 provides a summary of the studies delivered through printed materials, while Table 4 provides details of individual studies.

Change for Life is a UK-based national obesity prevention program. One element of the campaign is an information pack for families, which was evaluated with parents of 5- to 11-year-olds (Crocker, Lucas, & Wardle, 2012). After completing a baseline questionnaire, parents in the IG were sent standard *Change for Life* materials and a 'How are the Kids?' questionnaire, on completion of which they received a personalised family information pack. The CG received 'standard exposure to healthy lifestyle messages'. Due to extremely low response rates to the second questionnaire (of the 3774 families who signed up, 98 returned the questionnaire, only three of whom were in the CG), the protocol was adjusted; parents who did not complete the questionnaire were sent an un-personalised family information pack. At a 6-month follow-up, responses were obtained from 29% to 46% of the original samples in the IG and CG, respectively. No significant changes from pre- to post-intervention were found on any measure (monitoring, modelling, child FV intake, child sugar intake, PA duration, snacking and regular mealtimes) and parents in the IG placed less importance on physical activity than those in the CG. The authors provide a transparent and detailed list of potential explanations for the lack of success, including lack of theoretical basis, lack of clarity over the target audience (children or parents), targeting too many complex behaviours and CG contamination. For example, the authors acknowledged that the lack of

Table 4
Printed materials intervention study characteristics.

Printed information intervention studies				Theoretical framework				
Authors	Year	Type of information	Correspondence n (intervention length when n > 1)	Target of intervention	Primary outcome (measure) ^a	Statistically significant difference shown on primary outcome immediate IPI? (LTFU period)	Statistically significant difference shown at LTFU? (LTFU period)	Theoretical framework
Croker et al.	2012	Personalised 'family information pack'	1	Children's unhealthy eating	None identified as primary. (SR BMI, 4- food frequency questionnaire to calculate over all healthy eating score)	No change at 6 m post-baseline (unclear how long intervention lasts)	No additional LTFU	Not stated
Estabrooks et al.	2009	Workbook with 'targeted intervention days'	1	Healthy lifestyle behaviours	Child adiposity (BMI z-score)	No change at 6 m post-baseline (unclear how long intervention lasts)	Within subjects BMI reduction in workbook condition (p < 0.05) but no between groups change (1.2 m)	Socio-ecologic theory
Gholami et al.	2014	Leaflet	1	Mothers' self-regulatory skills for providing vegetables to children	Child vegetable intake (Study-specific question)	Vegetable intake higher in IG than CG 2-weeks (p = 0.04)	No (3 m)	Behaviour change theory
Hart et al.	2016	2 booklets, poster, children's book, accompanying website	1	Healthy eating, weight management and body satisfaction in childhood	Child adiposity, parental knowledge, family meal characteristics, parental feeding practices (various Likert scale measures, child BMI-z scores)	Yes, but not for workbook condition	No (6 wks)	Not stated
Heath et al.	2014	Picture books	1	Child's willingness to look at, taste and consume vegetables	Child's visual preference for target vegetable Child's willingness to taste target vegetable Child's intake of target vegetable (child offered choice of FV in all cases)	Toddlers looked at target vegetable for longer than control (p < 0.001) No significant difference between willingness to taste target vs control vegetable Toddlers consumed more of target than control vegetable (p = 0.016)	No LTFU	Not stated
Houston-Price et al.	2009	Picture books	1	Child's willingness to taste	Child's willingness to taste (child offered choice of FV)	No	No LTFU	Not stated
Looney et al.	2014	Monthly newsletter	6 (6 months)	Childhood obesity/ overweight	Child adiposity (BMI z-score)	BMI z-score reduced for whole sample (p < 0.036)	No LTFU	Not stated
Pearson et al.	2010	Separate newsletters for parents and children	2 each (1 month)	FV consumption in adolescents	FV consumption (previously validated youth FFQ)	IG adolescents reported higher fruit (p < 0.01) and vegetable (p < 0.05) consumption than CG	IG adolescents reported higher fruit (p < 0.01) and vegetable (p < 0.05) consumption than CG (6wks)	Behavioral choice theory; SCT
Wrieden & Levy	2016	'Smart swaps' information pack	1	Purchasing behaviour of children's snacks	Self-reported swaps	IG reported more swaps to lower-fat dairy products, lower-sugar drinks and lower-sugar cereal (p < 0.001, p = 0.01, p = 0.009)	No LTFU	Not stated

IPI = Immediately post-intervention.
 LTFU = Long Term Follow Up.
 FFQ = Food frequency questionnaire.
 SCT = Social Cognitive Theory.
^a If a PO is not explicitly stated in the study, it is selected according to the aims & objectives of the study. Where the study involves other health behaviours, the primary eating outcome & behaviour have been selected.

focus to the intervention was demonstrated by the failure to refer to ‘obesity’ in the materials used, despite obesity prevention being the primary aim. Feedback from focus groups also suggested that some parents found the materials ‘patronising’ or ‘unrealistic’.

Wrieden and Levy (2016) evaluated the *Smart Swaps* element of the Change4Life campaign, which focuses on reducing the fat and sugar content of children’s snacks through information packs suggesting healthy swaps. As with the Change4Life study described above, the *Smart Swaps* study did not report any theoretical rationale. Self-reported purchasing behaviour indicated that parents in the IG implemented more ‘smart swaps’ than those in the CG one and two weeks after receiving the packs, but no longer-term follow-up data were collected. Further limitations were that IG and CG participants lived in different geographical regions, that participants were not randomly allocated to groups, and that many of the CG had heard of the campaign (13% had signed up to it). The low retention rate in the IG (55%) further limits the conclusions that can be drawn about behaviour change within the whole sample.

Estabrooks et al. (2009) ran a study with three conditions, one of which was delivered in the home, satisfying criteria for inclusion in this review. Parent-child dyads were recruited when children were aged 8–12 years and ≥ 85 th percentile in BMI. Parents were provided with Family Connections workbooks, including ‘intervention homework assignments’. The intervention was based on Golan and Weizman’s model which purports that parents are the agent of children’s eating behaviour change (Golan & Weizman, 2001). Results were inconsistent: children showed a within-group decrease in BMI z-scores at 12-month follow up (but not at 6 months) but there were no between-group differences. The study was also underpowered due to the high attrition rates, raising the possibility of a Type I error.

Pearson, Atkin, Biddle, and Gorely (2010) carried out a newsletter-based intervention targeting adolescent children (12–14 years), drawing on ‘Behavioural Choice Theory’ and Social Cognitive Theory. The adolescents’ newsletters targeted normative beliefs, health and nutritional knowledge, aiming to increase FV preferences and ‘improve behavioural skills and healthy eating’ (p.877). The parents’ newsletters targeted nutritional knowledge, parents’ FV intake and FV accessibility and availability. Post-intervention, parents and adolescents in the IG reported increased consumption of fruits and vegetables; parents also reported increased availability and accessibility. Results appeared to be robust and consistent with medium-large effect sizes ($\eta^2 = 0.08$ – 0.32 for the above findings), most likely due to the intervention’s basis in theory, and the provision of targeted messaging for parents and children. However, the sample was mostly of relatively high social-economic status, and desirability may have played a role in responses in this study. Follow-up data collected 6-weeks post intervention were consistent with initial findings; whether effects are maintained in the longer-term remains unknown. Nevertheless, the promising results warrant a larger randomised controlled trial, which could also explore whether higher doses are able to maintain effects.

The *Confident Body, Confident Child (CBCC)* programme (Hart, Damiano, & Paxton, 2016) aims to change parenting behaviours and strategies around food. Resources consist of booklets (one on parenting strategies, another for extended family members), a ‘Do’s and Don’ts’ poster, an evidence-based children’s book with messages about appearance and self-worth, and an associated CBCC website. The evaluation involved two intervention groups, both of whom received the CBCC materials; one group additionally participated in a parenting workshop. There were two control groups: nutritional information and wait-list. The IG who took part in the workshop demonstrated the greatest behaviour change, suggesting limitations to the benefits of simply receiving information booklets. However, some outcome measures demonstrated improvement in both IGs, with no between-group differences (e.g. knowledge, parenting intention, weight restriction), while others showed equivalent benefits in all groups other than the wait-list CG (e.g. instrumental feeding, emotional feeding, pushing to

eat). Thus, the nature and intensity of the intervention appears to matter more for some behavioural outcomes than for others. The study acknowledges the difficulties around self-report measures and the high socio-economic status of participants. To enable parents who lived further away from the study centre to participate, all potential participants were asked whether they could attend the workshop, and responses were taken into account when allocating participants to groups (i.e. those who could not attend were not allocated to the workshop condition). Steps were taken to ensure even distribution and attrition rates were not noticeably larger in any group (statistical differences not reported). However, by attempting to be inclusive, the authors may have inadvertently assigned more engaged participants, willing to travel to the workshops, to the IG that participated in these. Nevertheless, the CBCC intervention was evidence-based and transparently reported; future work could address the necessity of the workshop component to the intervention.

Looney and Raynor (2014) compared outcomes between a group who received printed materials alone versus groups who received newsletters alongside higher intensity interventions (regular growth monitoring with or without counselling). No theoretical rationale was explicitly mentioned. Children all had a BMI z score ≥ 85 th centile at baseline. All groups showed a decrease in BMI z-score, but effect sizes grew as intervention intensity increased. Sugar-sweetened beverage consumption also decreased over time but no group effects or effect sizes were reported. No changes were seen on other outcome variables (FV intake, moderate-to-vigorous physical activity total energy intake, percentage energy from fat). Because there was no ‘inactive’ control group, it is impossible to ascertain whether the changes seen were due to participation in the study; this highlights the need for a proper control condition when comparing interventions.

Gholami, Wiedemann, Knoll, and Schwarzer (2015) investigated the efficacy of a ‘theory-based’ leaflet, targeted at mothers and aiming to increase their daughters’ (aged 6–11 years) vegetable intake. Little information or theoretical explanation is given about leaflet contents other than that they drew on Michie et al.’s (2011) behaviour change techniques. Although increased vegetable intake was reported in the IG compared to the CG two weeks post-intervention, the difference had disappeared by three months.

Houston-Price, Butler, and Shiba (2009) introduced printed information into the family home through the novel use of picture books, with the aim of supporting healthy eating through exposure to pictures of foods. This study aimed to build on the evidence base indicating that exposure to new foods can increase children’s willingness to try them but did not cite any specific underpinning theory behind intervention design. Families with toddlers received one of two books through the post containing familiar and unfamiliar fruits and vegetables. ‘Willingness to taste’ tests were conducted after 14 consecutive days of reading the books. The study was controlled through a within-subjects design; each food served as an exposed or non-exposed food for different children, controlling for any preferences for specific foods. A main effect of familiarity was seen, along with an interaction between familiarity and exposure; children were more likely to try unfamiliar foods that they had been exposed to but less likely to try familiar foods they had been exposed to.

Heath, Houston-Price, and Kennedy (2014) built on these findings with a further experiment addressing the effects of picture-book exposure on willingness to taste vegetables, due to the ‘particular challenge’ that vegetables present for healthy eating interventions. Toddlers were randomised to receive a picture book in the post about a liked, disliked, or unfamiliar vegetable, which parents were asked to read with the child for 5 min every day for two weeks. No significant differences in willingness to taste target versus control vegetables were seen in any IG. However, children consumed more of the target vegetable than the corresponding control vegetable when foods were initially unfamiliar. The authors suggest that this may be due to the ‘learned safety’ of exposed foods, or to the lack of ‘pre-existing schemas’

Table 5
Video gaming intervention study characteristics.

Video game interventions						Theoretical framework		
Authors	Year	AVG/Non-AVG	Session N	Target of intervention	Primary outcome (measure) ^a	Statistically significant difference shown on primary outcome immediate IPI?	Statistically significant difference shown at LTFU? (LTFU period)	
Baranowski et al.	2011	Non-AVG	9	Diet and PA	Child FV intake (24hr recall)	IPI and FU not reported separately.	FV intake increased in IG relative to CG (p = 0.018) (2 m)	SCT; SDT; Persuasion theory
Maddison et al.	2013	AVG	NR	Snacking	BMI	BMI decreased in IG group (p = 0.02) but no significant difference for self-reported snacking	No LTFU	Behavioural economic theory
Simons et al.	2015	AVG	NR	Snacking	BMI-SDS	CG decreased BMI-SDS by more than IG (p value not reported)	No (10 m)	SDT; TPB
Thompson et al.	2015	Non-AVG	10	Child FV intake	Child FV intake (24hr recall)	FV intake increased in 'Action' IG only (p < 0.0001)	FV intake increased in 'Action' IG only (p < 0.0001) (3 m)	SCT; SDT; Elaboration likelihood model

IPI = Immediately post-intervention.

LTFU = Long Term Follow Up.

NR = not reported.

AVG = Active Video Game.

SCT = Social Cognitive Theory.

SDT = Self Determination Theory.

TPB = Theory of Planned Behaviour.

^a If a PO is not explicitly stated in the study, it is selected according to the aims & objectives of the study. Where the study involves other health behaviours, the primary eating outcome & behaviour have been selected.

for unfamiliar foods. They also discuss the importance of parents' role in reading the book with the child, emphasising the need for a 'positive attitude' and citing an example of a parent who said 'Yuk!' at the end of every page, whose child did not show any positive exposure effects.

3.2.2. Game-based interventions

Video games have also been investigated as vehicles for delivering healthy eating and weight management interventions to adolescents. Two studies used non-active video-games (Non-AVG) as engaging ways to promote dietary change. Two further studies involved active video-games (AVG), which encourage physical activity by requiring active participation for success; these are included in this review as they cite decreased snacking as a secondary aim. Table 1 summarises these studies' characteristics, while Table 5 provides details of individual studies.

Non-active video games. Baranowski et al. (2011) investigated the efficacy of a video game as an agent for changing eating behaviour in adolescents aged 10–12 years. A CG received 'knowledge-enhancing' materials about healthy eating, including nutrition-based computer games. This was designed to act as a control but to 'meet recruits' expectations of playing health-related video games' (p.3). The intervention was described as drawing on Social Cognitive Theory (SCT), Self-Determination Theory (SDT) (Deci, 2012) and persuasion models. An increase in FV intake was seen in the IG two months after post-intervention; the effect size was small (Cohen's $d = 0.18$), equating to an increase of 0.67 portions to a total of 2.15 portions per day, considerably lower than recommended guidelines. However, dietary data collection took place through 24hr dietary recall, the validity of which is often questioned (Ioannidis, 2013). There were no between-group differences on other outcome measures (water intake, physical activity or body composition) and no long-term follow-up data were provided. By the authors' own admission, the study was underpowered and would benefit from replication with a larger sample. It is also worth noting that sedentary behaviour increased in the intervention group (albeit not significantly), raising the possibility that any positive health behaviour changes brought about by non-active video games might be negated by increased screentime.

The same research group also evaluated a video game that encouraged the setting of implementation intentions by 9- to 11-year-old children (Thompson et al., 2015). This also drew on SCT and SDT, as well as an elaboration likelihood model (Petty, 2012), 'behavioural inoculation' and maintenance theories. Building on a previous school-based trial of the 'Squire's Quest!' video game (Baranowski et al., 2003), 'Squires Quest II' was developed for home delivery, with a parallel parental component; parents received a relevant newsletter alongside each of the 10 game episodes. Participants were randomly allocated to one of four groups: Action (goal setting and action intentions, i.e. planning how to achieve goals), Coping (goal setting and coping intentions, i.e. identifying barriers to goals and describing coping strategies), Both Action and Coping, or None. Compared to baseline, the Coping and Action groups showed increased FV intake following the 3-month-long intervention. At the final follow-up, 3 months later, only the Action group maintained the increase; this equated to 0.68 servings per day, almost a 50% increase from baseline. Nevertheless, FV intake for all groups remained well below recommended daily guidelines. The authors noted their surprise in finding that participants in the 'Both' group showed no change in FV intake, and suggested that the cognitive load involved in setting two different types of implementation intention might be too demanding at this age. Again, the study relied on children's self-reported FV intake, which was not compared to parents' reports. Interestingly, a process evaluation showed that, although child participation was consistently high (91% completed all 10 episodes, with no between-group differences), parental involvement varied widely; around a third reported that they had read three or fewer of the 10 newsletters. This is an important finding, given the widely-held assumption that parents are the agent of change in relation to children's

eating (Golan, 2006). While an intervention aimed at the child may invoke behaviour change in children's asking behaviour, preferences or willingness to consume FV, parents must facilitate availability and accessibility for these effects to lead to dietary changes. Conclusions about the impact of parents' engagement on the study's outcomes cannot be drawn in this case as the article does not report on many of the secondary outcome measures of interest cited in the original protocol (e.g. accessibility, availability, family barriers to FV, etc.) (Thompson et al., 2012).

Active Video Gaming. Two studies investigated Active Video Gaming (AVG) as a means of weight management. Maddison, Jull, Marsh, Dieito and Mhurchu (2013) recruited adolescents with overweight or obesity. Participants in the IG reported lower snack consumption but the difference from the CG was not significant. IG participants also reported lower sedentary screentime; these reports were supported by larger decreases in BMI and BMI z-scores among this group (IG BMI difference = -0.24 kg/m^2 , IG BMI z-score difference = -0.06).

In a second, similar study (Simons et al., 2015) (also drawing on SDT and the Theory of Planned Behaviour), IG participants reported lower snack consumption than those in the CG; again, the difference was not significant. IG participants also reported lower sedentary screentime and reduced non-active video gaming. Conversely, this study found that CG participants had a greater reduction in BMI-SDS than IG participants (difference = 0.13, NS); the authors attribute the discrepancy to social desirability bias in self-report responses. A process evaluation provided valuable insight into the reasons for participant engagement; the authors found that 25% of the IG did not engage with the active games at all, and noted that enjoyment of the games decreased over time while agreement with the statement 'I'd rather play non-active video games' increased. This suggests that AVG is unlikely, in its current form, to be a broadly-effective weight management tool. However, half of the process evaluation respondents stated their intention to continue using AVG beyond study completion, suggesting that enjoyment was high for some. Despite the mixed findings, the authors suggest that AVG might prove effective among adolescents at risk or already obese (as in Maddison et al.'s, 2013, study) or among less 'excessive' gamers (participants spent $> 13 \text{ h}$ per week playing games at baseline), or with a higher 'treatment dose' (i.e. more time on AVG). Given the 'popularity of video gaming among youth', the authors conclude that further research is needed to bring AVGs in line with non-AVGs in terms of fun, attractiveness and sustainability. On the basis of current evidence, however, reduction in snacking is unlikely to underpin the efficacy of AVGs.

3.2.3. mHealth

Mobile health, often referred to as 'mHealth' is defined as 'medical health practice supported by mobile devices' (e.g. mobile phones, tablets and other wireless technology) (WHO, 2017). Mobile devices are increasingly common in both the developing and developed world, providing an opportunity to deliver convenient and innovative health behaviour change interventions to a wide audience. Seven studies of this kind were identified for the review. Table 1 summarises these studies' characteristics, while Table 6 provides details of individual studies.

MINISTOP (Nyström et al., 2017) is a smartphone application (app) delivered to parents and designed to prevent obesity in pre-schoolers drawing on Social Cognitive Theory (SCT). The app delivers information, tips and strategies on 12 topics (e.g. healthy foods, breakfast, physical activity), with prompts if parents fail to access the app regularly. It provides weekly graphical feedback based on information provided by parents and, if required, support from a dietician and/or psychologist. Alongside traditional parent-report measures, the study used novel methods of data collection (such as the Tool for Energy Balance in Children, (TECH), Delisle et al., 2015), which estimates dietary intake from photographs of meals taken by parents. Body fatness (Fat Mass Index, FMI) was measured, rather than BMI; the authors

Table 6
mHealth intervention study characteristics.

mHealth interventions				Theoretical framework			
Authors	Year	mHealth type (intervention length)	Target of intervention	Primary outcome (measure) ^a	Statistically significant difference shown on primary outcome immediate IPI?	Statistically significant difference shown at LTFU? (LTFU period)	
Byrd-Bredbenner et al.	2018	Website (12 months)	Healthy home environment	Household food availability Food-related lifestyle practices (measure not named, various questions related to FMI, FV availability etc.)	No	No LTFU	SCT; Social ecological model
Carfora et al.	2016	SMS text message (x 14) (2 wks) Website (8 wks)	Adolescent FV intake	Adolescent FV intake (Author-scripted q on FV portions)	Increase FV intake in both Igs as compared to CG (p = 0.001 for the affective group and p = 0.01 for the instrumental group as compared to CG). More IG participants reported consuming 3 or more FV portions than CG (p < 0.01), but not 5 or more	No LTFU	TPB
Cullen et al.	2013	Website (8 wks)	Adolescent eating behaviour	FV intake (Youth Risk Behavior Survey)	No	No LTFU	SCT
Cullen et al.	2017	Website (8 wks)	Home food environment & dietary behaviour	Availability of FV and high/low fat foods (author-scripted questionnaire) Child FV intake (Youth Risk Behaviour Survey)	No	No (4 m)	Not stated
Knowlden et al.	2015	Website (4 wks)	Childhood obesity prevention	Child FV intake (scale not named but e.g. questions provided)	IG increased FV consumption relative to CG (p = 0.036)	IG increased FV consumption (p < 0.001) (12 m)	SCT
Nystrom et al.	2015	App (6 months)	Childhood obesity prevention	Body fat (Fat Mass Index, FMI)	No	No LTFU	SCT
Sun et al.	2017	Tablet computer-based (8 wks)	Childhood obesity prevention	Child BMI	No	No (6 m)	Information Behaviour Model

IPI = Immediately post-intervention.

LTFU = Long Term Follow Up.

NR = not reported.

SCT = Social Cognitive Theory.

TPB = Theory of Planned Behaviour.

^a If a PO is not explicitly stated in the study, it is selected according to the aims & objectives of the study. Where the study involves other health behaviours, the primary eating outcome & behaviour have been selected.

suggest that BMI is a poor indicator of body fat. The intervention had no effect on FMI alone, but IG participants increased their ‘composite component score’ (a summation of FMI, FV intake, sweet intake, sugar-sweetened beverage intake, sedentary time and moderate to vigorous physical activity). Although FMI was the primary outcome measure, the composite score was arguably the more important outcome, given that the study was an obesity *prevention* intervention that recruited children of normal weight (mean weight for age z-score was 0 ± 1.16 at baseline). Interestingly, the study actively accommodated separated parents, allowing both to participate. The study maintained high levels of engagement (with no report of incentives for retention) and produced promising results. Future work should consider whether FMI is the appropriate primary outcome measure for similar interventions and why this showed no change.

Teen Choice: Food & Fitness is a website designed to promote healthy eating and physical activity in adolescents, also using SCT as a theoretical framework (Cullen, Thompson, Boushey, Konzelman & Chen., 2013). Twelve-to 17-year-olds were randomly allocated to receive details of the intervention website, containing materials about nutrition and physical activity, goal setting, a healthy eating calculator, 12 model video stories, recipes and a blog, or to receive details of a similar control website. The IG reported an increase in daily vegetable consumption of more than 3 portions, but there was no between-group difference in the numbers achieving at least 5 daily portions of FV. Both groups reduced their television viewing and increased their physical activity to at least 60 min per day. This study addressed the problem of social desirability in self-report measures by collecting an independent index of social desirability and entering this as a covariate in analyses. Nevertheless, questions remain over the reliability of young people's self-reports. This study also had a self-selecting sample and a control condition in which several elements were identical to the intervention, making it difficult to ascertain which of the study's findings might generalize to a wider sample.

Also grounded in SCT is *EMPOWER* (Knowlden, Sharma, Cottrell, Wilson, & Johnson, 2015) a web-based intervention which aims to support mothers' self-development across several constructs: environment, emotional coping, expectations, self-control and self-efficacy. The intervention was expected to lead to positive outcomes for children including increased physical activity and FV consumption and decreased sugar-free beverage consumption and screentime. The study had an active-control group who participated in 5 knowledge-based (rather than theory-based) ‘educational sessions’. Immediately post-intervention and at a 4-week follow up, both groups showed significant improvements in physical activity, sugar-free beverage intake and screentime (with no between-group differences) but only the IG showed an improvement in FV intake. At a 1-year follow-up (Knowlden & Sharma, 2016), this effect remained in the IG, equating to an increase of 1.8 cups of FV per day; all other significant effects had disappeared. The targeted maternal SCT constructs accounted for 33% and 13% of the change in FV consumption in the IG at the two follow-up time points, respectively. The authors provide a detailed theoretical rationale for the *EMPOWER* intervention and achieved a considerable increase in FV consumption, with a methodology that is practicable to roll out to a wider group. However, results should be treated with caution as F and V are not treated separately and may, therefore, be driven solely by increases in fruit consumption. It is also unfortunate that, despite the several published papers about the intervention, little detail is provided regarding its content, inhibiting the development of similar interventions.

The *HomeStyles* (Byrd-Bredbenner et al., 2018) program is a web-based intervention designed to help parents ‘make quick, easy, no-cost changes to their home environment ... to support child growth and avoid childhood obesity’ (p.140). The intervention content extracts from SCT, while ‘adult learning theory’ and ‘motivational interviewing’ are employed as learning techniques for participants, Spanish- and English-speaking parents of 2- to 6-year-olds were invited to select

among modules that focussed on nutrition, physical activity, sleep and advocacy, which were delivered over 12 months. CG participants engaged with a website with an identical format but with content focussing on safety in the home. No changes in dietary intake were observed in either group immediately post-intervention. Long-term follow-up outcomes are still to be reported. Data collection occurred online and, as is often the case with web-based studies, retention rates were low (35% post-intervention), despite the authors' notable efforts to reduce attrition.

Carfora, Caso, and Conner (2016) conducted a randomised controlled trial to assess the efficacy of text messages sent to adolescents at increasing FV intake and drew on the Theory of Planned Behaviour in their design. Messages were either ‘instrumental’ (e.g. ‘a diet rich in fruits and vegetables promote [sic] emotional well-being being associated with a lower prevalence of anxiety and depression’) or ‘affective’ (e.g. ‘a diet rich in vegetable and fruit reduces by 30–40% the probability of contracting cancer’). CG participants received no messages. The messages provoked a larger increase in FV consumption in both IGs (> 1 portion per day) compared to the CG, with larger effects for affective messages. No long-term follow-up data is provided. Again, little detail is provided regarding the text message contents, which appear to be long and potentially disengaging for teenagers, and no formative or evaluative work is reported regarding feasibility or acceptability. The authors also point out that messages were not exclusively instrumental or affective and that affective messages tended to focus on the short-term outcomes of FV consumption, suggesting alternative psychological explanations for the behaviour change seen in that group. Nevertheless, the relatively large effect sizes suggest that a more carefully designed RCT with longer-term outcome measures might be fruitful.

Family Eats (Cullen, Thompson, & Chen, 2017) is a web-based program targeting the home food environment and dietary behaviour of parents and children aged 8–12 years. It comprises 8 weekly online ‘sessions’ including graphics that tell the story of a family trying to develop healthier eating habits, tip sheets and recipes. Formative work in intervention development took place but no theoretical framework is explicitly described. The CG had access to the same website without the graphics. There were no between-group differences in FV consumption either post-intervention or 4 months later. Some positive changes were reported by the IG group alone (e.g. increased juice availability), but many were demonstrated in both groups (e.g. increased fruit availability). Strengths of the study include the recruitment of a more disadvantaged participant group than is typical and the positive feedback and evaluation provided by participants, reflected in a relatively high retention rate (68%). Given the high degree of overlap between the IG and CG intervention materials, further research would be necessary to better unpick the more effective elements of the intervention.

Sun et al. (2017) evaluated a tablet-based intervention that aimed to prevent obesity in American-Chinese mothers with children aged 3–5 years old. Its theoretical framework was described as being based on the ‘Information-Motivation Behaviour Model’ (Fisher, Fisher, & Harman, 2003). The intervention consisted of animated short videos, including two in ‘talk-show’ format, and children's songs, re-worded to fit the intervention. The CG received weekly mailings of printed health information. It is unclear whether the primary targets of this study were mothers, children, or both; results showed that more IG mothers had reduced BMI six months post-intervention but no group difference for child BMI.

3.2.4. Other equipment

One study (Galhardo et al., 2012) did not fit neatly into other categories but remained within the scope of our review. This evaluated the use of a Mandometer in the home for children and adolescents with obesity (BMI SDS \geq 95th centile, 9–18 years old). The Mandometer is a machine that is sometimes used to treat eating disorders; it provides the user with feedback about their eating rate, based on plate weight, and can be used to achieve an ‘ideal eating speed’. It was hypothesised that,

by slowing eating rates and inducing postprandial suppression of ghrelin, the IG would show increased weight loss. As predicted, the IG showed significant decreases in BMI-SDS, percent body fat, meal portion size, glucose and fasting ghrelin, while the CG did not. The study had a very small sample ($N = 27$) but nevertheless showed promising results in a clinical population. Cost-effectiveness was not addressed and may prove an obstacle to wider implementation. However, smartphone apps have been designed that provide a similar service; further research could explore their effectiveness in this population.

3.3. Synthesis of literature and conclusions for future research and application

This review set out to describe and evaluate the evidence relating to home-based family eating interventions and to establish the elements of such interventions that might lead to successful behaviour change. The following section synthesises the key findings of the literature reviewed, first drawing out the characteristics of successful and unsuccessful interventions in terms of both their design and implementation and their basis in theory or evidence, and second highlighting the methodological limitations of the studies reviewed and making recommendations for how these should be addressed in future research.

3.4. Characteristics of successful and unsuccessful interventions

Most of the studies that reported follow-up data collected six months or more after intervention delivery did not find significant long-term behaviour change; effect sizes, where reported, were small. One notable exception is the *EMPOWER* study (Knowlden & Sharma, 2016), a theory driven, web-based intervention which showed an increase in consumption of FV of almost two cups per day, 12 months post-intervention. This study reflects a broad trend for interventions based on theory to result more often in significant behaviour change, as we discuss in the next section.

3.4.1. Basis in theory and evidence

In total, six studies (Pearson et al., 2010; Baranowski et al., 2011; Wyse et al., 2012; Corsini et al., 2013; Knowlden et al., 2015; Thompson et al., 2015) showed some behaviour change in an IG compared to a CG beyond immediate post-intervention data collection (see Tables 2–6). All but one provided theoretical rationale, with the majority focussing on Social Cognitive Theory (SCT) and/or similar principles (in the case of Wyse et al. the authors did not cite SCT but did refer to a socio-ecological framework). This collection of studies appears to be set apart from the many others in the review referring to SCT in that authors went into noticeably more theoretical detail and attempted to integrate the principles of SCT with other theories (e.g. Self-Determination Theory, Behavioural Choice Theory, maintenance theories and Golan et al., 's 2001 Familial Model). The remaining study with longer term success (Corsini et al., 2013) took a more experimental approach and was rooted in the evidence base surrounding exposure.

There is an important distinction between no change at follow-up and no evidence of change at follow-up due to lack of data. Given the high number of studies which did not conduct any follow up beyond the end of the intervention, we also examined the characteristics of interventions with significant results immediately post-intervention where the study did not collect LTFU data. Of the studies that reported no LTFU, 12 reported significant between-groups differences on their primary eating-related outcome measure immediately post-intervention (Carfora et al., 2016; Cravener et al., 2015; Cullen, Thompson, Boushey, Konzelmann, & Chen, 2013; Haire-Joshu et al., 2008; Heath et al., 2014; Leung et al., 2015; Makert et al., 2014; McGowan et al., 2013; Rodearmal et al., 2006; Wardle et al., 2003; Wieland et al., 2013; Wrieden & Levy., 2016). Half of these studies reported a theoretical

rationale. These interventions warrant further investigation to establish whether longer-term behaviour change can be achieved.

Careful analysis showed no systematic similarities shared by the short-term successful interventions. Studies drawing on exposure as a mechanism to encourage FV consumption appeared to show promise collectively. However, all but one lacked long-term follow-up of the observed behaviour changes, and some reported that parents found repeated exposure to be burdensome. Future research might seek to identify more natural implementations of exposure-based interventions in the family home; novel methods of exposure (such as picture books, Houston-Price, Owen, Kennedy, & Hill, 2019) might be easier for parents.

3.4.2. Methodological factors

The six studies that did demonstrate longer-term behaviour change represented a range of delivery methods (the collection comprised one of each of home visit, telephone, printed information and mHealth, and two video-game studies), suggesting that all of these methods could feasibly lead to behaviour change. However, when examining the wider collection of studies described above (i.e. short-term behaviour change but no long-term follow-up), interventions that were person-delivered (i.e. involved human contact either face-to-face or over the telephone) were noticeably more likely to result in behaviour change than those which were information-delivered. Within the person-delivered category, however, studies in which a 'peer educator' delivered the intervention resulted in less success than those delivered by a researcher or health professional.

Information/technology-delivered interventions were less successful. Those that involved printed material and mHealth interventions were least likely to result in behaviour change. Both suffered from high attrition rates; the absence of the encouragement of a researcher or health professional may have reduced participants' motivation or willingness to continue. The information-based content of these types of intervention might also be off-putting or unengaging. Alternatively, most parents may already have reasonable knowledge of what constitutes healthy foods for children (Hart, Damiano, Cornell, & Paxton, 2015), and therefore benefit little from receiving further similar information. Parents may be less aware of the influence of their own feeding practices on children's behaviour, however. For example, in the motivational interviewing study (Tabak et al., 2012), no parents chose intervention elements that tackled their own behaviour at mealtimes (i.e. modelling and family meal frequency). Parents might not see the need to change their own feeding practices or might perceive this to be more difficult than tackling their child's eating. Future research should therefore consider parents' understanding of their role in shaping children's eating behaviours.

It is noteworthy that the number of mHealth interventions (and published protocols) included in the review doubled when the search was re-run in early 2018; this research area is evidently expanding rapidly despite the failures of early studies. Although current evidence indicates that the more intense interventions delivered through home-visits and telephone may be necessary to invoke meaningful behaviour change, the success of the *EMPOWER* study suggests mHealth may have the power to change behaviour with extensive formative work. More informed development could lead to improved outcomes for this type of intervention.

The majority of studies aimed to change parental behaviour, although those interventions targeting adolescent eating behaviour were more likely to involve active participation from the child. This is in line with evidence that suggests parents are the agent of change for younger but not teenage children (Golan, 2006; McLean et al., 2003). Several studies were based on the concept that parents' behaviour change might mediate the relationship between interventions and children's behaviour change (e.g. Wyse et al., 2014). This is a sensible assumption; if parents are responsible for making healthy food available and accessible, their engagement in a healthy eating intervention alongside the

child is likely to be beneficial. It is interesting to note that one of the few printed materials studies to induce higher FV consumption in the IG was unique in targeting children and adults separately (Pearson et al., 2010), while an unsuccessful printed information study highlighted the confusion about which family members their intervention was targeting (Croker et al., 2012). It is surprising, then, that most interventions focus on the child or parent alone, or adopt a 'one size fits all' approach. Consideration should be given to the target participants within family interventions.

3.5. Weaknesses of the literature reviewed

The variation in the length of follow-up periods across the studies in this review renders it impossible to compare the interventions' long-term efficacy. Many studies did not identify their primary outcome measures *a priori*, instead leading their results sections with significant findings, regardless of whether these related to the aims and objectives set out in the title and introduction. Some studies included numerous outcome measures, making the chance of Type 1 errors higher.

There was also little consistency in the selected outcome measures, even though studies often aimed for the same outcomes. For example, BMI, BMI-SDS, BMI z scores and Fat Mass Index were all used as indices of weight loss/gain in different studies. This inconsistency makes comparison between findings difficult, and meta-analysis impossible. Another difficulty specific to the interpretation of BMI outcome data is that several 'obesity prevention' studies interpreted a lower BMI in the IG than in the CG as a success, even for those within the healthy range. Arguably, it would be more meaningful to examine those in each group whose BMI is outside the healthy range, for example, by investigating whether overweight individuals' BMI reduced as a result of intervention, or whether the proportion of participants with a healthy BMI score increased post-intervention. Outcome measures should also reflect the target of the intervention; for example, obesity prevention studies involving healthy weight individuals might examine the proportion of participants who enter an unhealthy BMI category, while obesity reduction studies might be more concerned with absolute weight loss.

FV intake was similarly measured using a variety of scales. Only a handful of studies considered fruit intake and vegetable intake separately. As several studies suggest that fruit intake may be easier to increase, the two food types should be measured separately; otherwise, apparently successful interventions reporting increased FV intake might solely reflect changes in fruit intake.

Most behavioural measures were collected using self-report instruments, not all of which had been validated. Although self-report is widely used for collecting dietary data, its reliability is questioned, particularly when obtained from children or adolescents (Walker, Ardouin, & Burrows, 2017). Guidelines exist to improve the reliability of such measures (e.g. comparing parents' and children's reports; biochemical validation; see Subar et al., 2015); no study included in this review reported following these guidelines. Some findings collected from children seem implausible (Markert et al., 2014), indicating the possibility of a more wide-spread problem with self-report measures in this population.

People from more advantaged backgrounds and higher socio-economic status are more likely to display healthier eating habits (Pampel, Krueger, & Denney, 2010). Healthy eating interventions typically aim to reduce such health inequalities, by recruiting participants from more disadvantaged backgrounds. While most studies in this review attempted to recruit participants from disadvantaged or at-risk groups, many authors were open about the difficulties they encountered in doing so. Most studies relied on self-selecting samples; those providing information on non-completers noted that those on lower incomes were more likely to withdraw (e.g. Leung et al., 2015). The challenge to recruit 'those who really need it' to interventions merits attention.

3.5.1. Analyses

A notable inconsistency related to authors' use of Intention to Treat (ITT) analyses versus Per Protocol Analyses (PPA) or 'all available data'. Although ITT is considered 'gold-standard' in health research (see Armijo-Olivo, Warren, & Magee, 2009), the majority of studies did not employ this method. Printed materials and mHealth interventions were most likely to follow PPA, perhaps reflecting the much lower retention rates in these studies. This may be a sensible approach, however, depending on the intervention's cost. If an intervention is cheap to roll out to a wide audience, engages only a small subgroup of participants but leads to significant behaviour change within the participating group, there is a strong rationale to pursue the intervention. If, on the other hand, an intervention is costly and engages only a small number of people with a small effect size, the case for supporting it is less convincing. Future assessments of interventions in relation to their cost and effect size, as well as their retention rates, could therefore be fruitful.

3.5.2. Financial cost of interventions

Few studies discussed the cost of their intervention or its further development. Only one study attempted a cost-effectiveness analysis, which has yet to be published (Wen et al., 2012). Setting development costs aside, home visits and other person-delivered interventions are likely to be very expensive to deliver on a large scale (Rudolf, 2012), unless they can be incorporated into a pre-existing home visit programme. Technology-delivered interventions vary in their costs. While web-based interventions reach large audiences quickly, conveniently and inexpensively, smartphone/tablet applications are very expensive to maintain (Bartle, Wallace, & Curtis, 2015). If difficulties around engagement can be overcome, carefully-designed web-based interventions may therefore play an important role in the future of family eating interventions.

4. Conclusions

Changing healthy eating behaviour within the family home is challenging. Successful interventions tend to have a robust theory-driven evidence-base, are based on carefully-designed formative work and deliver engaging content. Furthermore, they have clear objectives with a well-defined target population. Future studies should address the difficulties around recruiting participants from disadvantaged backgrounds, demonstrate a better understanding of cost implications, and take a more consistent approach to measurement and analysis to allow intervention effects to be compared.

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Chapter 3: Healthy Happy Family Eating: Development and feasibility of an online intervention to improve family eating behaviours (Paper 2, *Intervention Development paper*)

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The Systematic Review paper indicated that intervention studies should include transparent and detailed descriptions of formative work. The field of health behaviour research increasingly encourages published descriptions of intervention development (Hoddinott, 2015; Wood, Hardeman, Johnston, Francis, Abraham & Michie, 2016). The review also noted that Mobile Health (mHealth) ‘may have the power to change behaviour with extensive formative work’.

As such, Paper 2 (hereafter referred to as the Intervention Development paper) describes the pilot work involved in creating and refining the Healthy Happy Family Eating programme, a healthy family eating intervention that is delivered by email to parents. *Part 1* of the paper describes three pilot studies conducted to inform intervention development. *Part 2* describes the formative work involved in developing the intervention including user-feedback, theoretical approaches, evidence-base review and stakeholder input.

A note on language: The Healthy Happy Family Eating intervention was presented as a 'course' when it was originally designed but as part of the refining process, was re-branded as a 'programme'. This is discussed further in the paper. Throughout the thesis, the updated intervention is referred to as a 'programme', and the older version is referred to as a 'course'.

Healthy happy family eating: Development and feasibility of an online intervention to improve family eating behaviours

Sarah Snuggs, Carmel Houston-Price & Kate Harvey

Unhealthy eating in children is a global problem, associated with poor long-term health outcomes and evidence indicates that unhealthy eating habits developed early in life may track into adulthood. Increasingly, description of behaviour change intervention development is encouraged. This paper describes the development and refinement of an online intervention designed to improve family eating behaviours. Part 1 describes three pilot studies designed to collect quantitative and qualitative feedback about the intervention to inform its development. This is followed by Part 2, which describes an additional study covering other formative work involved in developing the intervention, including theoretical approaches, evidence-base review and stakeholder input. The resulting, robustly refined intervention is described, the efficacy of which is being evaluated by a randomised controlled trial.

INCREASINGLY, description of intervention development (as well as evaluation) is encouraged, especially within the field of health behaviour change (Hoddinott, 2015; Wood et al., 2016). This improves transparency and facilitates replication of successful interventions. This paper describes the development and refinement of an online intervention designed to improve family eating behaviours.

Unhealthy eating in children is a global problem (WHO, 2015) and is associated with poor long-term health outcomes (Ogden, 2012). Neophobia (the fear of new foods) is an acknowledged developmental stage in very young children, which if unchallenged can lead to restricted food decisions in later life (Nicklaus et al., 2005). Food preferences are also believed to develop early in life, specifically the first five years (Savage et al., 2007). There is, therefore, a need to address the problem of unhealthy eating in children and young people as early and efficiently as possible.

Parents cite time constraints and stress as primary barriers to healthier eating and feeding behaviours (Fulkerson et al., 2011; Norman, et al., 2015). There is also some suggestion that parents may employ more positive feeding strategies if they are not anxious themselves (Norman et al., 2015; Ogden, 2014; Peters et al., 2014). Multi-component interventions are considered the gold-standard approach to tackling eating behaviour change (Bray et al., 2016; Brownell & Cohen, 1995). Nevertheless, there are few descriptions of dynamic family-focused healthy eating interventions in the literature (McLean et al., 2003).

Interventions to improve healthy eating in children should therefore be delivered in a flexible and easily accessible format. Further, they should focus not only on teaching parents healthy eating habits and feeding strategies, but also on encouraging a relaxed and stress-free environment in which to implement them. It is imperative that these interventions are also acceptable to their users who need to view the

intervention as appropriate, based on ‘anticipated or experienced cognitive and emotional responses to the intervention’ (Sekhon et al., 2017). Mobile health (mHealth) interventions are defined as, ‘medical health practice supported by mobile devices’ (WHO, 2017) (e.g. mobile phones, tablets and other wireless technology) and are becoming increasingly popular (Marcolino et al., 2018; Snuggs et al., in preparation). They provide users with a flexible way of engaging in health behaviour change interventions at their own convenience; they appear to be a suitable delivery mode for this type of intervention.

Netmums is a UK-based parenting website with a monthly audience of over 11 million people. It is the most frequently visited parenting social networking site in the UK and its visitors are more socio-economically representative of the population than other similar websites. With a strong focus on family and health, the Netmums website presents an ideal platform from which to deliver a healthy eating intervention to a large number of parents and families.

In 2009, Netmums created The Healthy Happy Family Eating (HHFE) course in consultation with the UK Department of Health. This consisted of nine emails, delivered to parents over a four-week period. The emails provided information on food swaps, healthy recipes, tips to encourage fussy eaters and ideas for activities to focus the family on food and cooking. Throughout the intervention, there was an emphasis on enjoyment and happy mealtimes. A pilot study was conducted to assess the effectiveness of the HHFE, with positive pre/post results (Court et al., 2010). Although this was encouraging, there was a clear need to evaluate the HHFE more robustly and to make substantial changes to it based on user feedback, the evidence base and developing behaviour change theories.

It has been observed that intervention development is not always a ‘standalone step’ (Hoddinott, 2015). Thus, this paper

begins with a description of three studies designed to assess and inform the feasibility and acceptability of the HHFE in terms of prospective, concurrent and retrospective acceptability as defined by Sekhon et al. (2017). This is followed by an account of the intervention refinement. Some specific challenges associated with collecting user feedback from this population and the methods we employed to overcome these are also discussed.

Part 1: HHFE pilot studies

Study 1: Long-term (six years) follow-up of pilot study participants

Background

Initially, in 2009, Netmums recruited 1861 participants to a pilot study investigating the acceptability of the newly-developed HHFE intervention (Court et al., 2010). They were asked to complete a short online questionnaire before receiving the nine emails that formed the HHFE intervention, and then another questionnaire immediately after intervention completion. Seven Likert scale statements were administered at each time point that focused on enjoyment and confidence around cooking and choosing healthy family food. Total of 528 (28 per cent) participants provided data at both time points and analyses revealed significant positive increases on each of the seven statements.

Given this initial success, the aim of the long-term Follow-Up study was to establish whether these positive changes were sustained over a longer period (six years).

Methods

The follow-up study had a within-subjects longitudinal design with three time points (T1 (baseline) and T2 (baseline + four weeks) were Pilot Study time points, T3 was the long-term follow-up time point (baseline + ~ six years)).

The sample consisted of Netmums members who had taken part in the Pilot

study (i.e. had provided data at both T1 and T2), the majority of whom were female and from the UK. All had previously agreed to being re-contacted as part of the study. The study was granted approval to proceed by the University of Reading Research Ethics Committee (reference: 2016-018-KM).

At T1, T2 and T3, participants were asked to indicate their level of agreement on a scale of 1 (no agreement) to 10 (complete agreement) with seven statements (Table 1). At T3, they were also asked to provide demographic data (gender, age, location, number of children and oldest child's age) which had not been collected in the pilot study.

All 528 of the original pilot participants were sent an email which explained why they were being contacted and requested that they complete an online questionnaire

similar to the previous one in order to see how people who had completed the HHFE intervention were getting on several years later. Participants who did not complete the questionnaire were sent a reminder one and three weeks later.

Results

Data were analysed from participants who provided information at T1, T2 and T3 (N=120, i.e. 23 per cent of the cohort in the Pilot study).

Participants

Participants all identified as female, with one participant declining to state their gender. They all stated that they were either a parent or step-parent of at least one child and 36 per cent remembered taking part in the

Table 1: Paired sample t-tests on Netmums HHFE items at T1 and T3. P < 0.005 indicated in bold. Statements with (r) have had their scores reversed such that a higher number indicates a positive change.

	T1 Mean (SD)	T3 Mean (SD)	t	df	Sig. (2-tailed)
We have happy mealtimes in our household	7.00 (1.798)	7.69 (2.144)	-3.185	120	.002
I am well well organised when it comes to family eating and mealtimes	5.96 (1.989)	6.98 (2.223)	-5.186	120	.000
I am inspired to try new recipes and food ideas	6.80 (2.060)	7.10 (2.296)	-1.317	120	.190
I am concerned that we aren't eating a healthy diet (r)	5.34 (2.189)	6.40 (2.584)	-4.147	120	.000
I am happy to cook	7.65 (1.792)	7.36 (2.217)	1.364	120	.175
I often choose unhealthy options because they are more convenient (r)	6.07 (2.411)	7.13 (2.322)	-4.399	119	.000
I feel confident about using food labels	6.82 (2.206)	7.49 (2.342)	-3.038	120	.003

Netmums HHFE intervention. Participants' mean age was 43.41 years ($SD=5.88$).

Changes on the Happy Family Eating measure over time

In the *Pilot* study, paired sample *t*-tests showed a significant and positive increase in the mean statements for all seven statements on the Netmums happy family eating measure. In this follow-up study, scores on five of these statements remained significantly higher (i.e. improved) than at baseline (Table 1).

When follow-up (T3) was compared to post-intervention (T2), scores had either worsened or stayed the same ('happy mealtimes' and 'concerned about diet' items stayed the same) (Figure 1).

Inter-reliability for the seven items was measured using Cronbach's α at T3, the value for which was 0.764.

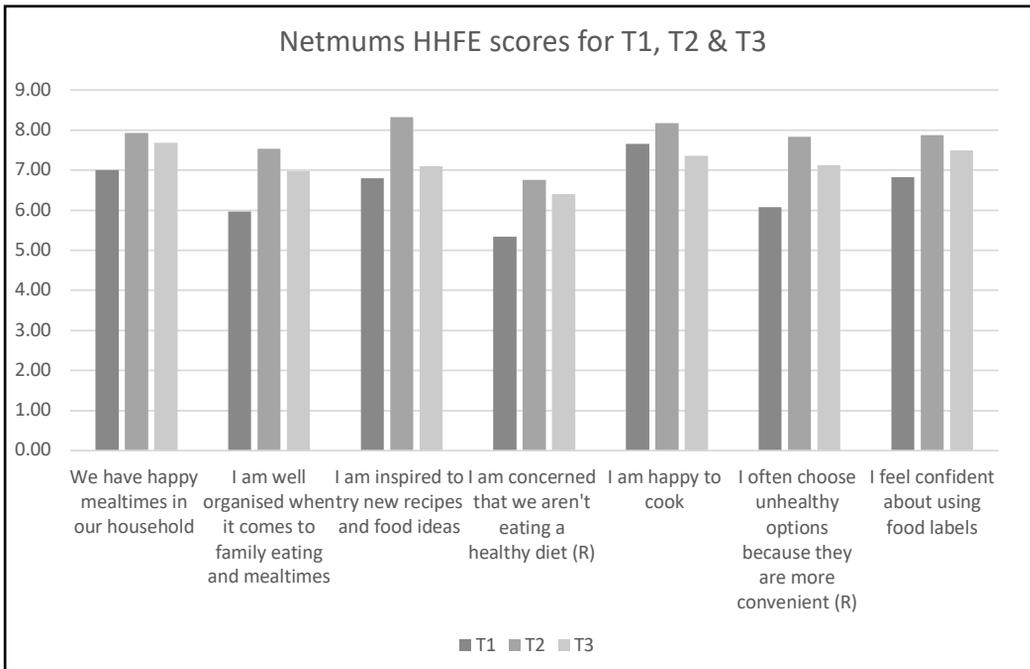
Discussion

Long-term follow-up suggested that positive behavioural and attitudinal changes were not

only achieved by the HHFE intervention but also sustained some years later in the subset of participants who provided complete data. This provides clear rationale for investigating the effects of the intervention further. Nearly a quarter of the original sample participated in this study six years later and it is encouraging to observe that participants maintained their self-reported improvements at long-term follow-up. There are no comparable studies with such long-term follow-up with which to compare retention rates but this appears to demonstrate a high level of engagement compared to other shorter-term online studies (Mathieu et al., 2013).

This study carries limitations; there was no control group and the measures used were not validated (although the measure did demonstrate good inter-item reliability at T3). Furthermore, long-term follow-up data collection took place six years after the original pilot; without a control group it is impossible to establish whether any maintenance of behaviour change is due to the HHFE or other factors, for example, parents

Figure 1: Bar chart indicating scores for each of the statements at T1, T2 and T3.



might find family mealtimes less stressful as children grow older and changes in attitudes and behaviours may result from this.

Other limitations relate to the sample. Socio-demographic data for participants was only collected at T3, leaving open the possibility that those who did not remain engaged and respond to our invitation to complete the questionnaire at T3 might differ significantly from those who did. Additionally, it seems likely that people would be more likely to respond at T3 (and T2) if they had a positive experience of the intervention and/or Netmums generally. Finally, 64 per cent of the long-term follow-up sample did not recall taking part in the HHFE intervention at all. While this would not necessarily negate intervention effects, it does pose the question as to how much influence the intervention could really have had on those who later forgot about it.

In summary, the results of this study suggest people may have benefitted from the HHFE intervention, becoming more comfortable with healthy cooking and food choices. The study was not controlled, however, and its sample may be demographically skewed in unknown ways. The Healthy Happy Family Eating intervention might provide the basis for a promising family eating behaviour change intervention and this study provides the justification for a robust randomised controlled trial to assess its efficacy.

Study 2: Qualitative analysis of Pilot data

Background

As part of the original Pilot study, qualitative data were collected before and after participants received the HHFE intervention. These data consisted of responses to open-ended questions about participants' hopes for the intervention beforehand, and feedback about the perceived success of the intervention afterwards. The data was not analysed at the time so the aim of Study 2 was to use this data to investigate what participants hoped to gain

from the intervention, their experiences of the intervention and how closely the two aligned.

Methods

Prior to beginning the HHFE, participants who signed up to the pilot study ($N=1865$) were asked an open-ended question about what they hoped to gain from the intervention. On completing the intervention, participants were asked for feedback on the HHFE intervention.

The responses to these two open-ended questions were coded by two researchers (10 per cent were coded by both to check agreement). Open coding (Blair, 2015) was used to analyse the responses to open-ended questions. Using this process, observed phenomena are labelled and grouped into categories based on their properties.

Results

HHFE Intervention:

Expectations and objectives

Of the 1865 participants recruited to the pilot study, 990 provided a response to the open-ended question about what they hoped to gain from the intervention. No demographic data was collected. Inter-rater reliability for the 10 per cent double coded was high: 100 per cent for the principal themes of each response. The themes are listed below:

Health: Over half ($N=498$) people mentioned the word 'health' or 'healthy' in their response to the question about their hopes for the intervention, making it the most prominent theme in the responses.

Healthy family: A common sentiment was, 'I want to get the whole family healthy'.

Ideas and inspiration: Many participants described hoping for fresh ideas from the intervention, either in the form of recipes or ideas of how to present food to their children.

Help with fussy eating: This typically meant increasing the variety of food child/ren would try, encouraging them to eat healthier food and getting them to eat what they were first given.

Speed/easy/healthy and organisation: These ideas were commonly reported, and there appeared substantial overlap between the hope of cooking healthy food quickly and easily, and being more organised, indicating possible competing demands.

Family meals: Participants said they were hoping for the family to eat together, either by all family members eating the same meal, and/or all eating together at the same time.

Happy mealtimes: Some participants described hoping to make mealtimes happier or more enjoyable. They wanted to reduce stress, make mealtimes more relaxed and make meal preparation 'more fun'.

HHFE Intervention: Feedback

Participants who completed the intervention ($N=528$) were also asked to provide feedback after the intervention, through an open-ended question. A total of 253 people provided an answer to this question. The majority of the feedback was positive, (perhaps not surprisingly as it was obtained from people who remained engaged with the nine emails over a four week period). Positive feedback most commonly centered on the provision of recipes and meal ideas, increased confidence around food choice and preparation, and help around organising and preparing meal plans. Many participants praised the email format of the intervention, largely because it meant they didn't need to 'log on' and that they simply received the emails as part of their usual day, which required less perceived effort than alternative interventions. Several also commented on the fact that doing the intervention only involved 'small changes' that weren't unrealistic and on the tone, which was received as friendly and not patronising.

Negative feedback most commonly stated that the information in the emails was too basic and sometimes repetitive. Age appropriateness was also criticised (by parents of babies and toddlers who could not help with meal preparation and by parents of teenagers who perceived the activities as too childish). A small number also reported that

they were disappointed not to have received more help with fussy eating.

Suggestions for improvements

Suggestions for improvements came from people who had had both positive and negative experiences of the intervention and included:

1. Information on budgeting and keeping healthy food costs low
2. More focus on fussy eating
3. More focus on younger children
4. More season-specific suggestions (e.g. picnics in the summer)
5. More example weekly meal plans.
6. None of these stood out as being consistent amongst participants.

Discussion

Study 2 allowed for detailed analysis of participants' hopes for, and experiences of, the HHFE intervention. The data suggests that these largely coincided; new recipes, focussing the family on happily eating together and becoming more organised were commonly mentioned hopes and experiences, as well as broader aims such as inspiration and motivation.

The main limitation to this study is that the data is relatively old, and parents' expectations from an intervention of this type might have changed with developments in technology. As with Study 1, the analysis indicates that a more up-to-date and robust evaluation of the HHFE is warranted.

Study 3: Feasibility testing

Background

Because of the time-lapse between the pilot study and the intervention refinement of 2016/17, it was necessary to collect some more up-to-date feedback about the intervention ahead of making any changes, and to trial a number of possible outcome measures for the anticipated randomised controlled trial. In this section, procedures and feedback results are described (detailed information on the outcome measure testing

is beyond the scope of the paper but a list of measures administered is available from the authors). We aimed to recruit forty participants through the Netmums online forum to participate in the HHFE and to provide data through online questionnaires before and after the intervention. We then planned to invite a sub-sample to focus groups to discuss their experiences in more detail.

Methods

An advert was placed in a Netmums chat-room by the Netmums administration team, inviting people to take the HHFE intervention and to provide feedback. People who were interested in taking part were invited to click on a link that directed them to participant information and consent, and then to a baseline questionnaire hosted by Survey-Monkey.com. Once they had completed the questionnaire, participants were directed to sign up to the HHFE intervention.

Upon completion of the intervention (time 2), participants were emailed a second questionnaire. Participants who did not respond at time 2 were sent a reminder one week later, and were also contacted by email and invited to contribute informal feedback. We additionally sought feedback over email because this method of data collection appeared to suit this particular target audience.

Results

Participants

A total of 65 participants consented to take part and provided a full dataset at baseline (a further 24 started but did not complete the baseline questionnaire). This was higher than the original target ($N=40$) because it became evident as participants completed the intervention that attrition rates at Time 2 were high and so recruitment was continued beyond 40 to ensure sufficient Time 2 data. Of 65 participants, 12 provided data at Time 2 (18.4 per cent).

Feedback

Participants were asked at Time 2 to describe three positive and three negative aspects of the HHFE. The questions were not mandatory and not all participants provided three (or in some cases any) answers. Open-ended responses can be seen in Tables 2 and 3.

Responses were examined to determine if they could be grouped. Common positive comments referred to new recipes, involving children more in food preparation, specific tips within the emails and the email format itself. Negative responses, on the other hand, were less consistent with few negative aspects of the intervention being named by more than one participant.

Ongoing user-involvement

Due to the low response rates and the fact that participants were spread around the UK, the planned focus groups were not conducted. Instead, over the intervention refinement stage (described in Part 2), we maintained contact with participants and on occasion asked them to answer focused questions. This is in keeping with a 'person-centred' approach to user-engagement in digital behaviour change interventions (Yardley et al., 2016).

For example, we approached an opportunity sample of pilot participants and asked them to pick the most and least interesting two or three email titles from the intervention. This was done verbally and by email and some participants also provided feedback about the titles themselves. This approach ensured that user-feedback was obtained, but collected in a way that was efficient and didn't over-burden participants.

Discussion

As discussed above, the retention rate for this study was low (13.4 per cent of T1 starters completed at T2). Even those who did respond at both time points did not all provide full sets of data. On consultation with the Netmums team, two likely reasons for this were proposed: (1) in their experience, appetite for completing online surveys had diminished considerably over recent years

and (2) some feedback from participants indicated that the intervention itself needed to be more engaging and inspiring. This information informed both the intervention refinement and design for the upcoming randomised controlled trial (RCT).

Feedback for intervention refinement

The positive feedback provided, though limited, was encouraging as much of it focussed on key aims of the intervention; involving children in meal preparation, delivering information in an easily-digestible format and sharing new food ideas, for example. Similarly, the negative feedback supported some of the ideas we already had about improving the HHFE. In both cases the sample size was too small to draw any conclusions but Study 3 data does appear consistent with Study 2 findings, which resulted from a much larger data-set.

Interestingly, two topics were raised in Study 3 that did not appear in Study 2. First, some of the nutritional advice was not well-received because it was perceived to be inaccurate or inconsistent. Although the original intervention was designed in consultation with the UK Department of Health, nutritional guidelines have changed over the last five to 10 years, in some cases substantially, for example the shift of focus on reducing saturated fats to reducing sugars, this criticism seemed reasonable. In response to this feedback, we reviewed the nutritional advice offered in the intervention to ensure it reflected current thinking. An alternative interpretation of this feedback is that it perhaps reflects a declining acceptance of expert advice. The second topic that arose related to portion control advice. This advice was well received by a few members of the Study 3 cohort but rarely mentioned by those in the original pilot study. This perhaps reflects that portion control is better understood as an important aspect of healthy eating, and has been communicated as such in public health campaigns (NHS, 2015). That these topics emerged again highlighted the need to refresh the content of the intervention and ensure it is current.

Conclusions

Collectively, the original pilot study and follow-up (Study 1), participants' feedback (Study 2) and the Feasibility Study (Study 3) presented a case to update and evaluate the healthy happy family eating intervention. The findings indicated that the intervention may demonstrate long-term effects, and be received positively by users, in particular its focus on making small sustainable changes.

The pilot work highlighted a number of opportunities to update the intervention whilst also emphasising the need for a review of the relevant evidence base. With this in mind, Part 2 describes the intervention refinement.

Part 2: Intervention refinement and formative theory

Refinement of the Healthy Happy Family Eating intervention was based on four elements:

1. Review of the HHFE evidence-base;
2. User-feedback;
3. Behaviour change theory;
4. Stakeholder input.

Review of the evidence-base

A thorough review of the original HHFE content was conducted before any changes were made. This evidence fell broadly into one of two categories; psychological theory and nutritional information. The multi-component intervention was designed to draw on a number of theories and ideas in order to account for individual differences and preferences. It drew from approaches including, but not limited to self-monitoring (Burke et al., 2011, Michie et al., 2009), the Theory of Planned Behaviour (Ajzen, 1985), nudging (Arno & Thomas, 2016) and implementation intentions (Gollwitzer, 1993). It also drew on a number of more 'food-specific' psychological constructs such as feeding styles (Rodenburg et al., 2014) and practices (Musher-Eizenham & Holub, 2007), the Portion Size Effect (Hetherington & Blundell-Birtill, 2018) and shared family meals (Hammons & Fiese, 2011). Nutri-

tional themes included '5 a day' (NHS, 2018), hydration, increasing variety, food swaps (Change4Life, 2018) and information around other UK government initiatives such as the Eatwell plate (NHS, 2018) and advice on checking food labels. The majority of information in the original HHFE emails was well-evidenced, although the intervention contained some themes for which there was no convincing empirical evidence. Recommended changes resulting from this review are outlined below:

1. Suggest inventive ways to encourage family members of different ages to spend time together at mealtimes.
2. Communicate information to parents about exposure and modelling as techniques to encourage variety seeking.
3. Change the six main 'themes' described at the beginning of each email to be more coherent and representative of the intervention.
4. Clarify language (e.g. some confusion around messages about sugar in fruit juice).
5. Reduce emphasis on hydration.
6. Reduce emphasis on saturated fat.

User-feedback

The feedback obtained in Studies 2 and 3 suggests that parents were primarily attracted to the principal of healthy, happy family eating. On signing up to the intervention, they hoped for help organising and finding convenient ways to prepare healthy food, finding ways for the family to eat together and inspiration around new recipe ideas. The intervention developed appear to have met these goals and the email format was broadly acceptable.

Examples where the intervention did not align well with participants' hopes included participants' desires for more help with food fussiness and more information on eating healthily on a low budget. In the case of the more recent pilot work, there was also a concern that some of the information was not nutritionally sound. This was all taken into consideration and the updated

intervention placed more emphasis on the missing aspects identified, while care was taken to ensure all nutritional information was consistent with up-to-date guidelines (also see stakeholder input below).

Opportunity samples from Study 3 (including completers and non-completers) were engaged throughout the process of refinement. Parents were consulted about the photographs contained in the emails, the updated HHFE logo and the email titles as well as written email content to ensure that it was engaging, accessible and easily understood.

Recommended changes resulting from user-feedback are listed below:

1. More emphasis that children can get involved with food preparation regardless of their age.
2. More emphasis on speed and ease of meal preparation.
3. Tablet and smartphone-friendly emails.
4. Themed emails (e.g. link similar tips and topics together in one email).
5. Removal of 'printables' for parents (burdensome and unlikely to be used).
6. Removal of 'foodie thought for the day' (perceived as outdated and patronising).

Behaviour change theory and the behaviour change wheel

The fundamentals of the current intervention had already been established in the original design. We therefore sought to use the Behaviour Change Wheel (BCW; Michie, van Stralen & West, 2011) and the corresponding APEASE criteria to help guide the refinements and maintain focus throughout the design process. Tables 2 and 3 demonstrate this.

Stakeholder input

Once the email content had been revised by researchers to accurately convey the messages agreed on, the Netmums team applied their expertise communicating with parents to the email content. In the first instance, this involved making the language more informal and in keeping with the website's chatty jour-

Table 2: BCW intervention design guide process.

1. Define problem	Children's restricted/unhealthy eating.
2. Select target behaviours	Changing parents' feeding practices in the home.
3. Specify	Parents making healthy foods available in the family home regularly; increase shared family meal frequency in the family home (e.g. parents sitting down with children to eat, parents cooking same food for whole family), increase family enjoyment of food (by involving children in decision-making, completing tasks designed to provide fun).
4. Identify what needs to change?	Parents' capability and motivation around providing healthy food, children's opportunity to eat healthy food.
5. Identify intervention functions	Education, persuasion, training, environmental restructuring, enablement.
6. Identify categories	Communication.
7. Identify behaviour change techniques	Goals and planning, (self) monitoring, shaping knowledge, antecedents, restructuring the physical environment, restructuring the social environment, modelling the behaviour.
8. Identify mode of delivery	Distance – population – digital media – internet/mobile phone.

Table 3: APEASE criteria.

Affordability	Email format is inexpensive and straightforward to roll out without further development costs.
Practicable	Intervention is deliverable to target audience; medium of parenting website means that interested parties are already using the delivery platform.
Effectiveness	RCT currently underway to establish effectiveness.
Acceptability	Studies 1 to 3 have indicated and informed acceptability (e.g. greater understanding of questionnaire burden, intervention feedback & retention data). RCT will provide more detailed data on participation, feedback and engagement.
Side effects	None known. Feedback is collected after participation in RCT.
Equity	Netmums more closely represents the population on socio-economic measures than other parenting websites .

Figure 2: HHFE email structure

		Content	Evidence base and theory
Day 1	Healthy happy family eating	Introduction: Togetherness, balance, variety, planning, simplicity. Bright Ideas: Take notes, cooking with kids Top Tips: Getting the family eating together	Theory of planned behaviour Shared family meals Balance and variety
Day 2	Heathy happy breakfasts	Bright Ideas: Planning family breakfast, adding fruit to breakfast, try porridge with choice of topping. Top Tips: Low sugar, check labels, wholemeal, calcium, grilled vs. fried.	Theory of planned behaviour Shared family meals Nutritional information
Day 5	5 a day: Having fun with fruit and veg	Bright ideas: FV activities for various ages Top tips: keep pre-chopped veg, keep trying same fruit & vegetables (FV), don't negotiate with dessert. Top tips for fussy eaters: involvement in food choices, parents eat the FV, don't pressure.	Exposure to FV Availability/ accessibility Encouragement of 'positive' feeding practices Discouragement of 'negative' feeding practices
Day 8	Portion control: how much is too much?	Bright Ideas: Eatwell plate, consider regular meals. Top Tips: Portion size guidance, avoid plate clearing language, avoid 'tv-eating'!	Portion Size Effect Nutritional information
Day 11	Sugar: swapping the sweet stuff	Bright ideas: sugar swaps, family members plan sandwich. Top Tips: Cook from scratch, remove temptation, check labels, stealth sugar.	Theory of planned behaviour Shared family meals Nutritional information Nudging
Day 14	Happy mealtimes	Bright Ideas: 'Me-time', family meals (ground rules). Top tips: Slow down eating, no screens.	Mindful eating Shared family meals Screen time reduction
Day 17	Salt	Bright ideas: clear out, family taste test. Top tips: Salt guidance, labels.	Family involvement Nutritional information

Day 20	Planning and budgeting	Bright ideas: Meal planner, kids involvement in preparation. Top tips: batch cooking, frozen veg, leftover ideas.	Theory of planned behaviour Family involvement
Day 21	Healthy happy family eating	Recap: Useful links. Bright ideas: Plan special family meal.	Theory of planned behaviour Family involvement

nalistic style. Typically, this involved reducing sentence length, using more encouraging language and personalising language (e.g. changing ‘the family’ to ‘your family’). The word ‘course’ was also felt to alienate people, and the intervention was consequently renamed the ‘Healthy Happy Family Eating Programme’. A new template was used for the emails which had previously been ‘a/b’ tested (Kohavi & Longbotham, 2016) by Netmums, and pictures and photographs were replaced to look more current and more diverse.

At this stage, a nutritional therapist was also consulted to read through the emails and confirm that the content was nutritionally sound. She felt that the main email content was balanced and informative. However, she expressed some concern that some of the recipes the emails linked to on the main website contained too much sugar and too few fruits and vegetables. Recipe links were therefore adjusted to ensure they involved a wider variety of foods and reduced sugar content.

New intervention: The healthy happy family eating programme

Figure 2 describes the final online healthy eating intervention designed for parents, which aims to change eating behaviours across the whole family. Content is organised to ensure that each email has a clear theme with relevant ‘bright ideas’ and ‘top tips’.

Using user-feedback, we have ensured that the emails are of manageable length, attractive and easy to read on a variety of electronic devices. Only advice considered aligned with current evidence is included. All content is considered to be accessible for the typical adult population, as established by an electronic readability tester.

Thus, the content is robustly evidenced and theory-based, and carefully tailored to suit its audience. The new HHFE has the potential to reach a large number of parents in an inexpensive and easily accessible way. A randomised controlled trial to assess its efficacy is underway (Snuggs, Houston-Price, Harvey, in preparation).

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Chapter 4: Measure selection for the Randomised Controlled Trial

4.1 Rationale and aim

Chapter 3 described the development of the Healthy Happy Family Eating intervention and stated the need for a Randomised Controlled Trial (RCT). This chapter explores how best to test the intervention outcomes for this RCT.

The aim of the chapter is to provide supplementary information that is not available in the Intervention Development paper (Paper 2) or the RCT paper (Paper 4) due to space limitations of the journals. It is divided into three sections as follows:

4.2 Description of outcome measures used in the pilot work described in the Intervention Development paper. This information was not reported in the paper because the focus was on the development of the intervention;

4.3 Selection of measures for the RCT;

4.4 Paper 3: Development of a parental feeding goal measure: The Family Mealtime Goals Questionnaire.

4.2 Description of outcome measures in the pilot work

As well as trialling the intervention itself, the pilot work described in the Intervention Development paper was a useful opportunity to test a wide range of potential outcome measures. It was clear that these should reflect the principal themes of the intervention; healthy, happy and family. Less clear was which, of a broad assortment of measures, would be most appropriate for this research. The pilot work described in the Intervention Paper presented a unique opportunity to explore a much larger collection of measures than would be used in the final RCT and to collect both qualitative and quantitative feedback on these measures. This allowed for investigation to measure reliability (through considering Cronbach's α values of scale measures) as well as examining parents' receptiveness to various measures.

4.2.1 Method.

Fifteen measures were chosen for possible selection (see table 4.1, overleaf), combined to form one online questionnaire and administered at two time points, 4 weeks apart (Time 1 and Time 2). See Appendix 1 for the complete questionnaire. In the interim period, participants also received the original HHFE course emails, as described in the Intervention Development paper. The questionnaire was hosted by Survey Monkey and the study was granted ethical approval by the University of Reading Research Ethics Committee (UREC number: 2016-009-KH) (Appendix 2).

Table 4.1

Collection of measures delivered at time 1 and time 2 during the pilot study

Adult food neophobia scale	(Pliner & Hobden, 1992)	Measures avoidance of/willingness to eat novel foods in adults (10 items)
Child food neophobia scale	(Pliner, 1994)	Measures avoidance of/willingness to eat novel foods in children, reported by parents (10 items)
Child eating behaviour questionnaire	(Wardle, Guthrie, Sanderson, & Rapoport, 2001)	Comprises 8 subscales: food responsiveness, emotional overeating, enjoyment of food, desire to drink, satiety responsiveness, slowness in eating, emotional under-eating, food fussiness, reported by parents (35 items):
Comprehensive feeding practice questionnaire	(Musher-Eizenman & Holub, 2007)	Comprises 12 subscales: monitoring, emotion regulation, food as a reward, child control, modelling, restriction for weight, restriction for health, teaching nutrition, encourage balance/variety, pressure to eat, healthy environment, involvement (49 items)
Netmums 'Healthy happy family' measure	(Court, Vince-Cain, & Jefferson, 2010)	Carried over from previous pilot work, focuses on 'happy, healthy' eating (7 items)
Mindful eating questionnaire	(Framson et al., 2009)	Comprises 5 factors: disinhibition, awareness, external cues, emotional response, distraction (28 items)
Food choice questionnaire	(Steptoe, Pollard, & Wardle, 1995)	Measures motives for food choices, comprises 9 factors: health, mood, convenience, sensory appeal, natural content, price, weight control, familiarity, ethical concern (36 items)
Adapted food choice questionnaire	(Steptoe et al., 1995)	Measures as above but adapted to examine parents' choices for their children's food (36 items)
Family eating item	(Developed for the study)	Aims to capture family eating dynamics, asking how often the child has eaten with: parents and brothers/sisters; another adult (e.g. childminder) and brothers/sisters; parents only; other adults only; other children only; alone (7 items).
Raw ingredients	Developed for the study	Single item asking how often the parents cook with raw ingredients in the home.
Family food expenditure	Developed for the study	Single item asking roughly how much money the whole family spends on food each week.
Fruit & vegetable liking measure	Developed for the study	Asks the parent to rate how much the child likes a) fruit and b) vegetables (2 items).
Fruit & vegetable availability measure	Developed for the study	Fruits and vegetables listed, parents asked to indicate how often the child is offered each food (66 items)
Fruit & vegetable consumption measure	Developed for the study	Parents asked to indicate how often the child consumes each of the above foods (66 items).
Feedback	Developed for the study	Open-ended questions asking for positive and negative aspects of the HHFE (delivered at time 2 only) (2 questions).

4.2.1.1 Participants.

Sixty-five participants provided informed consent for the study and answered at least some of the questions presented in the questionnaire at Time 1. Forty two (65%) answered all the questions. Twelve participants also provided data at Time 2.

All participants identified themselves as the parent of the child about whom they were answering questions, apart from one participant who did not answer this question. Of those who answered, 61 (95%) were female.

Participants were asked, if they had more than one child, to choose one child about whom to answer questions consistently throughout the survey. They were also asked to provide a reason for choosing this child. The most common reason cited was that they had chosen the child because s/he was a fussy eater (n=19). Other reasons included choosing the oldest (n=12), choosing a child who already ate a wide variety of food (n=5); or who had specific food requirements or allergies (n=3); or the youngest child (n=3).

Further sample characteristics are in Table 4.2

Table 4.2

Demographic characteristics of Pilot Study participants.

	n	Mean	SD
Participant age (years)	65	35.18	6.22
Number of children who reside with you at least half the time ($\geq 1\text{yo}$, $\leq 16\text{yo}$)	65	2.08	0.85
Age of child chosen for questionnaire	64	6.06	4.17
Number of meals prepared by the participant for the child each week*	65	15.57	6.94

*Qualitative work in the Think Aloud study suggested that some parents (particularly those with younger children) prepare more than 3 meals a day for their children.

Five participants also participated in a ‘Think Aloud’ (French & Hevey, 2008) study, during which they were asked to reflect and comment aloud while they completed the online questionnaire. The purpose of this part of the project was to gather understanding as to what participants thought they were being asked to do throughout the questionnaire, as well as to provide insight into which questions proved difficult or unclear.

Analysis.

Statistical analysis to assess behaviour change was not conducted because the main purpose of this study was to test-run the measures and gain feedback to inform changes to the intervention and the sample providing data at both time points was very small (n=12). However, some analysis was conducted on the Time 1 data to determine the psychometric properties of the measures and to examine possible relationships between measures.

4.2.2 Results.

Measures.

Adult Food Neophobia Scale & Child Food Neophobia Scale (AFNS & CFNS).

Scale scores for both the AFNS and the CFNS are in Table 4.3. In both cases, a higher score represents higher levels of neophobia. (n.b. the two scales are different, and the AFNS has a maximum possible score of 7, while the CFNS has a maximum possible score of 4).

Correlation between the two measures was examined in order to establish whether adult and child neophobia were related (this may have been relevant to whether either or both measures were used, especially if they turned out to be highly correlated).

Cronbach's α was also measured for each in order to consider the internal consistency of both measures.

AFNS and CFNS scores were not correlated with each other. CFNS score was negatively correlated with child's liking for vegetables ($r = -0.532, p < 0.001$) and with child's liking for fruit ($r = -0.285, p = 0.022$). Both scales demonstrated good reliability using the Time 1 data (AFNS Cronbach's $\alpha = 0.832$, CFNS Cronbach's $\alpha = 0.918$).

Table 4.3

AFNS & CFNS scores (n=64)

	Minimum	Maximum	Mean	SD
AFNS Score	1.20	6.60	2.79	1.08
CFNS Score	1.00	4.00	2.56	0.80

Child eating behaviour questionnaire (CEBQ).

Cronbach's α values were measured for each subscale of the CEBQ to examine internal consistency. The correlation between the *food fussiness* subscale and the Child Food Neophobia Scale (CFNS, discussed above) was also measured because the two scales represent very similar concepts; if the measures demonstrated a high r -value, it might be necessary to consider whether they were measuring the same (or nearly the same) concept and if so, that only one (if any) should be used in the RCT.

Most of the subscales demonstrated strong internal consistency. Food fussiness CEBQ scores were highly correlated with CFNS scores ($r = 0.863, p < 0.001$).

Subscale scores and Cronbach's α values are in Table 4.4.

Table 4.4

Descriptive data for CEBQ subscales (n=54)

	Minimum	Maximum	Mean	SD	Cronbach's α
Emotional overeating	1.00	3.50	1.88	.65	0.68
Enjoyment of food	1.00	5.00	3.61	.96	0.88
Desire to drink	1.00	5.00	2.70	1.12	0.90
Satiety responsiveness	1.00	4.40	3.01	.73	0.77
Slowness of eating	1.00	5.00	2.92	.91	0.81
Emotional undereating	1.50	5.00	3.11	.86	0.77
Food Fussiness	1.00	5.00	3.09	1.05	0.90
Food responsiveness	1.20	5.00	2.77	1.02	0.88

Comprehensive Feeding Practice Questionnaire (CFPQ).

As with the CEBQ, Cronbach's α values were measured for each of the subscales of the CFPQ to determine internal consistency.

These tests indicated that *Modelling, Monitoring, Pressure to eat* and *Healthy Environment* were particularly reliable constructs, with Cronbach's α values of 0.8 or higher. *Restriction for weight, involvement* (of the children in food preparation), *emotion regulation* and *food as reward* also demonstrated reliability with Cronbach's α values of over 0.7. The remaining factors (*restriction for health, child control* and *encouraging balance/variety*) showed weaker Cronbach's α values. Subscale scores and Cronbach's α values are in Table 4.5.

Table 4.5

Descriptive data for CFPQ subscales (n=49)

	Min	Max	Mean	SD	Cronbach's α
Monitoring	1.00	5.00	3.85	0.97	0.86
Emotion Regulation	1.00	5.00	2.19	0.82	0.76
Food as Reward	1.00	4.00	2.13	0.93	0.75
Child Control	1.20	5.00	2.64	0.67	0.58
Modelling	1.00	5.00	3.76	0.92	0.86
Restriction for Weight	1.00	3.88	1.90	0.63	0.78
Teaching Nutrition	1.00	5.00	3.59	0.94	0.74
Encourage Balance/variety	1.67	5.00	4.14	0.77	0.41
Pressure to Eat	1.00	5.00	3.02	0.89	0.81
Healthy Environment	1.25	5.00	3.51	0.85	0.80
Involvement	1.00	5.00	3.07	0.95	0.76
Restriction for health	1.50	5.00	3.29	0.75	0.59

Family eating arrangements

The eating arrangements question was developed for the study and in this sense was being 'test-run'. Therefore the descriptive data were examined to establish plausibility of answers and the qualitative Think-Aloud data were examined to consider acceptability of the measure. T-tests were also run to examine whether there were differences in family eating arrangements between younger (pre-school aged) and older (school aged) children.

Participants reported that their children ate with their parents, siblings, or both approximately 14 times per week. Some parents reported a total of considerably more than 21 meals per week. Think Aloud work indicated that parents of younger children sometimes prepare up to 5 or 6 meals a day which may account for the high number of meals. However, it may also indicate a lack of clarity or confusion around the question. A total of 14 participants reported that their child ate alone at least once in the preceding week (see Table 4.6).

Table 4.6

Family eating arrangements (frequency of meals eaten per week) (n=49)

	Min	Max	Mean	SD
With parent(s) only	0	19	3.59	5.26
With siblings only	0	15	2.90	4.32
With parents & siblings	0	21	7.33	6.68
With other adult/s (not parents)	0	15	1.76	3.02
With other non-family adults and/or children	0	10	2.35	3.01
Alone	0	5	0.76	1.45
Another combination	0	4	0.12	0.63
Parents, siblings, or both	1	45	13.82	7.50

There was no significant difference in the number of times parents reported that children ate with their families or alone between school-aged and preschool-aged children ($\chi^2(2) = 0.22, p=0.894$).

Food Choice Questionnaire.

Principal Components Analysis (PCA) was conducted for both the Food Choice Questionnaire (FCQ) (Steptoe et al., 1995) and the adjusted FCQ (AFCQ) (to measure parents' motives behind food choices for their children) in order to establish a) whether the FCQ presented as a reliable method of measuring parents' own food choices and b) whether it translated well into a measure of parents' food choices for their children. For the AFCQ to present as a plausible measure, the expectation would be that the components should remain broadly (if not exactly) similar to the adult version of the scale, and also that these components should maintain strong internal consistency.

The PCA for the adult FCQ broadly supported the subscales that emerged in the original development of the scale. This was not the case for the AFCQ¹ and the PCA

¹ Confirmatory Factor Analysis (CFA) should ideally be run (as opposed to an exploratory analysis, such as PCA) with a view to confirming the factors in an already validated scale. For this reason, CFA was run subsequently in AMOS, and supported the results described above. The CFA model for the AFCQ was rejected ($\chi^2=1113.23, p<0.001, df=558, RMSEA=0.13, CFI=0.46, TLI=0.35$).

model did not provide a good fit. For this reason it was not deemed necessary to examine Cronbach's α values. Think Aloud data and other qualitative feedback indicated that the reason for the poor model fit was that some of the items did not translate appropriately for parents to think about their child's eating. For example, 'it is important to me that the food my child eats helps them cope with life' and 'it is important to me that the food my child eats is good for their hair/teeth/nails' were both reported as difficult items to answer.

Food Choice Questionnaire and Adjusted Food Choice Questionnaire Subscales.

Paired samples t-tests were conducted to consider whether there were differences in how much importance parents placed on reasons for food choice for their own food compared to their children's food.

These tests showed that participants placed significantly more importance on the healthiness and natural content of food when choosing for their children, than when choosing for themselves. By contrast, they placed more importance on price, weight control and ethical concern when choosing their own food. Table 4.7 shows the mean scores for each subscale.

Table 4.7

Paired sample t-test results comparing parents' motivations for their own food choices compared to those for their children (n=46)

	Mean parent FCQ score	Mean child FCQ score	Mean difference	SD	p-value
Health	2.95	3.16	0.21	0.40	<0.01
Mood	2.51	2.56	0.05	0.61	0.57
Convenience	2.99	2.93	-0.07	0.27	0.11
Sensory appeal	3.08	3.17	0.09	0.40	0.14
Natural content	2.82	3.09	0.28	0.45	<0.01
Price	3.07	2.74	-0.33	0.51	<0.01
Weight control	2.57	2.01	-0.56	0.50	<0.01
Familiarity	2.33	2.49	0.16	0.58	0.07
Ethical concern	2.09	1.94	-0.14	0.32	<0.01

Food choices & feeding practices

A series of correlation analyses were run to check for associations between participants' food choice motivations for their children (using the AFCQ) and the feeding practices they reported using in the CFPQ.

Broadly, 'positive feeding practices' were associated with health and natural content goals, while 'negative feeding practices' were associated with familiarity, price, convenience, weight control, and mood goals. Table 4.8 (overleaf) shows all significant correlations.

Table 4.8

Correlational data between food choice goals and feeding practices (n=46 and 47, inconsistent due to missing data)

		Goals +vely associated with feeding practice	Goals -vely associated with feeding practice
Positive feeding practices	Encourage balance and variety Parents promote well-balanced food intake, including the consumption of varied foods and healthy food choices.	Health (r = 0.35, p = 0.017) Natural content (r = 0.341, p = 0.02)	Familiarity (r = - 0.327, p = 0.026)
	Teaching about nutrition Parents use explicit didactic techniques to encourage the consumption of healthy foods		Price (r = -0.385, p = 0.008) Familiarity (r = -0.317, p = 0.032)
	Involvement Parents encourage child's involvement in meal planning and preparation.		Convenience (r = -0.407, p = 0.005)
	Healthy Environment Parents make healthy foods available in the home	Natural content (r = 0.393, p = 0.007)	Price (r = -0.404, p = 0.005) Familiarity (r = -0.553, P<0.001)
	Modelling Parents actively demonstrate healthy eating for the child.	Health (r = 0.488, p = 0.001) Natural content (r = 0.452, p = 0.002)	Familiarity (r = -0.429, p = 0.03)
	Monitoring Parents keep track of child's intake of less healthy foods		Price (r = -0.446, p = 0.002) Familiarity (r = -0.581, p < 0.001)
	Restriction for Health Parents control the child's food intake with the purpose of limiting less healthy foods and sweets.	Mood (r = 0.353, p = 0.016) Weight control (r = -0.307, p = 0.038)	
	Restriction for weight control Parents control the child's food intake with the purpose of decreasing or maintaining the child's weight	Weight control (r = 0.394, p = 0.007)	
	Child Control Parents allow the child control of his/her eating behaviours and parent-child feeding interactions.	Convenience (r = 0.381, p = 0.009) Familiarity (r = 0.446, p = 0.002)	Natural content (r = - 0.352, p = 0.016)
	Emotion regulation Parents use food to regulate the child's emotional states.	Familiarity (r = 0.295, p = 0.046)	Health (r = -0.359, p = 0.014) Natural content (r = -0.357, p = 0.015)
Negative feeding practices	Food as reward Parents use food as a reward for child behaviour	Mood (r = 0.364, p = 0.013) Price (r = 0.488, p = 0.001) Weight control (r = 0.514, p < 0.001) Familiarity (r = -0.3, p = 0.043)	
	Pressure Parents pressure the child to consume more food at meals.	Weight control (r = 0.327, p = 0.027)	

Raw ingredients.

The raw ingredients measure comprised one item, so internal consistency could not be measured. A t-test was conducted, however, to establish whether there was any difference across age groups (pre-school children compared to school children) as to how often parents cooked with raw ingredients (i.e. 'cooked from scratch').

Participants reported that their family had eaten a meal prepared with raw ingredients a mean of 7.4 (SD = 5.97) times in the preceding week, individual answers ranged from 0 to 21 (n=41).

There was a significant difference between these groups on how many meals participants reported preparing at home with raw ingredients such that pre-school children received significantly more home-prepared meals (M=9.8, SD=6.5) than school children (M=5.3, SD=4.78) ($t(1,38)=-2.51, p=0.02$). This is likely to reflect the fact school children are receiving more school meals and more pre-school children are spending time at home during the week.

Money spent on food.

Participants reported spending a mean of £107.44 (SD = 61.825) per week on their families' food in the preceding week, ranging from £8 - £300 (n=41).

Netmums Healthy Happy Family Measure.

The Netmums 7-item measure remained unvalidated so Cronbach's α values were measured to examine internal consistency.

The measure showed high internal consistency, with a Cronbach's α value of 0.84. Table 4.9 shows mean scores for each item.

Table 4.9

Participants' scores on Netmums questionnaire (n=41)

	Min	Max	Mean	SD
We have happy mealtimes in our house.	2	10	7.10	2.08
I am well organised when it comes to family eating and mealtimes.	1	10	6.05	2.38
I am inspired to try new recipes and food ideas.	2	10	6.85	2.34
I am happy to cook	1	10	7.51	2.41
I feel confident about using food labels	1	10	6.85	2.72
I am concerned that we aren't eating a healthy diet*	1	10	5.20	2.87
I often choose unhealthy options because they are more convenient*	1	10	6.07	2.65

*reversed items

Fruit & vegetable availability & consumption

Participants were presented with a list of 66 fruits and vegetables. In each case they were asked how often the child was offered the food (*'Never, Less than monthly, Monthly, Fortnightly, Weekly or Several days per week'*) and assigned a score for each food ranging from 1 – 6 (where a higher score indicated that the child was offered the food more often). A global availability score was generated by calculating the sum of each person's 66-item availability scores. Scores ranged from 86 – 269, with a mean score of 196 (SD = 38.74) (possible scores ranged from 66 to 396). A global consumption score was calculated in the same way (with the same possible range of scores) with a range of 15 – 250 and a mean score of 168 (SD = 55.11).

A correlation was run between the availability measure scores and the *Healthy Environment* subscale score from the CFPQ described earlier. The *Healthy Environment* measure represents a substantially shorter way of measuring availability, but the availability measure described above is evidently more detailed. The rationale for establishing whether the two were closely associated was to consider whether the *Healthy Environment* subscale could plausibly represent a 'proxy' measure of the complex 66-item availability measure.

Availability scores significantly correlated with the *Healthy Environment* subscale from the CFPQ ($r = 0.61, p < 0.001$).

Fruit & vegetable liking

Parents were asked, ‘*in general how much does your child like fruit?*’ and ‘*in general how much does your child like vegetables?*’. Six possible answer options were available for each question, ‘*never tried, strongly dislikes, dislikes, neither likes nor dislikes, likes, strongly likes*’ these were coded as a scale of 1 – 6. A correlation was conducted to establish whether the two measures were closely related and a t-test conducted to examine whether liking for vegetables and fruit significantly differed amongst the children in this cohort.

Parents reported high levels of liking in each case (fruit liking mean: 5.28, SD: 1.04, vegetable liking mean: 4.45, SD: 1.21). The two measures significantly correlated ($r = 0.51, p < 0.01$). A paired samples t-test indicated that children’s liking for fruit was significantly higher than their liking for vegetables ($t(1,63) = 5.91, p < 0.001$).

Mindful Eating Questionnaire.

Mindful eating was a somewhat under-researched topic in 2016. Consideration of how much (if any) emphasis on mindfulness to have in the intervention was ongoing, concurrent to this pilot study. This measure was therefore added for exploratory purposes. Cronbach’s α values were examined to consider whether the individual factors in the scale had strong internal consistency and correlations were run between these factors and the other variables in the study to investigate potential relationships that mindful eating might have with other behaviours and attitudes.

Cronbach’s α ranged from very high (0.86 for ‘*Disinhibition*’) to very low (0.21 for ‘*Distraction*’). The five factors are in Table 4.10.

Table 4.10

Cronbach's α figures for MEQ

	Cronbach's α
Disinhibition	0.86
Emotional Response	0.70
Awareness	0.48
External Cues	0.44
Distraction	0.21

None of the factors correlated highly with any of the other measures.

Table 4.11 (overleaf) presents a summary of the key features of the measures tested. Section 4.3 discusses the collective evidence around the psychometric properties of the measures and participant reactions to these measures, before justifying the measure choices for the Randomised Controlled Trial (RCT).

Table 4.11

Summary of key features of measures tested.

Measure	Key features
Adult food neophobia scale	Measures adult neophobia which is not a target behaviour for the intervention
Child food neophobia scale	Correlates highly with Food Fussiness on the CEBQ. Negatively associated with fruit & vegetable preferences.
Child eating behaviour questionnaire	Notably widely validated across numerous studies. Captures a number of child intervention target behaviours; notably food fussiness and enjoyment of food.
Comprehensive feeding practice questionnaire	Captures a number of parent intervention target behaviours. Notably, Healthy Environment, Modelling & Involvement.
Netmums 'Healthy happy family' measure	Designed to capture the main themes of the intervention. Not validated (although high Cronbach's alpha value). Arguably too transparent in their intention, lending themselves to positive responses.
Mindful eating questionnaire	Psychometrics not consistently strong. No apparent association with any of the behaviours measured with other instruments. Minor coverage of mindful eating in intervention.
Food choice questionnaire	Measures adult food choice motives. Well validated and psychometrically strong but does not capture motives for family food choice.
Adjusted food choice questionnaire	Some items lack face validity. Parental motives for food choice appear to be associated with a number of feeding practices and intervention target behaviours.
Family eating item	Some participants reported confusion with this question. Designed to capture all possible family meal dynamics but probably too complicated to elicit this information accurately.
Raw ingredients	Not validated. May provide useful reflection of whether parents are using healthy ingredients.
Family food expenditure	Not validated. May be useful to examine whether food expense changes with behaviour change.
Fruit and vegetable liking measure	Gives a broad indication of whether a child likes fruit and vegetables. Does not indicate whether they consume them. Not validated.
Fruit & vegetable availability measure	Extremely detailed but cumbersome and many participants dropped out while completing this measure. Correlates highly with Healthy Environment subscale of CEBQ.
Fruit & vegetable consumption measure	As above, extremely detailed but led to many participants dropping out.

4.3 Selection of measures for the RCT

The purpose of this element of the pilot work was to explore a wide range of potential measures for the RCT both psychometrically (testing for reliability) and in terms of participants' apparent acceptance of the measures.

Informed by this pilot work, three primary outcome measures were selected to reflect the three main themes of the intervention: happy, healthy and family. The decisions and justification for these are described below.

4.3.1 Happy.

Very few of the measures considered child, parent or family happiness within their items or factors. This is disappointing because the literature increasingly indicates that stress, anxiety and conflict around mealtimes may be important factors in how parents choose to feed their children (see Chapters 1 and 5 for further discussion). The Netmums measure has good face validity but has no research underpinning and has not been extensively psychometrically tested which means that any changes on the measure over time would be difficult to interpret.

The ‘Happy’ element of the intervention seeks to help families enjoy their mealtimes and meal preparation and targets both parents and children to try and do this. The Enjoyment of Food subscale of the Children’s Eating Behaviour Questionnaire (CEBQ) measures this happiness in part, examining the child’s enjoyment of their food and includes items such as ‘my child looks forward to mealtimes’. The subscale demonstrated high reliability and high response numbers indicated that participants found the items straightforward to answer. Although it does not consider the parents’ happiness (or stress), in the absence of any other suitable measure, Enjoyment of Food was selected as the primary outcome measure to examine the ‘happy’ element of the intervention.

4.3.2 Healthy.

Many of the measures considered here address elements of healthiness so careful consideration about precisely what is useful to measure was important. The fruit

and vegetable availability and consumption data provide rich and detailed information but it was common for parents to abandon the questionnaire at this point and it therefore appeared that they may find these measures burdensome. For this reason, both were rejected. Interestingly, Wyse et al. (2012) comment in their telephone-delivered family healthy eating intervention study that there is no validated measure for availability of fruit and vegetables that is appropriate for a trial of this kind. They made use, instead, of a long list of foods similar to the ones rejected for this study. This approach may be appropriate for person-delivered interventions, for example over the telephone the researcher is able to encourage a participant to continue if they are growing tired of the questions. However, given the indication that it was not well-received online in this pilot work, it seemed appropriate to avoid using it for the RCT.

Further to the decision not to include a long list of foods for either consumption or availability measures, it was also important to decide whether either consumption or availability was a key measure. Although a long term aim of the intervention was to improve children's eating behaviours so that their food consumption became healthier, it may be optimistic to expect this to change following a three-week intervention, or even at six month follow-up. Any change in children's eating behaviours as a result of the intervention would also likely be mediated by a change in parents' feeding behaviours, given that they are being targeted as the agent of change. With this rationale, it was considered more useful to measure parents' healthy feeding practices. The 'Healthy Environment' subscale of the Comprehensive Feeding Practices Questionnaire (CFPQ) addresses whether parents make healthy food available in the family home. This is an important element of what the intervention is trying to achieve. The outcomes from this measure correlated with the more complex availability measure discussed above, and had a high Cronbach's α value. Furthermore, the questionnaire is

well-validated and has been used extensively to measure parents' feeding practices. For these reasons it was chosen as the primary 'healthy' outcome measure.

A number of other subscales on the CFPQ appeared to capture elements of the intervention's healthy aims as well as demonstrating good psychometric properties and these were therefore included as secondary measures. There is emphasis in the intervention on getting the whole family involved in food decisions and meal preparation. Furthermore, participants were encouraged to model healthy eating to their children in a number of the emails. The additional CFPQ subscales were therefore included as secondary measures: *Modelling*, *Involvement* and *Encourage Balance & Variety*.

4.3.3 Family.

The family meal arrangement measure in this study was evidently too complicated, either for participants to understand or for researchers to interpret. Shortly after the pilot work had started, a paper was published examining different ways to ask about family meal frequency (Horning, Fulkerson, Friend & Neumark-Sztainer, 2016). Drawing from this research, it was decided to use the question, '*During the last seven days, roughly how many times did you and most of your family sit down to eat dinner together?*'. Two key elements to this question are that it a) only asks about dinner in order to avoid confusion around when children were at school for mealtimes; and b) it refers to 'most' of the family in order to ensure that mealtimes with just one or two family members missing remain within the definition of 'family meals'.

4.3.4 Secondary outcome measures.

Three secondary outcome measures were selected in addition to the three Comprehensive Feeding Practice Questionnaire described in 4.3.2:

- 1) *Food fussiness* subscale of the CEBQ: Elements of the intervention dealt with how to encourage picky eaters to consume more fruit and vegetables.
- 2) *Frequency of raw ingredients*: This had not been validated so was not appropriate as a primary measure but may be a useful reflection of whether parents are preparing food at home.
- 3) *Weekly food budget measure*: Again, this had not been validated so outcomes should be treated with caution but it may be useful to establish whether a change in feeding and eating behaviour correlates with an increase or decrease in expenditure, and whether implementation of intervention ideas has any cost impact.

Evidence indicates feeding goals are closely related to feeding practices (Hoffmann, Marx, Kiefner-Burmeister, & Musher-Eizenman, 2016; Kiefner-Burmeister, Hoffmann, Meers, Koball, & Musher-Eizenman, 2014) , and so it remained of interest in this study to establish whether specific goals predict behaviour change, are associated with specific feeding practices and/or have any relationship with engagement levels in the intervention. As discussed in section 4.2 (p. 48), the adapted Food Choice Questionnaire (FCQ) lacked face validity and parents reported that some questions were difficult to answer. Furthermore, it is feasible that parents hold entirely different goals around their children's eating compared to their own, which the FCQ was not designed to capture. For this reason a parental mealtime goal measure was developed to be used as a secondary outcome measure in the RCT. The following section contains Paper 3 (hereafter referred to as the Mealtime Goals paper) which describes the development of the questionnaire which was subsequently used.

**Development of a parental feeding goal measure: The Family
Mealtime Goals Questionnaire (Paper 3, *Mealtime Goals paper*)**

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Development of a Parental Feeding Goal Measure: The Family Mealtime Goals Questionnaire

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It is well established that parents' feeding practices predict children's eating behaviors. However, there has been little research into parents' mealtime goals—their desired outcomes for family mealtimes. These goals, and potential conflicts between them, may be important both in explaining parents' feeding practices and improving children's eating behaviors, as health behavior change is more likely to be achieved by programmes and interventions that are aligned with an individual's goals. The objectives of this study were to develop a reliable and valid measure that captures parental mealtime goals, and to describe parents' endorsement of these goals. Online questionnaire methods were used to design and test the Family Mealtime Goals Questionnaire with 1,140 parents and carers of at least one child aged from 1 to 16 years. Exploratory qualitative analysis, Principal Components Analysis, Confirmatory Factor Analysis, and test-retest analysis (using intraclass correlations) were conducted to establish the psychometric properties of the instrument. An 18-item questionnaire was produced with seven dimensions: *stress/conflict avoidance*, *homemade food*, *shared family food*, *family involvement in mealtimes*, *price*, *occasional treats*, and *high/low fat regulation*. Some differences were found in the goal structure of parents of children of different ages but *stress/conflict avoidance* was the most strongly endorsed mealtime goal for all age groups. The Family Mealtime Goals Questionnaire provides a useful measure of parents' feeding motivations. It will facilitate large-scale research into the relationships between parents' feeding goals and practices and could inform the design of more effective healthy eating interventions that target specific feeding goals.

Keywords: goals, priorities, eating behavior, family, mealtimes, surveys and questionnaires

INTRODUCTION

Research has established that parents' feeding practices predict children's eating behaviors (Patrick and Nicklas, 2005; Pearson et al., 2009; Carnell et al., 2014). Possible mechanisms for this influence include parenting style, modeling of eating behavior, family meal frequency and exposure to food, all of which are associated with child eating behaviors, such as fruit and vegetable intake (Birch, 1999; Birch et al., 2007; Mitchell et al., 2013). One further potential factor, which has been little explored to date, is parents' mealtime goals or parents' desired outcomes for family mealtimes. Individual goals (defined as "internal representations of a desired state") (Austin and Vancouver, 1996) are known to predict health-related behaviors, such as dieting and physical activity

(Presseau et al., 2010; Papies, 2012). Moreover, interventions tailored to an individual's goals are more successful in invoking health behavior changes (Papies, 2012). However, goal attainment is found to be hindered if goals are perceived to conflict with one another (Emmons and King, 1988; Boudreaux and Ozer, 2013). One might therefore expect parents' mealtime goals—and any conflicts between these—to play an important role in determining their feeding behaviors. However, there has been surprisingly little research into the nature of parent's mealtime goals, or how these might be harnessed to support healthy eating interventions. This study set out to develop a tool that could be used for this purpose.

Family mealtimes with positive family dynamics play an important role in children's healthy eating (Hammons and Fiese, 2011; Dwyer et al., 2015). More frequent shared family meals predict greater intake of fruit, vegetables, and key nutrients such as fiber, calcium, and iron (Gillman et al., 2000) and might be protective against obesity and disordered eating (Ackard and Neumark-Sztainer, 2001; Berge et al., 2014) and support general emotional wellbeing (Utter et al., 2017). The mechanisms underlying this relationship are unclear but may include lower reliance on pre-packaged food (and therefore more exposure to home-made foods) when families eat together, along with greater opportunities for parents to model healthy eating behaviors and notice when children are eating unhealthily (Gillman et al., 2000; Fulkerson et al., 2006; Hammons and Fiese, 2011). Parents' goals may differ when planning shared family meals vs. providing other kinds of meals or snacks. Yet, few studies have examined parents' motivations when choosing foods for children to eat alone or with the family, and none have examined their goals specifically in relation to mealtimes.

Recent qualitative studies suggest that, while health is a key motivator of parents' food choices for children, practicality, cost, appetite management and weight control are also important (Moore et al., 2010; Carnell et al., 2011). Furthermore, St John Alderson and Ogden (St John Alderson and Ogden, 1999) found that parents fed their children fewer healthy foods than they ate themselves, despite placing more emphasis on health when describing their motivations for selecting their children's food. This suggests that, although parents hold a health goal for their children's meals, other goals are prioritized during mealtime decision-making. Additionally, how parents interpret "health" and "convenience" in relation to their mealtime goals remains unclear, and this might differ between individuals. For example, when thinking about the importance of providing healthy meals for their children, some parents might consider the nutritional quality of the child's dietary intake whilst others may be more concerned with establishing healthy eating behaviors, such as shared family meals.

Previous investigations of the relationship between parents' feeding goals, feeding practices and children's eating behaviors (Roos et al., 2012; Kieflner-Burmeister et al., 2014; Russell et al., 2015; Hoffmann et al., 2016) have typically used adaptations of the Food Choice Questionnaire (FCQ) (Stephoe et al., 1995), originally designed to measure adults' reasons for their own food choices. This work suggests that parents' health-related goals are associated with positive eating behaviors among children, while

"convenience" goals predict both negative feeding practices (e.g., using food as a reward, feeding for emotion regulation) and negative eating behaviors (e.g., candy consumption). However, synthesizing the findings of these studies is hindered by their use of differing versions of the questionnaire. For example, while Russell et al. (2015) found the parental goal of "giving the child what s/he wants" to predict low liking of vegetables by children, this goal was not assessed in other studies.

While the original FCQ has good psychometric properties, the reliability and validity of the instruments adapted to explore parents' motivations were examined in only two of the above studies (Roos et al., 2012; Russell et al., 2015). Most factors demonstrated good Cronbach's α values and factor loadings, but several were lower than those reported for the original FCQ. Of greater concern are the face and content validity of the adapted questionnaires, which focus on *Convenience* and *Health* factors, and may not fully capture parents' goals when making decisions about the food they provide for their children. For example, recent qualitative work investigating reasons for feeding children pre-packaged food identified lack of time, meal-planning ability and family preferences as key motivations (Horning et al., 2017), only some of which are captured by the items in the FCQ (e.g., no items measure the influence of family preferences). The FCQ items for the "health" and "convenience" factors are also insufficiently specific to elucidate parents' interpretations of these terms, and whether these differ between parents, especially in the case of health goals (e.g., "It is important to me that the food my child eats keeps him/her healthy" does not reveal parents' understanding of the concept of "health"). Finally, the FCQ primarily measures the reasons behind parents' selection of foods for their child, rather than their mealtime goals per se.

We therefore set out to develop a tool that would more directly assess and operationalize parents' goals when planning and making decisions about mealtimes. Preliminary research explored parents' understanding of an adapted FCQ using a "think aloud" technique (Ericsson and Simon, 1998); this revealed that, while several of the factors measured by the FCQ aligned with parents' broad motivations in relation to mealtimes (e.g., health, price, convenience), some items lacked face validity (Snuggs et al., 2016). In line with St John Alderson and Ogden (St John Alderson and Ogden, 1999), we found that parents' motivations differ substantially when choosing foods for themselves vs. for their children, suggesting that goals for children's mealtimes are likely to be distinct from parents' own food choice goals [e.g., whether to involve children in food decisions (Carnell et al., 2011)]. This preliminary research led us to conclude that a new measure was required to capture parents' goals and priorities when feeding their children. Such a measure could be used not only to describe parents' feeding goals but also to establish how these goals, and any conflicts between them, influence parents' feeding behaviors and children's eating behaviors in both the general population and in cases of pediatric feeding/eating disorders. As a first step, the objectives of the current study were to develop a reliable and valid measure for this purpose and to describe the mealtime goals endorsed by parents using this instrument.

DEVELOPMENT OF THE FAMILY MEALTIME GOALS QUESTIONNAIRE

The questionnaire was developed and tested in three stages. First, a large item pool was generated in order to capture as many potential goals as possible; this was then refined using qualitative methodology to produce a preliminary questionnaire. Next, the preliminary questionnaire was administered to an initial sample of parents, after which Exploratory Factor Analysis methods were used to produce a provisional questionnaire. This was subjected to Confirmatory Factor Analysis and test-retest analysis in a new sample of parents. We describe the procedure followed and the results of this stage-by-stage below.

All parts of the study were granted approval to proceed by the University of Reading Research Ethics Committee.

Development of the Item Pool Methods

A systematic approach to measure development (Churchill, 1979; Clark and Watson, 1995) was followed to capture as many potential goals as possible. An initial pool of items was produced from three sources:

- 1) Parents who responded to social media posts placed on several web-based parenting forums ($N = 61$). Members of these forums were invited to provide written responses to the open-ended question, "What is your goal when providing a meal for your child?"
- 2) Secondary analyses of data from parents who had participated in an earlier, unpublished study involving a family eating intervention ($N = 990$). When asked to provide written responses to an open-ended question about what they hoped to gain from the intervention, parents often mentioned mealtime goals; these responses were included in the item pool.
- 3) Items used in previous studies of food choice motivation (e.g., items reflecting factors such as *Convenience* from the FCQ) and feeding practices [e.g., introducing unfamiliar foods Musher-Eizenman and Holub, 2007]; practicality and appetite management (Moore et al., 2010; Carnell et al., 2011).

Finally, we cross-checked and confirmed that the proposed motivators identified by the literature mentioned in the Introduction were covered by the items generated from these sources.

Results

The development process provided 130 items (113 after de-duplication) describing the feeding goals of parents from a wide range of socio-economic backgrounds and age groups. As recommended by DeVellis (DeVellis, 2017), these items were sent to a group of expert academics (developmental psychologists and nutritionists) all of whom were also parents ($n = 8$). The experts were asked to highlight any items that were ambiguous or difficult to answer (to ensure face validity), and to identify any goals that were missing from the list of items (to ensure content validity). Based on the expert feedback and item-formatting guidance (Dolnicar, 2013; DeVellis, 2017), we

adjusted or removed duplicate or confusing items. Experts did not identify any missing goals. This resulted in a preliminary Mealtime Goal questionnaire containing 66 items presented in a random order on a 5-point Likert scale (see **Appendix I**).

Testing of the Preliminary Questionnaire Methods

The preliminary questionnaire was administered to a pool of parents to allow exploratory analysis to identify the components underlying their responses. For this purpose, we used Principal Components Analysis (PCA), commonly used for exploratory analysis in scale development (Hinkin et al., 1997; DeVellis, 2017).

Participants

Parents ($N = 515$) were recruited through online social media platforms, including national parenting forums and regional family websites, and through snowball sampling (participants were encouraged to share the questionnaire link with friends and family). Participants were excluded if they stated that no children lived with them some or all of the time. Participants with more than one child were asked to answer questions in relation to the child whose name began with the letter closest to the beginning of the alphabet. To help ensure consistency during completion, parents provided the name of the child they were answering in relation to and this appeared continuously on the screen as a prompt. Several participants failed to provide socio-demographic information, but all participants who completed the goal questionnaire in full ($N = 407$) were included in analyses. A description of the sample of parents who completed the preliminary questionnaire is provided in **Table 1**.

Procedure

The 66-item preliminary Mealtime Goal questionnaire was scripted onto an online survey platform¹ and a link to the survey was posted on relevant parenting sites. Participants were asked, "Thinking about your child's mealtimes, how strongly do you agree with the following statements?" Participants were asked to provide socio-demographic information (OfNS, 2005; Sapsford, 2007; Connelly et al., 2016) and to rate their agreement with each statement about their mealtime goals on a 5-point scale (Strongly agree, Agree, Neither agree nor disagree, Disagree, Strongly disagree). Items were presented in random order. In line with recommendations that scale development requires 5–10 participants per item and a total sample of at least 150 (Hinkin et al., 1997), the questionnaire remained available until the sample exceeded 400.

Results

The data were screened for their suitability for Principal Components Analysis (PCA). First, parents' responses to each item were examined and those with severely skewed distributions (i.e., eliciting agreement or disagreement by >98% participants; $n = 21$) were discarded.

¹www.getfeedback.com

TABLE 1 | Participant characteristics: testing of preliminary questionnaire using PCA.

	Mean	Std. deviation
Number of children living at home	1.6	0.8
Child age ($n = 398$)	4.6	3.7
Parent age ($n = 404$)	37.1	6.5
	%	n
% female (child)	48.2	196
% female (participant) ($n = 388$)	91.7%	356
RELATIONSHIP TO CHILD		
Parent/step-parent	97.3	396
Grandparent	1.2	5
Other	1.5	6
PARTICIPANT ETHNIC ORIGIN		
White-British	76.2	310
White-Other	17.2	70
Other	4.2	17
Not stated	2.5	10
PARTICIPANT OCCUPATION		
In employment	72.4	295
Stay at home parent	16.5	67
Student	1.2	5
Other	9.8	40
PARTICIPANT EDUCATION LEVEL		
Undergraduate degree or higher	78.4	319
Post-secondary/vocational qualification	12.5	51
Secondary education	4.9	20
Did not complete secondary education/other	4.2	17

PCA, Principal Components Analysis. $N = 407$ unless otherwise stated ($n_s < 407$ indicate missing data).

Responses to items relating to general “health” were heavily skewed at the preliminary PCA stage, due to all parents endorsing them, and so are not included in **Table 2**. However, due to the potential importance of this factor (and of the conflict between health-related and other goals), 3 health-related items were retained at this stage, with a view to exploring further at the CFA stage (*Optional Component 9* in **Appendix III**). Correlations were computed between responses to each item; none exceeded 0.9, the value used to indicate that multi-collinearity is present (Hair et al., 2010).

A PCA was carried out on the remaining 45 items using SPSS version 24, adopting standard procedures and thresholds unless otherwise stated. Varimax rotation with Kaiser normalization was used, applying the Kaiser criterion (Eigenvalue >1) (Kaiser, 1960) and suppressing loadings <0.4 (Hinkin et al., 1997). The first PCA resulted in nine items being dropped due to loading onto more than one component (Hair et al., 2010). The PCA was repeated, identifying 10 components comprising 30 items (six items with a factor loading <0.4 were suppressed). Inter-item correlations were computed within components; two

TABLE 2 | PCA component loadings and Cronbach's α values: preliminary questionnaire.

	Component loading	Cronbach's α
COMPONENT 1: SHARED FAMILY FOOD		
I don't want to prepare different foods for different family members	0.796	0.723
I want my child and me to eat the same food	0.794	
I want to prepare food that all my family will eat	0.754	
COMPONENT 2: STRESS/CONFLICT AVOIDANCE		
I want to avoid arguments at mealtimes	0.781	0.691
I don't want to get stressed thinking about mealtimes	0.763	
I want to make sure I don't lose my temper at mealtimes	0.759	
COMPONENT 3: HOMEMADE FOOD		
I want to prepare food for my child using natural ingredients	0.784	0.669
I want to prepare food for my child using raw ingredients	0.743	
I want to give my child home-cooked food	0.727	
COMPONENT 4: FAMILY INVOLVEMENT IN MEALTIMES		
I want the whole family to help out with mealtimes	0.816	0.671
I want to choose food that my child can help prepare	0.708	
I want to get my child involved with things like setting the table or clearing up	0.669	
COMPONENT 5: EASE OF PREPARATION		
I want to choose food for my child that is easy for me to prepare	0.878	0.748
I don't want to spend a long time preparing food for my child	0.875	
COMPONENT 6: PRICE		
I want to keep to my budget	0.887	0.767
I want to keep costs down	0.842	
COMPONENT 7: OCCASIONAL TREATS		
I want to give my child sugary treats sometimes	0.856	0.661
I want my child to be free to eat unhealthy food sometimes	0.845	
COMPONENT 8: HIGH AND LOW FAT REGULATION		
I want to give my child food that is low in fat	0.837	0.581
I don't want to give my child fatty foods	0.815	

components (containing 10 items) with r values substantially below 0.4 were discarded (Hinkin et al., 1997).

Inter-item reliability was measured for the eight remaining components and all but one had Cronbach's $\alpha >0.65$ suggesting medium to good reliability (see **Table 2**). The remaining component ($\alpha = 0.581$) was retained for the next stage of analysis with a view to discarding it if it remained unreliable. The Kaiser Meyer Olkin Index for the model containing 8 components was 0.714 ($p < 0.001$), indicating adequate sampling.

TABLE 3 | Participant characteristics: testing the provisional family mealtime goals questionnaire using CFA.

	All participants		Participants who contributed to Reliability testing	
	Mean	Std. deviation	Mean	Std. deviation
Number of children living at home	1.8	0.81	1.8	0.9
Child age (<i>n</i> = 729)	6	3.87	6.3	5.1
Parent age (<i>n</i> = 729)	37.8	7.03	37.1	7.6
	%	<i>n</i>	%	<i>n</i>
% female (child) (<i>n</i> = 728)	50.8	372	47.3	87
% female (participant) (<i>n</i> = 746)	96.9	723	94.9	168
RELATIONSHIP TO CHILD (<i>n</i> = 729)				
Parent/step-parent	99	723	99.5	184
Grandparent	0.5	4	0.5	1
Other	0.2	2		0
PARTICIPANT ETHNIC ORIGIN				
White-British	73.2	537	67.6	127
White-Other	11.7	86	22.3	42
Other	13.1	96	5.9	11
Not stated	1.9	14	4.3	8
OCCUPATION (<i>n</i> = 718)				
In employment	65.2	468	64.6	115
Stay at home parent	23.8	171	25.3	45
Student	2.4	17	2.3	4
Other	8.6	62	7.9	14
PARTICIPANT EDUCATION LEVEL (<i>n</i> = 692)				
Undergraduate degree or higher	61.2	424	62	106
Post-secondary/vocational qualification	28.3	196	29.2	50
Secondary education	8.7	60	7	12
Did not complete secondary education/other	1.7	12	1.8	3

CFA, Confirmatory Factor Analysis. For CFA, *N* = 733 unless otherwise stated (total *ns* < 733 indicate missing data). For test-retest, *n* = 188 unless otherwise stated (total *ns* < 188 indicate missing data).

Further PCA analyses were run to explore the responses of parents of younger and older children (split by median child age) separately. In both samples, the components shown in **Table 2** were broadly supported by both PCA and Maximum Likelihood Exploratory Factor Analysis (Kaiser Meyer Olkin Index = 0.72 and 0.62 for the younger and older samples respectively).

The 20 items shown in **Table 2** were therefore retained in the Family Mealtime Goals Questionnaire, to be tested in a confirmatory stage of analysis involving a separate sample of parents.

Testing the Family Mealtime Goals Questionnaire

Methods

The Family Mealtime Goals Questionnaire was administered to a new sample of parents, and Confirmatory Factor Analysis (CFA)

was used to verify the factor structure of the model described above. A subset of the data were also used to establish test-retest reliability of the new measure.

Participants

A new sample of parents were recruited to complete the questionnaire through adverts on parenting websites and snowball sampling, with the same exclusion criteria as the previous stage. All participants who completed the goal questionnaire in full (*n* = 733) were included in analyses. Participant characteristics are described in **Table 3**.

Procedure

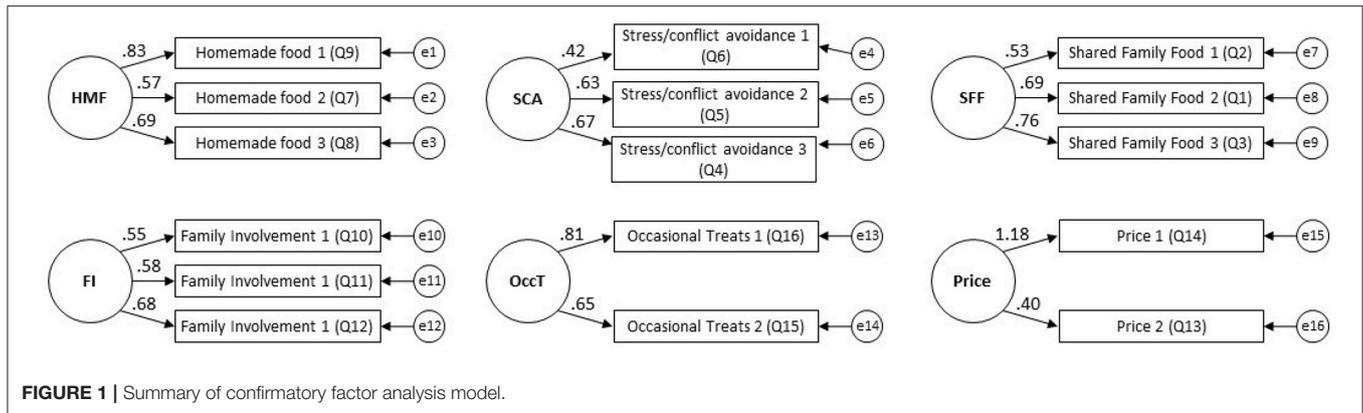
The Family Mealtime Goals Questionnaire, consisting of the 20 items in **Table 2**, was scripted onto the same online survey platform as before with the same instructions, randomizing order of item presentation.

Results

Confirmatory Factor Analysis (CFA) was conducted using AMOS version 24. The a-priori 8-factor model identified by the PCA did not provide a good fit for the data from the second cohort of parents. However, when the *ease of preparation* factor was removed, the model was supported ($\chi^2 = 275.07$, *df* = 114, *p* < 0.01. RMSEA = 0.04 (90% CI [0.037, 0.051]), CFI = 0.95, TLI = 0.93). See **Figure 1** for the loading of each item in the final model. Cronbach's α for each factor is provided in **Table 4**; all values >0.6. The aforementioned component with a lower alpha value in the PCA stage had a notably higher value in the CFA stage (0.74) and its items were therefore retained in the final questionnaire. The three "health" items mentioned in the PCA stage were, again, almost universally endorsed and also worsened the CFA model fit. They were therefore discarded at this point, although remain in **Appendix III** for transparency and further research.

To investigate whether parents' goals for children's mealtimes change as children age, separate Confirmatory Factor Analyses were conducted for three age groups: 1–3 year-olds (pre-schoolers), 4–10 year-olds (primary school children) and 11–16 year-olds (secondary school children). Considerable overlap can be seen between the models, indicating that goals are very similar, but not identical, for parents of different age groups (see **Appendix II**).

Model fit for the pre-schooler group (*n* = 258) was best when both the *ease of preparation* and *high & low fat regulation* factors were dropped ($\chi^2 = 163.760$, *df* = 89, *p* < 0.01, RMSEA = 0.06 (90% CI [0.03, 0.09]), CFI = 0.91, TLI = 0.88). The best model fit for the primary school group (*n*=390) was the same 7-component model that best fitted the whole sample (i.e., dropping the *ease of preparation* factor) ($\chi^2 = 186.609$, *df* = 114, *p* < 0.05. RMSEA = 0.04 (90% CI [0.030, 0.051]), CFI = 0.96, TLI = 0.95). The secondary school group was a relatively small sample (*n* = 115), with participant numbers falling below scale development recommendations (Hinkin et al., 1997). Consequently, results should be treated with caution, as emphasized by the confidence interval data. The model best supported by the data for this age group was



the original model identified at the PCA stage (i.e., including *ease of preparation*), but with *occasional treats* removed, along with one further item ($\chi^2 = 118.928, df = 98, p = 0.074$. RMSEA = 0.04 (90% CI [0.00, 0.69]), CFI = 0.96, TLI = 0.95) (See **Appendix II**).

The final questionnaire therefore includes the 7 components and 18 items confirmed to provide the best fit for the cohort as a whole (see **Appendix III**). The questionnaire assesses parents' goals in relation to the following factors: *shared family food; stress/conflict avoidance; homemade food; family involvement in mealtimes; price; occasional treats; high and low fat regulation*. Items relating to the additional component of “*ease of preparation*” are also provided, to enable the tool's use by parents of older children, as are items relating to a global “*health*” component, which did not meet criteria for retention but may be of interest in further research.

Test-Retest Reliability Methods

An opportunity sample of participants at this stage ($n = 303$) were recruited specifically to participate in test-retest analyses. These participants displayed similar characteristics to the rest of the sample (see **Table 3**) and were sent an email containing a link to an identical questionnaire 1 week after completion of the first questionnaire, with a follow-up reminder 1 week later if necessary. All participants who completed the second questionnaire were included in test-retest reliability analyses ($n = 188, 62\%$).

Results

Table 3 shows the characteristics of the participants who also completed the second questionnaire.

Table 5 shows median scores for this sub-group at both time points and the intra class correlation coefficients between these (Weir, 2005). A 2-way mixed effects model was applied, as recommended (Koo and Li, 2016). All correlations were significant at the 0.001 level and values ranged from 0.48 to 0.8, indicating some temporal variability.

TABLE 4 | Cronbach's α values from CFA (testing provisional family mealtime goals questionnaire).

	α
Shared family food	0.73
Stress/conflict avoidance	0.62
Homemade food	0.71
Family involvement in mealtimes	0.65
Price	0.78
Occasional treats	0.67
High and low fat regulation	0.72
(Ease of preparation)	0.74

CFA, Confirmatory Factor Analysis.

PARENTS' ENDORSEMENT OF FEEDING GOALS

Data from both samples of parents (those who completed either the preliminary or final questionnaires) were combined to examine parents' endorsement of the measure's goals. **Table 6** shows the scores for each mealtime goal both for the whole sample ($N = 1,140$) and by age group. Scores were calculated by taking the mean item score for each component (there are no reversed items).

The table shows that goal endorsement was similar across age groups; *stress/conflict avoidance* was the most highly endorsed goal, followed closely by *homemade food* and *shared family food*. *High & low fat regulation* and *occasional treats* were comparatively less strongly endorsed. All goals had a mean and median endorsement score ≥ 3 .

DISCUSSION

The objectives of this study were, first, to develop a measure to capture parental goals at mealtimes and, second, to use this to describe parents' motivations when feeding children. In line with the first of these objectives, a self-report questionnaire measure was designed and tested, and found suitable for use in future research to better understand parents' goals in relation

TABLE 5 | Test-retest reliability of provisional family mealtime goals questionnaire.

	Time 1 Median	Time 1 IQR	Time 2 Median	Time 2 IQR	ICC
Shared family food	4.33	0.67	4.33	0.67	0.66*
Stress/conflict avoidance	4.33	1	4.33	1	0.48*
Homemade food	4	1	4	1	0.66*
Family involvement in mealtimes	4	0.67	4	0.67	0.65*
Price	4	1	4	1	0.66*
Occasional treats	4	0	4	0.5	0.67*
High and low fat regulation	3	1.5	3	1.5	0.80*
(Ease of preparation)	3.5	1	4	1	0.65*

* $p < 0.001$. IQR, Interquartile range; ICC, Intraclass Correlation.

TABLE 6 | Endorsement of feeding goals.

	Mean	Median	SD	Minimum	Maximum
WHOLE SAMPLE (n = 1,140*)					
Stress/conflict avoidance	4.30	4.33	0.55	2.00	5.00
Homemade food	4.22	4.33	0.58	1.00	5.00
Shared family food	4.21	4.33	0.69	1.00	5.00
Family involvement in mealtimes	3.95	4.00	0.61	1.33	5.00
Price	3.91	4.00	0.77	1.00	5.00
Occasional treats	3.83	4.00	0.63	1.00	5.00
High and low fat regulation	3.27	3.00	0.92	1.00	5.00
PARENTS OF PRE-SCHOOLERS (<4 years) (n = 455)					
Stress/conflict avoidance	4.29	4.33	0.56	2.00	5.00
Homemade food	4.18	4.00	0.61	1.00	5.00
Shared family food	4.17	4.33	0.71	2.00	5.00
Family involvement in mealtimes	3.90	4.00	0.65	1.33	5.00
Price	3.85	4.00	0.79	1.00	5.00
Occasional treats	3.72	4.00	0.73	1.00	5.00
(High and low fat regulation)	3.06	3.00	0.93	1.00	5.00
PARENTS OF PRIMARY SCHOOL AGED CHILDREN (4–10 years) (n = 517)					
Stress/conflict avoidance	4.31	4.33	0.56	2.33	5.00
Shared family food	4.25	4.33	0.69	1.00	5.00
Homemade food	4.24	4.33	0.57	2.33	5.00
Family involvement in mealtimes	3.99	4.00	0.58	2.33	5.00
Price	3.97	4.00	0.77	1.00	5.00
Occasional Treats	3.91	4.00	0.54	1.50	5.00
High and low fat regulation	3.40	3.50	0.86	1.00	5.00
PARENTS OF SECONDARY SCHOOL AGED CHILDREN (11–16 years) (n = 159)					
Stress/conflict avoidance	4.30	4.33	0.48	2.67	5.00
Shared family food	4.25	4.33	0.66	2.33	5.00
Homemade food	4.23	4.00	0.49	3.00	5.00
Family involvement in mealtimes	4.00	4.00	0.59	2.67	5.00
Price	3.91	4.00	0.74	2.00	5.00
(Occasional treats)	3.89	4.00	0.53	2.00	5.00
Ease of preparation	3.56	3.50	0.87	1.50	5.00
High and low fat regulation	3.47	3.50	0.97	1.00	5.00

*Nine participants in PCA stage did not provide an age for their child but stated that they had at least one child aged 1–16 living with them. Parentheses around a component indicate that that component was not robust in the CFA for the given age group.

to children's eating and family mealtimes. Among a large sample of parents, 18 items describing seven distinct goals were identified. Goals include *price* and several relating to the provision of healthy food, supporting previous findings that these concepts are important in parents' decisions about feeding their children (Carnell et al., 2011; Russell et al., 2015). Due to the extensive exploratory work, our results also highlight several motivators that have not previously been considered, namely *stress/conflict avoidance*, *shared family food*, *homemade food*, *family involvement in mealtimes*, *occasional treats* and *high & low fat regulation*, confirming that parents' mealtime goals are not fully captured by measures designed for the assessment of adults' food choices.

In this study, several distinct health-related motivators emerged as individual factors, namely *homemade food*, *high & low fat regulation* and *occasional treats*. The separation of these factors contrasts with the approach taken in previous research, which has assumed that parents hold a global health goal, and has measured their endorsement of this (e.g., Kiefner-Burmeister et al., 2014; Hoffmann et al., 2016). The lack of a global health goal in our analysis might reflect the universality with which parents hold such a goal when planning children's meals, or at least claim to do so, given their broad awareness of the healthy eating messages promoted by healthcare providers, government and the media. It may also represent a response bias whereby parents over-estimate how much they prioritize healthy eating because they think they ought to. However, our analysis indicates that parents do vary in their endorsement of goals related to different approaches to healthy eating. The individual items within the *homemade food* factor refer to the use of raw and natural ingredients, which likely represent healthier food choices to parents (Hart et al., 2015). *High & low fat regulation* demonstrated the most variability of all the factors, indicating that some parents value low-fat food choices while others endorse high-fat choices. This variability likely reflects the complexity of the task of ensuring children have a balanced diet and a lack of clarity around health messages relating to fat, especially for children. Arguably, parents' search for balance is also reflected in the *occasional treats* goal, which describes less healthy nutritional aspirations, perhaps representing parents' desire to avoid restrictive feeding practices (Birch, 1999). These findings therefore go beyond simply stating that children's health is important to parents, and help to elucidate how parents interpret healthy feeding and eating behaviors, and the differing importance they ascribe to different health-related goals.

Our analyses also suggest that parents' goals vary somewhat according to children's age group. The majority of goals identified among the cohort as a whole remained psychometrically strong within each individual age group (i.e., *homemade food*, *shared family food*, *price*, *family involvement in mealtimes*, *stress/conflict avoidance*). However, other goals did not. The absence of *ease of preparation* as a coherent goal for parents of younger age groups is particularly noteworthy. *Ease of preparation* aligned most closely to the factor termed "convenience" in previous research; work based on the Food Choice Questionnaire (Stephens et al., 1995) has assumed that convenience is an important

motivator for parents (Hoffmann et al., 2016). As discussed in the Introduction, "convenience" might hold different meanings among parents. We intentionally avoided using this term when labeling our component "*ease of preparation*," as the items that most strongly loaded on this factor related very clearly to the time involved in and ease of meal preparation, rather than other items potentially falling under the heading of convenience (e.g., availability of foods to purchase). In our study, while parents of children in all age groups endorsed the individual *ease of preparation* items strongly, collectively these items do not form a coherent goal for most parents. What constitutes convenience may therefore differ for parents of children of different ages; other factors such as *stress/conflict avoidance* and *shared family food* may better represent the elements of "convenience" that matter more to parents of younger children in particular. Thus, as we suggested above in relation to "health" goals, our questionnaire may better represent the diversity of "convenience" goals that matter to parents, and the differences between parents of different age groups in the importance of these.

We also saw inconsistency between the age groups in relation to the factor *occasional treats*, perhaps because parents of secondary school-aged children are less able to monitor their children's snack consumption. The final inconsistency related to *high/low fat regulation*, likely reflecting parents' awareness of the differing nutrition advice given for children of different ages. Parents of very young children are often encouraged to provide full-fat foods, for example (NHS, 2015).

Our second stated objective was to describe parents' motivations when feeding their children. The goals endorsed in the final Family Mealtime Goals Questionnaire were explored in the combined sample of 1,140 parents. Across age groups, *stress/conflict avoidance* was the most highly endorsed goal, closely followed by *homemade food* and *shared family food*. The emphasis on *stress/conflict avoidance* is interesting; a recent study suggests that parents who try to avoid conflict at mealtimes more often concede to children's food-related demands, resulting in less healthy food choices being provided (Norman et al., 2015). If the focus on *stress/conflict avoidance* in this sample is typical of parents in general, it is possible that healthy eating interventions that contain stress-free messages may be responded to more positively. However, an unintended consequence of efforts to reduce the stress associated with mealtimes might be a decrease in the healthiness of the child's diet. Future research might explore the consequences of parents holding such potentially-conflicting goals. In terms of the goals least strongly endorsed, participants placed lower importance on *occasional treats* and *high & low fat regulation*. Nonetheless, mean and median scores for all goals were above neutral (except *high & low fat regulation*, with a median of exactly 3), indicating that all goals were endorsed by a majority of participants.

Strengths and Limitations

The sample size in this study was large, and as such we can be confident that the FMGQ is usable with parents of younger age groups (1–11 year olds). However, our sample of parents of older children was below threshold for satisfactory

CFA testing, and future work should address the suitability of the questionnaire with a larger sample of parents of this age group.

In addition, despite the large sample size in our study, participants were predominantly well-educated and employed. Parents from other socio-demographic groups might report different feeding goals, or display more variability in their prioritization of these. Likewise, we did not seek to recruit parents of children with feeding or eating disorders. The lack of a global health goal or broader convenience goal might, therefore, be specific to our sample. In this study, several global health-related items were dropped because they demonstrated little between-subject variability; although three items (heavily skewed but otherwise psychometrically strong) were carried into the CFA stage to ensure this concept was represented, these remained skewed and their inclusion worsened the model's fit. However, we provide these items in **Appendix III** for transparency and to enable their inclusion in future investigations of health goals among other populations.

Strictly, guidelines around questionnaire and scale development recommend that no single component should have fewer than three items that load on it Hair et al. (2010). Our questionnaire has three components including only two items, which arguably reduces the reliability of these factors. However, given our previous findings around parents' low tolerance of long questionnaires (Snuggs et al., 2016) and the psychometric strength of these components in the PCA, we gave priority to keeping the final questionnaire brief.

It is worth noting that some components and items that were eliminated due to statistical weakness may be important to some parents. For example, in the preliminary item generation work, some parents expressed the view that their priority was to "get food into their child"; responses to open-ended questions illustrated their frustration with ensuring sufficient energy consumption, and the lesser importance of the food's nutritional content ("Getting them to eat something so they're no longer hungry. If it's healthy then that's good.") This goal did not meet threshold for inclusion in the final questionnaire; nor did "prevention of fussy eating" or "portion control," both of which were highlighted by some parents at the item generation stage. While it is important that the methodological rigor of measure development does not come at the expense of losing valid indices of the construct in question, it is also true that, for a questionnaire to be useable, it cannot measure everything. The FMGQ allows the measurement of the principle mealtime goals that parents have expressed and on which they show individual differences. However, we acknowledge that our measure, although practical and reliable, may not capture the full complexity of parents' motivations around mealtimes.

The aim of this study was to examine the extent to which parents endorsed different mealtime-related goals and to develop an instrument that would discriminate between parents in terms of the goals that are important to them. Future work could usefully consider the influence of the different goals on parents' behavior. For example, parents could be asked to rate the goals

in order of importance, in terms of the extent to which each influences their choices about what to prepare for their child's meals. They might also be asked to identify any goals that they perceive as conflicting with one another, causing difficulty when making decisions about mealtimes. Development of the tool to capture parents' priorities in this way would enable identification of any changes in these over time, such as with age, or treatment. With this approach, it might also be useful to reconsider some of the items dropped in the preliminary stages of the scale development (**Appendix I**). As suggested above, some of the items dropped in this study may be more meaningful for other population groups (e.g., parents of children with obesity or eating disorders).

Implications for Research and Practice

In addition to enabling the measurement of parents' feeding goals, the Family Mealtime Goals Questionnaire (FMGQ) could support the design of interventions to change feeding practices. To date, interventions have assumed that parents prioritize health goals when making decisions about children's meals. This might reflect a bias in the underpinning research; studies of family eating typically rely on self-selecting participants, in which parents who are motivated to provide healthy foods may be over-represented. To our knowledge, no intervention study has incorporated parents' broad range of feeding goals in their design. The few that include "goal-setting" as a component have typically required participants to select among prescribed health-related goals (e.g., Draxten et al., 2016). The FMGQ does not assume that health is parents' principal motivation. It facilitates a more sophisticated understanding of parents' feeding goals, allowing the development of interventions that better align with parents' motivations. For example, among parents for whom a low-cost goal is priority, interventions focusing on inexpensive ways to create healthy meals may be successful. Similarly, parents who prioritize shared family mealtimes may benefit most from support with planning healthy meals that appeal to a range of tastes and ages.

Where a child's eating is disordered, insight into parents' mealtime priorities and any areas of conflict between these may facilitate care coordination between dietitians and psychologists. The measure could also be used to investigate and address the potential discrepancy between parents' feeding goals and practices and the relationship between parental goals and children's eating behaviors. For example, parental feeding goals may be linked to cooking self-efficacy, which has been shown to be associated with increased adherence to nutritional guidelines (Arcan et al., 2019). Given the importance of *stress/conflict avoidance* at family mealtimes it would also be of interest to examine whether there is any association between this goal and family meal frequency, thought to be a protective factor against family conflict (Hammons and Fiese, 2011).

Our results clearly indicate that individuals can endorse several feeding goals simultaneously. Less clear is whether this leads to perceived goal conflict, hindering the achievement of their goals (Emmons and King, 1988; Boudreaux and

Ozer, 2013). For example, if a parent has goals of both *stress/conflict-avoidance* and *homemade food* but perceives preparing home-made meals to be stressful, one goal is likely to suffer. Goal conflict can be addressed by goal facilitation (Presseau et al., 2010; Boudreaux and Ozer, 2013); when designing interventions, healthcare practitioners could facilitate the achievement of multiple goals to reduce conflict, leading to healthier, happier mealtimes. Future research should investigate whether conflict is common in relation to mealtime goals and whether support in reducing such conflict enhances feeding practices or mealtime characteristics.

DATA AVAILABILITY

The datasets generated for this study are available on request to the corresponding author.

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AUTHOR CONTRIBUTIONS

SS, CH-P, and KH were involved in the conception and design of the study and in interpretation and writing up of results. SS was responsible for data collection and data analysis.

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SUPPLEMENTARY MATERIAL

The Supplementary Material for this article can be found online at: <https://www.frontiersin.org/articles/10.3389/fpsyg.2019.00455/full#supplementary-material>

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Appendix I: Pool of 66 items before discards in Principal Components Analysis stage

- I don't want to spend a long time preparing food for my child
- I don't want my child to be a fussy eater
- I don't want to get stressed thinking about mealtimes
- I don't want to give my child fatty foods
- I don't want to give my child processed foods
- I don't want to prepare different foods for different family members
- I don't want to waste food
- I want mealtimes to be an opportunity for my child to chat to me
- I want mealtimes to be an opportunity for my family to be together
- I want my child and I to eat the same food
- I want my child to appreciate different types of foods*
- I want my child to be free to eat unhealthy food sometimes
- I want my child to behave well at mealtimes*
- I want my child to eat a reasonable amount of food at every meal
- I want my child to eat all the food I give them at a meal
- I want my child to eat high energy food more than highly nutritious food
- I want my child to eat something at mealtimes, regardless of what it is
- I want my child to enjoy healthy food*
- I want my child to enjoy their food*
- I want my child to have a healthy diet overall*
- I want my child to have enough food to keep them going for the day
- I want my child to learn about different foods*
- I want my child to like the taste of the food*
- I want my child to look forward to mealtimes*
- I want my child to make sensible choices about their food*
- I want my child to think the food looks appealing
- I want my child to understand the difference between healthy and unhealthy foods*
- I want my child's meal to include protein, carbohydrates and fruit/vegetables*
- I want the whole family to help out with mealtimes
- I want to avoid arguments at mealtimes
- I want to avoid mealtimes being stressful*
- I want to avoid mess at mealtimes
- I want to be organised about my child's meals
- I want to choose food for my child that is easy for me to prepare
- I want to choose food that my child can help prepare
- I want to control my child's weight
- I want to enjoy preparing food for my child
- I want to ensure my child has a balanced diet overall*
- I want to get my child involved with things like setting the table or clearing up
- I want to give my child enough fruit and veg*
- I want to give my child enough variety*

I want to give my child food that is high in energy
 I want to give my child food that is low in fat
 I want to give my child food that is low in sugar
 I want to give my child food that is nutritious*
 I want to give my child food that will fill them up
 I want to give my child food they like, to avoid a fuss
 I want to give my child fresh food*
 I want to give my child good quality food*
 I want to give my child healthy food*
 I want to give my child home-cooked food
 I want to give my child sugary treats sometimes
 I want to give my child the right portion size
 I want to introduce my child to foods they haven't tasted before*
 I want to keep costs down
 I want to keep to my budget
 I want to make sure I don't lose my temper at mealtimes
 I want to make sure my child eats something at mealtimes, even if they're not
 hungry
 I want to make sure my child is never hungry
 I want to offer my child an alternative if they don't want the food I give them
 I want to offer my child foods with different textures
 I want to prepare food for my child using natural ingredients
 I want to prepare food for my child using raw ingredients
 I want to prepare food that all my family will eat
 I want to prepare food that my child will eat
 I want to prepare food that my child will like*

*Indicates dropped from the model due to severely skewed distribution. All other discards due to unsatisfactory factor loading.

Appendix II: Figures 2 – 4, showing Confirmatory Factor Analysis models for different age groups

Figure 2: Summary of Confirmatory Factor Analysis model for parents of pre-schoolers

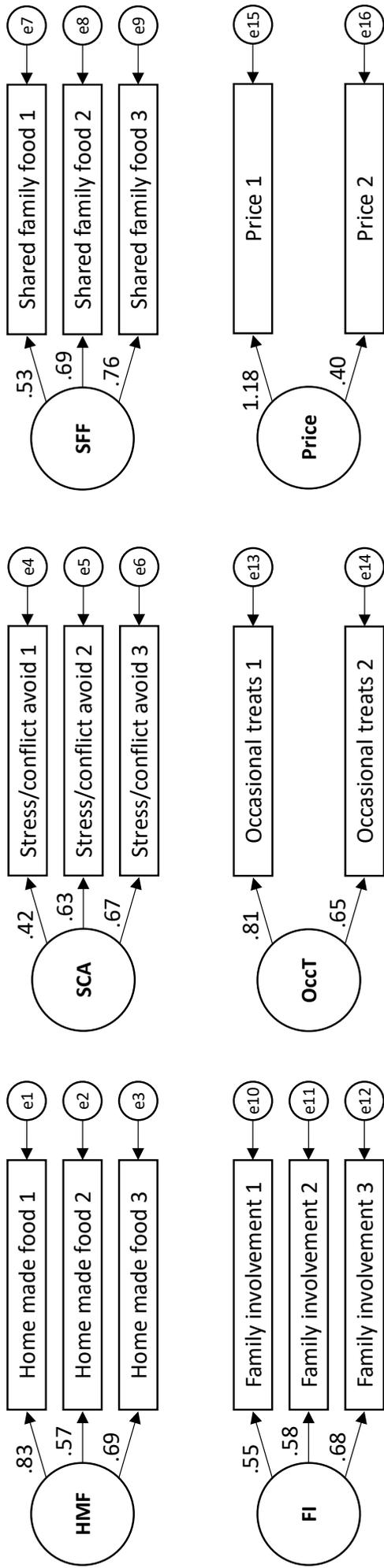


Figure 3: Summary of Confirmatory Factor Analysis model for parents of primary school aged children

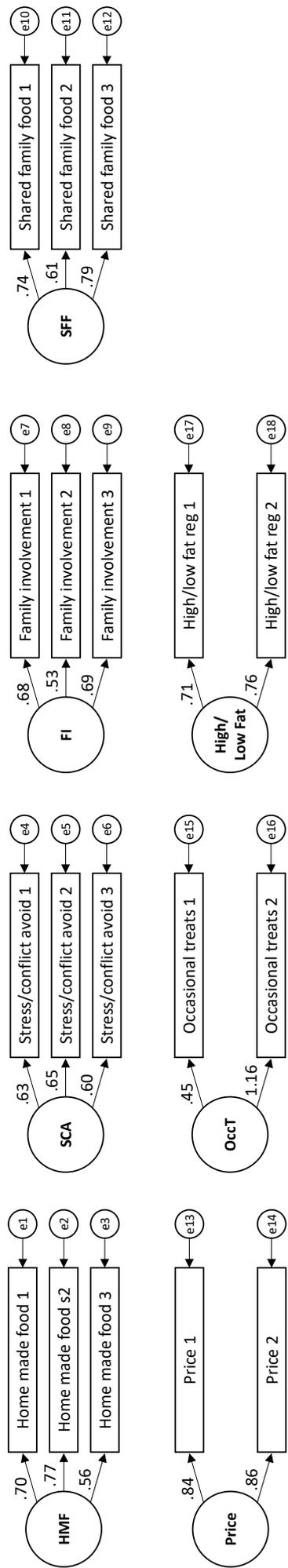
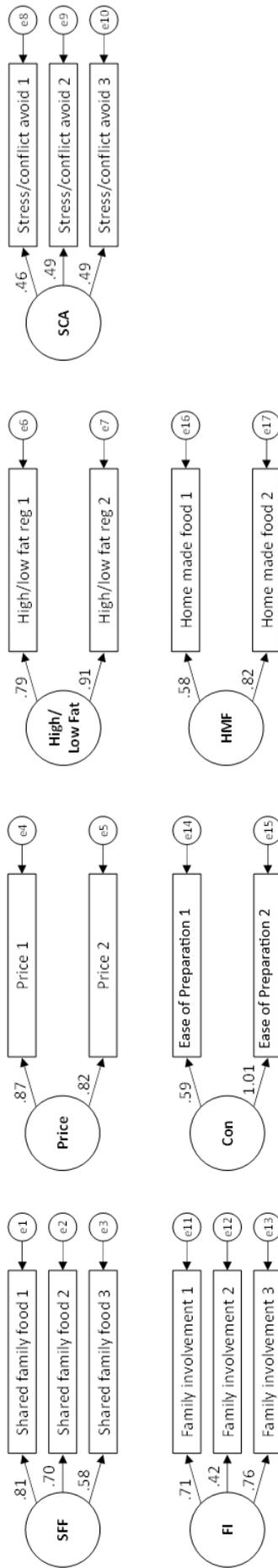


Figure 4: Summary of Confirmatory Factor Analysis model for parents of secondary school aged children



Appendix III: The final Family Mealtime Goals Questionnaire

Thinking about your child's mealtimes, how strongly do you agree with the following statements? [*Strongly agree* = 5, *Agree* = 4, *Neither agree nor disagree* = 3, *Disagree* = 2, *Strongly disagree* = 1]

Component 1: Shared family food

- 1 - I don't want to prepare different foods for different family members
- 2 - I want my child and I to eat the same food
- 3 - I want to prepare food that all my family will eat

Component 2: Stress/conflict avoidance

- 4 - I want to avoid arguments at mealtimes
- 5 - I don't want to get stressed thinking about mealtimes
- 6 - I want to make sure I don't lose my temper at mealtimes

Component 3: Homemade food

- 7 - I want to prepare food for my child using natural ingredients
- 8 - I want to prepare food for my child using raw ingredients
- 9 - I want to give my child home-cooked food

Component 4: Family involvement in mealtimes

- 10 - I want the whole family to help out with mealtimes
- 11 - I want to choose food that my child can help prepare
- 12 - I want to get my child involved with things like setting the table or clearing up

Component 5: Price

- 13 - I want to keep to my budget
- 14 - I want to keep costs down

Component 6: Occasional treats

- 15 - I want to give my child sugary treats sometimes
- 16 - I want my child to be free to eat unhealthy food sometimes

Component 7: High and low fat regulation

- 17 - I want to give my child food that is low in fat
- 18 - I don't want to give my child fatty foods

Because of the notable absence of a global 'health' factor in the PCA (which we attribute to the fact that health-related items were dropped, as exclusively endorsed by parents), we reintroduced the three psychometrically-strongest health-related items in Step 3. These items were similarly skewed in the CFA and did not improve the model, and are therefore not reported in detail in the full text. The items can, however, be seen in Component 9, below.

(Optional component 8: Ease of preparation)

- 19 - I want to choose food for my child that is easy for me to prepare
- 20 - I don't want to spend a long time preparing food for my child

(Optional component 9: Health)

- 21. I want to give my child enough fruit and veg
- 22. I want to ensure my child has a balanced diet overall
- 23. I want to give my child food that is nutritious

Scores for each subscale are calculated by dividing the sum of all items by the number of items. E.g. Component 1 score = (Item 1 score + Item 2 score + Item 3 score)/3.

Chapter 5: Healthy Happy Family Eating: A randomised controlled trial (Paper 4, RCT paper)

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Randomised Controlled Trials (RCT) are often considered the gold-standard of health behaviour intervention research (Hariton & Locascio, 2018). The Intervention Development paper identified the need for such a trial to evaluate the efficacy of the Healthy Happy Family Eating programme. Following on from Chapter 4, which described measure selection for the RCT, Chapter 5 presents Paper 4, hereafter referred to as the RCT paper, which describes the design, methodology and results of the study. This is followed by Chapters 6 and 7, which comprise supplementary trial information and analysis respectively that are not included in the paper.

The RCT paper does not include either the full questionnaire administered to participants or the full content of intervention or control emails, so these are included in the thesis as Appendices 7, 8, 9 and 10. The CONSORT and TIDieR checklists referred to in the paper are also included as Appendices 11 and 12.

Healthy Happy Family Eating: A Randomised Controlled Trial

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Abstract

Introduction: Unhealthy eating among UK children is a widespread problem, putting them at risk of many long-term health difficulties. Evidence shows that positive eating behaviors encouraged at home can influence children's food preferences. Studies also indicate that parents may be more likely to employ positive feeding strategies when they are not anxious about mealtimes, suggesting the need for a family-focused intervention to improve eating behaviors that is practical and enjoyable for parents. The purpose of this study was to evaluate an online intervention developed by the University of Reading and Netmums, the UK parenting website.

Methods: The Healthy Happy Family Eating (HHFE) programme aimed to improve family eating behaviors, and consisted of nine emails delivered over three weeks. Four hundred and eighty-eight parents were randomly allocated to an intervention group (HHFE) or a control group (Kids' Wellbeing, KW). Primary outcome measures comprised healthy home environment, child's enjoyment of food and family meal frequency. Secondary outcome measures related to other feeding practices, food neophobia and expenditure on food. Data were collected at baseline, immediately after the intervention and six months post intervention.

Results: There was an improvement in healthy environment scores for both groups ($p < 0.001$ at both time points) and for family dinner frequency immediately post-intervention ($p=0.017$). There were no changes in enjoyment of food and no effects of Condition on any measure.

Conclusions: This was a robust study with a carefully designed control condition. The absence of Condition effects suggests that the content of the HHFE intervention did not support healthy eating behavior change as intended, and highlights the importance of authentic control conditions in intervention studies.

Trial registration: This study was registered on the ISRCTN registry (registration number 11278880) on the 7th January 2017 (retrospectively registered).

Key words:

Healthy eating, children's eating behaviors, intervention, mHealth

Introduction

Unhealthy eating in children is a global problem (World Health Organisation, WHO, 2015b). It can result in children being over or underweight, and in either case may lead to malnourishment (Carruth, Ziegler, Gordon, & Barr, 2004; Unicef, 2013; WHO, 2015a). Unhealthy diet is also associated with poor long-term health outcomes, including cardiovascular disease, cancer, and even mortality (Vivier & Tomkins, 2008). Evidence indicates that children's food preferences and eating behaviours develop early in life, with particular focus on the first five years (Savage, Fisher, & Birch, 2007). Neophobia (the fear of new foods) is a typical developmental stage in very young children, but if it persists into later life it can lead to restricted food choices (Nicklaus, Boggio, Chabanet, & Issanchou, 2005). Similarly, habitual over-eating often begins at an early age (Phares, Curley & Rojas, 2008). It becomes increasingly difficult to break unhealthy habits and change behaviour as the child grows older and problems such as overweight/obesity and sub-optimal diet in childhood are likely to follow individuals into adulthood if left untreated (Dickens & Ogden, 2014, Nicklaus et al. 2005, Phares et al., 2008). There is, therefore, a need to address the problem of unhealthy eating in children as early and effectively as possible.

Early in childhood, and even during their early school years, children eat most of their meals in the home environment (Poti & Popkin, 2011). Parents are important in shaping children's food choices, eating behaviours and habits. Shared family meals are thought to play a particularly important role in fostering healthy eating habits and positive family relationships (Hammons & Fiese, 2011). For example, they have been shown to be a protective factor against obesity and, possibly, disordered eating (Ackard & Neumark-Sztainer, 2001; Berge, Loth, Hanson, Croll-Lampert, & Neumark-Sztainer, 2012).

There are several reasons why shared family meals are important for healthy eating behaviour. For example, they are more likely to be home-prepared (rather than 'ready-made') and nutritious (Gillman et al., 2000); and are associated with greater availability and accessibility of healthy foods (Mills, Brown, Wrieden, White, & Adams, 2017). Another advantage is that they provide parents with more opportunity to employ key elements of social learning, exposure (repeatedly offering the child target healthy foods to encourage familiarity) and modelling (providing the opportunity to watch other family members eat healthy food), which are consistently found to be strong predictors of children's healthy eating, alongside availability and accessibility of healthy foods (Pearson, Ball, & Crawford, 2012). Social learning may therefore partly explain the link between shared family meals and positive eating habits (Snuggs, Houston-Price, & Harvey, 2019b).

These findings suggest that eating behaviour interventions for younger children should target parents as the principal agents of change (Golan, 2006). It has also been suggested that involving the whole family can aid interventions in changing younger children's eating behaviour (Glenny, O'Meara, Melville, Sheldon, & Wilson, 1997). It is less clear what role parents can play in eating behaviour change in adolescents, who may need to be their own agent of change (see McLean, Griffin, Toney, & Hardeman, 2003) but shared family meals provide a plausible way of drawing the whole family together to encourage healthy eating across the age range. Despite this evidence, there are few high quality descriptions of family-focussed healthy eating interventions, either for younger children or adolescents, in the literature (McLean et al., 2003).

Many published interventions have involved face-to-face or phone contact with a practitioner (e.g. Haire-Joshu et al., 2008; Skouteris, Hill, McCabe, Swinburn, &

Busija, 2016; Wyse et al., 2012), which are both unfeasibly costly to roll out to a broader population, and carry considerable burden for participants in terms of time. Parents cite time constraints and stress as primary barriers to participating in relevant interventions and programmes (Virudachalam et al., 2016) and to engaging in healthy eating and feeding behaviours more generally (Fulkerson et al., 2011; Norman, Berlin, Sundblom, Elinder, & Nyberg, 2015). Parental anxiety is also associated with less positive feeding strategies (Norman et al., 2015; Peters, Parletta, Lynch, & Campbell, 2014), suggesting that effective interventions must be easy and stress-free for participants; in line with parents' childcare demands and occurring in a convenient location (Virudachalam et al., 2016).

A recent systematic review of family healthy eating interventions (Snuggs et al., 2019b) found that interventions of this type were most likely to be successful if they were robustly theory-driven with clear objectives and well-defined target populations. Furthermore, they should consider the factors that ensure engagement and retention and should target all parents, not just those who have children at risk of health difficulties. In recent years, an increasing number of parent-centred interventions have been delivered within the family home, reducing barriers to participation; advances in technology have also permitted the development of cheaper, more accessible health behaviour interventions (WHO, 2017).

In 2009, Netmums – the UK's largest parenting community engaging with three out of four UK mums – recognised the need for such an intervention and created The Healthy Happy Family Eating (HHFE) course in consultation with the UK Department of Health. Netmums engages its audience via multiple channels - millions of unique users rely on its site content each month, it commands the UK's largest parent Facebook audience, has over 2 million registered members and hundreds of thousands of

subscribers to Netmums daily and weekly newsletters plus hundreds of thousands of posts in Netmums forums every month. Critically, Netmums Users are more socio-economically representative of the UK population than any other similar website. With a strong focus on family and health, Netmums channels present an ideal platform from which to deliver a healthy eating intervention to a large number of parents and families. In 2010, a pre/post pilot study was conducted to assess the effectiveness of the HHFE, with positive results (Court, Vince-Cain, & Jefferson, 2010). Although these results were encouraging, there was a clear need to evaluate the HHFE more robustly and update it. Based on extensive pilot work (Snuggs, Houston-Price & Harvey, 2019), we considered user feedback, the evidence base and developing behaviour change theories to inform refinements and a new and updated HHFE programme was introduced in 2016.

The current study adopted an RCT design, often considered the gold-standard of effectiveness in health research (Hariton & Locascio, 2018), to evaluate the new Healthy Happy Family Eating intervention and to identify whether the programme is more effective for certain sub-groups.

The study hypothesis was that participants receiving the Healthy Happy Family Eating intervention would demonstrate improvements over time on the primary outcome measures, namely *healthy food environment*, *child enjoyment of food* and *shared family meal frequency*. Furthermore, these improvements were expected to be significantly greater for these participants than those receiving a comparable control online programme.

Method

This study was granted approval to proceed by the University of Reading Research Ethics Committee.

Design.

In a randomised controlled trial, participants were allocated to one of two programmes: Healthy Happy Family Eating (intervention) or Kids' Wellbeing (control). As is typical with behavioural intervention studies, participants were necessarily not blind to their condition, but efforts were made to ensure that the control condition appeared authentic and viable (see below).

Intervention: Healthy Happy Family Eating (HHFE) Programme

The intervention comprised nine emails delivered over three weeks. Emails provided information on food swaps, healthy recipes, tips to encourage fussy eaters and ideas for activities to focus the family on food and cooking. The emphasis was on enjoyment and 'happy' family mealtimes. The emails were evidence-based and written in a style acceptable to the Netmums audience. Detailed formative work on the intervention is described elsewhere (Snuggs et al., 2019). Table 1 shows the content of individual emails along with the psychological concepts and supporting evidence for each. All communications were reviewed by health psychologists, a nutritionist and the Netmums team.

Control: Kids' Wellbeing (KW) Programme

Participants in the control condition also received nine emails across three weeks, with the same design and format. These emails focussed on wellbeing topics known to be of interest to the Netmums audience, and for which there were existing resources on the website that emails could signpost, to maximise the similarity between the format of the control condition and the HHFE programme. Emails covered screen

time, bullying, getting active, medicine cabinet essentials, internet safety, child benefit, safety in the sun, and tooth-brushing (Table 2). They did not include any information or advice around eating, family togetherness or mealtimes.

Table 1: HHFEE email contents

	Content	Evidence base & theory
Day 1	Healthy happy family eating <i>Introduction:</i> Togetherness, balance, variety, planning, simplicity <i>Bright Ideas:</i> Take notes, cooking with kids <i>Top Tips:</i> Getting the family eating together	Theory of planned behaviour; shared family meals; balance & variety
Day 2	Heathy happy breakfasts <i>Bright Ideas:</i> Planning family breakfast, adding fruit to breakfast, try porridge with choice of topping <i>Top Tips:</i> Low sugar, check labels, wholemeal, calcium, grilled vs fried	Theory of planned behaviour; shared family meals; nutritional information
Day 5	5 a day: Having fun with fruit & veg (FV) <i>Bright ideas:</i> FV activities for various ages <i>Top tips:</i> keep pre-chopped veg, keep trying same FV, don't negotiate with dessert <i>Top tips for fussy eaters:</i> involvement in food choices, parents eat the FV, don't pressure	Exposure to FV; availability/accessibility; encouragement of 'positive' feeding practices; discouragement of 'negative' feeding practices
Day 8	Portion control: how much is too much? <i>Bright Ideas:</i> Eatwell plate (NHS, 2016), consider regular meals <i>Top Tips:</i> Portion size guidance, avoid plate clearing language, avoid 'tv-eating'	Portion Size Effect; nutritional information
Day 11	Sugar: swapping the sweet stuff <i>Bright ideas:</i> sugar swaps, family members plan sandwich <i>Top Tips:</i> Cook from scratch, remove temptation, check labels, stealth sugar	Theory of planned behaviour; shared family meals; nutritional information; nudging
Day 14	Happy mealtimes <i>Bright Ideas:</i> 'Me-time', family meals (ground rules) <i>Top tips:</i> Slow down eating, no screens	Mindful eating; shared family meals; screen time reduction
Day 17	Salt <i>Bright ideas:</i> clear out, family taste test <i>Top tips:</i> Salt guidance, labels	Family involvement; nutritional information
Day 20	Planning and budgeting <i>Bright ideas:</i> Meal planner, kids involvement in preparation <i>Top tips:</i> batch cooking, frozen veg, leftover ideas	Theory of planned behaviour; family involvement
Day 21	Healthy happy family eating <i>Recap:</i> Useful links <i>Bright ideas:</i> Plan special family meal	Theory of planned behaviour; family involvement

Table 2: KW email contents

Content	
Day 1	Welcome <i>Introduction</i>
Day 2	Screen time <i>Top tips:</i> Limit viewing times, keep screens away from bedroom, monitor screen time
Day 5	Bullying <i>Top tips:</i> Signs of bullying (e.g. mood/behaviour change, damaged/missing belongings)
Day 8	Getting active <i>Top tips:</i> Changes to school run, afterschool activities, screen time limits
Day 11	Medicine cabinet essentials Info on paracetamol, sun cream, calamine, antiseptic, plasters and other basic first aid tools
Day 14	Internet safety <i>Top tips:</i> Sample social media, privacy settings, time limits, computer location, tips for kids to stay safe themselves
Day 17	Child benefit <i>Top tips:</i> Claim even if you don't think you're entitled, eligibility information.
Day 20	SunSense <i>Top tips:</i> Appropriate time and duration of sun time, teaching kids to apply sun cream, hats and sunglasses, beware of cloudy days
Day 21	Winning the bathroom brushing battle <i>Top tips:</i> Brush young children's teeth for them, no need to rinse, encourage kids to choose their own toothbrush

Participants.

Power calculations indicated that to detect a small effect size (0.3), each of the two groups should contain 175 participants. High attrition rates across time were anticipated but these rates were unpredictable due to no comparable studies with similar timescales. With this in mind, we aimed to recruit at least double the figure needed to detect a small effect size (i.e. 700 in total). Recruitment methods were, in practice, somewhat pragmatic because they relied on engagement of Netmums users. As a result, the final sample size was determined by the timescale outlined in the protocol (6 months allowed for recruitment).

Two approaches were used to recruit participants: promotions on the Netmums website and via the University of Reading (electronic newsletters were circulated in local primary schools and to staff at the University). Parents/carers of at least one child aged 1 – 16 years who could read and understand English were eligible to take part. There were no further inclusion/exclusion criteria. The study was advertised as ‘Healthier Lives’ rather than a healthy eating study.

To encourage interest in the study, participants were eligible to take part in a prize draw offering two prizes of £250 vouchers for a retail outlet of the winner’s choice. The draw was advertised from the outset and participants were invited to enter upon starting the third questionnaire, providing an incentive to continue participation beyond the intervention.

Between 3rd November 2016 and 16th May 2017, the study recruited 488 participants who provided informed consent and useable data on at least one of the primary outcome measures at Time 1 (352 through Netmums and 136 through the University of Reading). Of these, 239 (49%) were randomly allocated to the Healthy

Happy Family Eating (HHFE) condition and 249 (51%) were randomly allocated to the Kids' Wellbeing (control) condition. See Figure 1 for Consort diagram and Table 3 for participants' demographics.

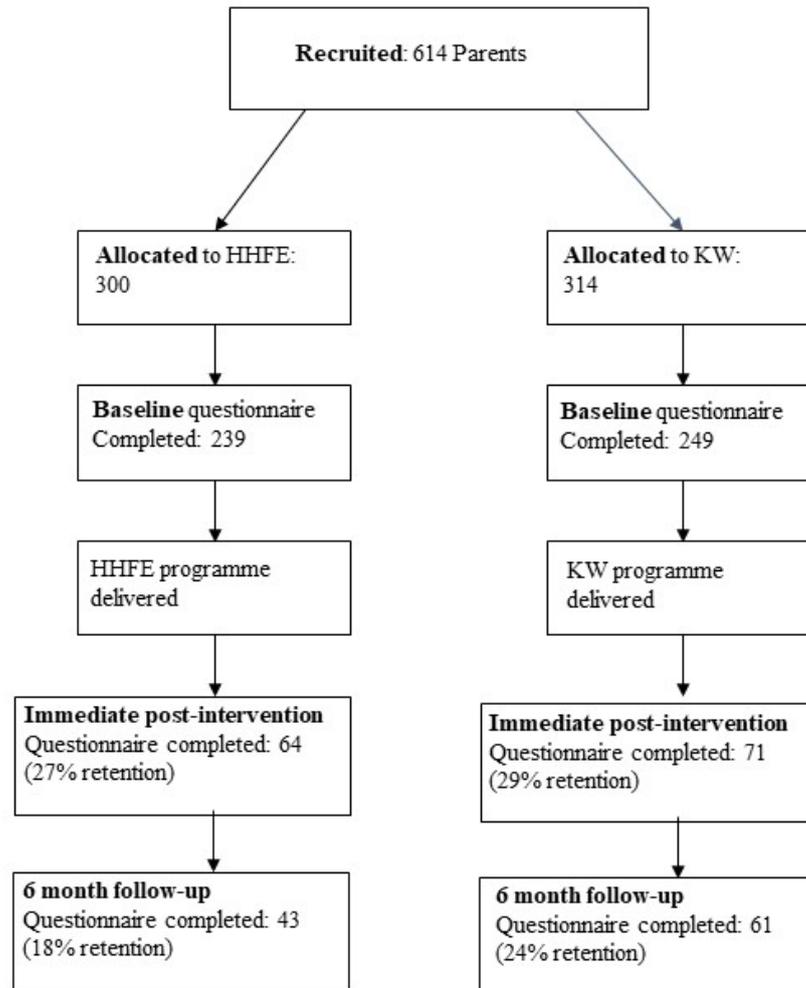


Figure 1: HHFE RCT Consort diagram

(Consort and TIDieR checklists also completed and available).

Table 3: Participants' demographics and social characteristics

	Whole sample			HHFE			KW			Test for baseline difference	
	N	Mean	SD	n	Mean	SD	n	Mean	SD	t	p
No of children in family	488	1.86	0.76	239	1.9	0.83	249	1.82	0.69	1.287	0.199
Child's age	472	5.87	3.5	229	5.95	3.59	243	5.79	3.43	0.471	0.638
Participant age	487	37.85	6.74	238	37.66	6.03	249	38.04	7.36	-0.632	0.528
Motivation to become more healthy	487	4.2	0.96	239	4.18	0.96	248	4.21	0.96	-0.34	0.734
Motivation to engage with the programme	478	4.23	0.8	234	4.27	0.75	244	4.2	0.84	0.822	0.411
	%	n		%	n		%	n		χ^2	p
Child gender (female)	51.7	252		53.1	127		50.2	125		0.487	0.485
Participant gender (female)	98.1	478		98.3	235		97.6	243		(expected values <5 so no test)	
Participant occupation ²										0.012	0.914
Higher managerial, administrative or professional	13.3	65		13	31		13.7	34			
Intermediate managerial, administrative or professional	25.8	126		24.3	58		27.3	68			
Supervisory or clerical and junior managerial, administrative or professional	18.6	91		21.3	51		16.1	40			
Skilled manual worker	3.5	17		2.9	7		4	10			
Semi-skilled or unskilled manual worker	3.5	17		3.3	8		3.6	9			
Unemployed	1.2	6		0.8	2		1.6	4			
Stay at home parent	23	112		23.4	56		22.5	56			
Student	2.9	14		2.9	7		2.8	7			
Retired	0.2	1		0	0		0.4	1			
Other	7.8	38		7.5	18		8	20			
Ethnicity ³										0.105	0.746
White – British	77	374		76.2	182		77.1	192			
White-Irish	2.1	10		1.7	4		2.4	6			
White- Any other White background	8.2	40		8.8	21		7.6	19			
Mixed-White & Black Caribbean	1.6	8		0.8	2		2.4	6			
Black or Black British-African	0.8	4		1.3	3		0.4	1			

² For the Chi-squared test, participants were grouped into new categories of 'working outside of the home' and 'not working outside the home' (n=316 & 171 respectively).

³ For the Chi-squared test, participants were grouped into new categories of 'white' or 'not white' (n=424 & 58 respectively). Participants who preferred not to say were not included in this analysis.

Mixed – Any other mixed background	0.4	2	0.4	1	0.4	1			
Black or Black British-Caribbean	0.8	4	0.8	2	0.8	2			
Asian or Asian British-Indian	3.7	18	3.8	9	3.6	9			
Asian or Asian British-Pakistani	1.9	9	0.8	2	2.8	7			
Chinese	0.4	2	0.4	1	0.4	1			
Other ethnic group	2.3	11	2.9	7	1.6	4			
Prefer not to say	0.8	4	1.3	3	0.4	1			
<i>Education⁴</i>								0.027	0.871
Did not complete Secondary Education	0.9	4	0.4	1	1.2	3			
Secondary Education (GCSE/O-Levels)	7.9	37	7.1	17	8	20			
Post-Secondary Education (College, A-Levels, NVQ3 or below, or similar)	13.5	63	13.4	32	12.4	31			
Vocational Qualification (Diploma, Certificate, BTEC, NVQ 4 and above, or similar)	15.2	71	14.2	34	14.9	37			
Undergraduate Degree (BA, BSc etc.)	36.1	168	34.3	82	34.5	86			
Post-graduate Degree (MA, MSc etc.) Doctorate (PhD)	25.5	119	24.3	58	24.5	61			
Other	0.9	4	1.3	3	0.4	1			
<i>Relationship to child</i>								(expected values <5 so no test)	
Parent	97.3	473	97.9	232	96.8	241			
Step-parent	1.4	7	1.70	4	1.20	3			
Special guardianship	0.2	1	0.40	1	0	0			
Aunt/uncle	0.2	1	0	0	0.40	1			
Foster parent	0.2	1	0	0	0.40	1			
Grandparent	0.6	3	0	0	1.20	3			

⁴ For the Chi-squared test, participants were regrouped into categories of ‘attended university’ or ‘did not attend university’.

Procedure.

Participants initially expressed interest in the study by clicking on promotional links on the Netmums website or responding to links within the newsletters. After reading the information about the trial, participants were invited to click on a link if they wished to take part. They were then randomly allocated (through simple randomisation, the software for which was developed by Netmums) to one of the two conditions, gave informed consent and completed a baseline questionnaire. Participants were not explicitly aware of the existence of a control group; rather they were told that they would receive one of two email programmes, both focussed on health. Completion of the baseline questionnaire triggered delivery of the relevant email programme.

The first email was delivered to individuals on the day their baseline questionnaire was completed. Participants were asked to complete two further questionnaires: one 24 hours after they had received their last programme email; another 6 months after the programme had been completed.

All questionnaires were hosted by GetFeedback.com (GetFeedback, 2019), online survey software for presenting surveys on smartphones, tablets and other devices. Both programmes were hosted by Campaign Monitor, a global marketing platform.

Measures.

It was judged important that outcome measures reflected the three main elements of the intervention: *Happy*, *Healthy* and *Family* eating behaviours, and an early review of potential instruments identified a multitude of possibilities. Extensive pilot work with parents was conducted to determine which of this multitude would best capture the data we required (Snuggs et al., 2019). Three primary outcome measures

were selected to reflect *Happy*, *Healthy* and *Family* eating behaviours, and eleven secondary measures were included to consider other aspects of shared family mealtimes deemed important (see Table 4). All published measures in the table have undergone extensive psychometric testing and, with the exception of the Family Mealtime Goals Questionnaire (Snuggs, Houston-Price, & Harvey, 2019a), which was created for the purposes of this study, have been widely used in eating behaviour research.

Additional demographic questions were asked at baseline only (child age, child gender, participant relationship to child, participant age, participant gender, participant occupation (Office of National Statistics, ONS, 2005), participant ethnicity (ONS, 2005), participant education level (ONS, 2005), participant number of children). These questions were asked in order to consider whether the intervention and control group differed on key characteristics and, in the case of occupation, to assess whether primary outcomes differed according to whether participants worked outside of the home or not (i.e. the intervention might better suit those with more time and opportunity to implement the strategies promoted at home).

Two further questions (developed by the researchers) were administered at baseline in order to assess any between-group differences in motivation for behaviour change and motivation for taking part in the intervention.

Table 4: Outcome measures

Primary outcome measures	Item characteristics	Authors
The Healthy Environment subscale of the Comprehensive Feeding Practice Questionnaire (CFPQ)	4 items on a scale of 1 – 5 (strongly disagree – strongly agree). Mean of items taken as subscale score.	Musher-Eizenman & Holub, 2007
The Enjoyment of Food subscale of the Child Eating Behaviour Questionnaire (CEBQ)	4 items on a scale of 1 – 5 (never – always). Mean of items taken as subscale score.	Wardle, Guthrie, Sanderson, & Rapoport, 2001

Shared family meal frequency measure	Frequency of shared family dinners per week (0 - 7)	Horning, Fulkerson, Friend, & Neumark-Sztainer, 2016
Secondary outcome measures		
Three further subscales of the CFPQ: Modelling, Encourage Balance/Variety and Involvement	Scoring as above for Environment subscale	Musher-Eizenman & Holub, 2007
One further subscale of the CEBQ: Food fussiness	Scoring as above for Enjoyment of Food subscale.	Wardle et al., 2001
Home-cooking/use of raw ingredients measure	Frequency of occasions per week of home-cooked meals using raw ingredients (0 – 21)	Developed by the researchers, based on pilot work
Weekly food budget measure	Estimate of family food expenditure in past week (£0 - £500)	Developed by the researchers, based on pilot work
Family Mealtime Goals Questionnaire	7 feeding goals on 5 point scale (strongly disagree – strongly agree).	Snuggs et al., 2019a
Family mealtime goal conflict measure	4 measures of goal conflict on 99 point Visual Analogue Scale.	Developed by the researchers, based on pilot work

Some questions relating to activity and wellbeing were added. These questions mirrored the structure of the primary outcome measures relating to healthy eating. For example, in addition to asking participants to indicate their endorsement of the statement, ‘my child enjoys eating’ (an item on the *enjoyment of food* subscale), we also asked them to rate the statement, ‘my child loves computer games’. The purpose of these extra questions was to try to avoid demand characteristics affecting responses by broadening the focus of questions beyond healthy eating. At the end of Questionnaire 3, participants were asked an open-ended question regarding what they thought the study was about.

Questionnaire 1, completed at baseline (Time 1) took approximately ten minutes to complete and Questionnaires 2 and 3 (completed immediately post-

intervention/Time 2 and 6-months post-intervention/Time 3) took around five minutes to complete. Aside from questions relating to participants' socio-demographic characteristics, all measures were administered at each time point (Table 4).

Data Analysis

Shapiro-Wilk tests were conducted on all outcome variables to establish whether they were normally distributed.

T-tests and Mann-Whitney tests were conducted for normally and non-normally distributed variables to assess whether there were any between-group baseline differences.

Two-way repeated measures ANOVAs were conducted for all outcome measures. The independent variables were Time (T1, T2, T3) and Condition (HHFE, KW). For each outcome measure, two ANOVAs were conducted, one to measure change between Time 1 (baseline) and Time 2 (immediately post-intervention) and one to measure change from Time 1 to Time 3 (6-months post-intervention).

For non-normally distributed outcome measures, 'change in behaviour' scores were calculated by subtracting the T1 score from the T2 or T3 scores for each individual. Mann-Whitney tests were conducted to test for differences between the HHFE and KW conditions on these measures, in addition to computing ANOVAs as described.

Intention to treat analysis was not employed because there was a substantial amount of missing data (Dumville, Torgerson and Hewitt, 2006, Armijo-Olivo, Warren & Magee, 2013). All analyses were conducted with participants in their originally assigned groups.

Results

Shapiro-Wilks tests indicated that the majority of the outcome measures were normally distributed. The exceptions to this were *enjoyment of food, modelling* and *encourage balance & variety* (these were non-normally distributed at all time points except *modelling*, which was normally distributed at baseline).

Baseline scores were then compared between groups using T-tests (for *healthy environment* and *family dinner frequency*) or a Mann-Whitney test (*enjoyment of food*) (Table 5).

Table 5: Primary outcome measures by time & condition

	Whole sample			HHFE			KW			Between group tests	
	n	Mean	SD	n	Mean	SD	n	Mean	SD	t	p
Healthy Environment T1	470	3.33	0.71	230	3.28	0.67	240	3.38	0.75	0.15	0.144
Healthy Environment T2	133	3.54	0.66	64	3.45	0.70	69	3.62	0.61		
Healthy Environment T3	103	3.66	0.64	42	3.60	0.69	61	3.69	0.60		
										<i>U</i>	<i>p</i>
Enjoyment of food T1	482	3.98	0.79	237	3.92	0.79	245	4.05	0.78	26217	0.063
Enjoyment of food T2	132	3.98	0.86	64	4.01	0.87	68	3.96	0.86		
Enjoyment of food T3	104	4.09	0.83	43	3.97	0.83	61	4.17	0.82		
										<i>t</i>	<i>p</i>
Family Dinner Frequency T1	484	4.79	2.10	235	4.78	2.10	249	4.81	2.10	0.92	0.104
Family Dinner Frequency T2	135	5.12	1.84	64	5.22	1.74	71	5.04	1.93		
Family Dinner Frequency T3	104	5.39	1.74	43	5.53	1.82	61	5.28	1.69		

At baseline, there were no significant differences between groups on any of the participant demographics (see Table 3), any of the primary outcome measures (Table 5) or any of the secondary outcome measures (Table 6).

Primary outcome measures.

Healthy Environment.

There was a significant effect of Time between T1 and T2 such that *healthy environment* scores increased for the whole group ($F(1,127)=14.20, p<0.001$). However

there was no significant main effect of Condition ($F(1,127)=0.473$, $p=0.493$), and no interaction between Condition and Time ($F(1,127)=3.48$, $p=0.064$). This pattern was repeated in the analysis comparing T1 and T3 with the whole group increasing on *healthy environment* scores from baseline to follow-up ($F(1,97)=14.72$, $p<0.001$), but no effect of Condition ($F(1,97)=0.633$, $p=0.428$) or interaction between Time and Condition ($F(1,97)$, $p=0.689$).

Enjoyment of food

There was no main effect of Time on *enjoyment of food* scores either between T1 and T2 ($F(1, 128)=0.005$, $p=0.944$) or between T1 and T3 ($F(1,101)=3.08$, $p=0.082$). There was also no main effect of Condition in either analysis ($F(1,128)=0.134$, $p=0.715$ at T2; $F(1,101)=1.30$, $p=0.257$ at T3), and no interactions between Time and Condition ($F(1,128)=2.94$, $p=0.09$ at T2; $F(1,101)=0.38$, $p=0.54$ at T3).

Mann Whitney tests also failed to find a significant difference between conditions in the change in enjoyment of food scores over time ($U=1718.5$, $p=0.061$, from T1 to T2; $U=1203$, $p=0.554$, from T1 to T3).

Family Dinner Frequency.

Between T1 and T2, there was a significant main effect of Time on *family dinner frequency* ($F(1,87)=5.9$, $p=0.017$) but there was no effect of Condition ($F(1,87)=0.56$, $p=0.46$) or interaction between Time and Condition ($F(1,87)=1.72$, $p=0.193$).

There was no main effect of Time on *family dinner frequency* between T1 and T3 ($F(1,62)=2.36$, $p=0.13$) and no effect of Condition ($F(1,62)=0.42$, $p=0.52$) or interaction between Time and Condition ($F(1,62)=0.01$, $p=0.98$).

Secondary outcome measures.

Table 6 presents the secondary outcome measures collected at each time point.

Outcomes for *modelling*, *involvement* and *raw-ingredient use* demonstrated a similar pattern to *healthy environment* in that they increased in the whole sample between Time 1 and Time 2 (*modelling* $F(1, 127)=19.88$, $p<0.001$, *involvement* $F(1,128)=4.57$, $p=0.03$, *use of raw ingredients* $F(1,130)=0.036$, $p=0.001$) but there were no between-group differences (effects of Condition) in these changes.

Correspondingly, scores on these three measures increased in the whole sample between Time 1 and Time 3 (*modelling* $F(1,97)=21.36$, $p<0.001$, *involvement* $F(1,97)=12.23$, $p=0.001$, *use of raw ingredients* $F(1,97)=8.89$, $p=0.004$), with no effects of Condition.

There were no effects of Time or Condition on any of the other outcome measures: *food fussiness*, *encourage balance & variety*, *weekly food budget*, *family mealtime goals* or *family mealtime goal conflict* (all $p > 0.05$).

Table 6: Secondary outcome measures by time and condition

	Whole sample			HHFE			KW			Between-group tests	
	n	Mean	SD	n	Mean	SD	n	Mean	SD	t	p
Modelling T1	470	3.90	0.66	230	3.90	0.63	240	3.89	0.68	0.16	0.88
Modelling T2	133	4.11	0.55	64	4.12	0.59	69	4.10	0.51		
Modelling T3	103	4.26	0.49	42	4.22	0.47	61	4.29	0.51		
										<i>U</i>	<i>p</i>
Encourage balance & variety T1	471	4.24	0.55	230	4.24	0.55	241	4.25	0.56	27325	0.79
Encourage balance & variety T2	132	4.39	0.51	63	4.42	0.50	69	4.37	0.51		
Encourage balance & variety T3	103	4.41	0.49	42	4.48	0.44	61	4.37	0.52		
										<i>t</i>	<i>p</i>
Involvement T1	472	3.35	0.78	230	3.32	0.77	242	3.38	0.79	-0.79	0.43
Involvement T2	134	3.42	0.83	65	3.41	0.91	69	3.43	0.75		
Involvement T3	103	3.60	0.78	42	3.56	0.82	61	3.62	0.76		
										<i>t</i>	<i>p</i>
Food fussiness T1	481	2.88	0.86	237	2.93	0.84	244	2.83	0.88	1.38	0.17
Food fussiness T2	132	2.79	0.91	64	2.84	0.89	68	2.74	0.93		

Food fussiness T3	104	2.70	0.85	43	2.74	0.88	61	2.67	0.84		
										t	p
Cooking with raw ingredients T1	488	12.19	24.64	239	11.84	24.75	249	12.52	24.48	-1.45	0.17
Cooking with raw ingredients T2	132	12.87	21.10	64	12.24	24.08	68	13.47	17.56		
Cooking with raw ingredients T3	104	13.84	21.14	43	12.65	21.95	61	14.68	19.77		
										t	p
Weekly food budget T1 (£)	487	147.20	13.58	239	148.45	14.01	248	145.95	13.18	0.41	0.68
Weekly food budget T2 (£)	134	144.81	12.30	64	146.9	12.63	70	142.95	12.07		
Weekly food budget T3 (£)	104	142.02	11.77	43	143.5	11.00	61	141.00	12.37		

Sub-group analysis.

Based on socio-demographic status, the sample was split into two groups; ‘working outside the home’ (WOH) and ‘not working outside the home’ (NWOH) (see Table 3 for group n). The above analyses were repeated to establish whether the intervention was effective in either group. The results for both groups mirrored those for the whole sample, except that the change from baseline to T2 for *family dinner frequency* seen in the sample as a whole was only present in the WOH group ($F(1,55)=9.41, p=0.003$). There were no effects of Condition or interactions between Time and Condition on any measure for either group (all $p > .05$).

Responses to Open-ended question.

At T3, around half of each group responded to the open-ended ‘purpose of this research?’ question. In the HHFE group (n=24), 92% of participants guessed that the study had something to do with eating, food or mealtimes. In the KW group (n=33), the figure was lower (70%) but nevertheless represented the majority. Few participants responded to the invitation for feedback about the programmes (19 and 15 for HHFE and KW, respectively). In both groups, feedback was predominantly positive, typically relating to enjoyment of the course, learning new tips and feeling reassured that they

were already ‘getting things right’. The only consistent negative feedback was that the information provided during the programmes was not novel or was too basic.

Discussion

This study employed a randomised controlled trial (RCT) to evaluate an online intervention designed to improve family eating behaviours. The trial was rigorously designed, with extensive pilot work and robust measures. Results indicate that intervention participation, but not content, invoked behaviour change; participants demonstrated positive changes on a number of the outcome measures but did not exhibit differences according to condition.

Across the sample, significant behaviour change occurred on two of the three primary outcome measures immediately post intervention (*healthy environment* and *family dinner frequency*). Only one of these differences remained significant six months post intervention (*healthy environment*, which assesses the extent to which parents make healthy food available in the family home). There were no significant changes on either of the other primary outcome measures, indicating that families did not increase their shared family dinner frequency in the longer-term and that participants did not perceive that their children enjoyed their food more over the study period. Three secondary measures also demonstrated positive change across the whole sample; specifically *modelling*, *involvement* and *raw ingredient usage*. These results indicate that parents’ role-modelling of healthy eating, involving their children in food preparation and cooking with raw ingredients increased over the study period. However, other secondary outcome measures saw no change, most notably *food fussiness* and *encourage balance & variety*. Food fussiness is arguably related to *enjoyment of food* and in this sense, it is perhaps not surprising that the results parallel one another. It is more surprising that *encourage balance & variety* did not see any

change given the apparent overlap with the *healthy environment* outcome, which did improve. However, the *encourage balance and variety* measure of the Comprehensive Feeding Practice Questionnaire (CFPQ) assesses whether parents promote well-balanced food intake (see Table 4.8) and how much a parent actively encourages their child to eat a variety of healthy foods, while *healthy environment* looks at the availability of healthy food in the house. This suggests that parents may find changing their own behaviour (e.g. making fruits and vegetables freely available) easier than changing their child's behaviour (e.g. increasing the child's fruit and vegetable consumption).

The remaining secondary measures, *mealtime goals*, *mealtime goal conflict*, and *food expenditure*, did not change in either condition. This was less surprising; goals are thought to be relatively stable (Emmons & King, 1988) and the *food expenditure* measure was included to establish whether participants perceived a need to increase their food budget in order to achieve healthy food changes, so change was not necessarily anticipated.

A further line of enquiry in this study was to investigate whether parents working outside of the family home were more or less likely to benefit from the intervention. The rationale for this was that the intervention might better suit those with more time and opportunity to implement the strategies promoted at home. However, no systematic differences were seen, indicating that this is not the case.

The failure to find differences on any measure between the intervention group and the control group is puzzling. The study was presented as 'Healthier Lives' and researchers were careful not to include references to eating or family food in the control condition. Nevertheless, the results indicate that participants in the control condition

changed their eating and feeding behaviours as much as those in the intervention condition.

Behaviour change theory suggests a number of possible explanations for the changes reported by participants in the control condition. First, it is possible that parents who enrolled in the study may have done so because they felt ready to make a health change. In this sense, both programmes may have utilised the Motivation element of the COM-B model (Michie et al., 2011) or the Preparation/Action stages of the transtheoretical (stages of change) model (Prochaska and Diclemente, 1983). The content of the intervention may not have mattered; engagement with the programme may have been motivating enough. On the other hand, the control intervention may have made children's health more salient to participants or may have been too 'health-focussed' to act as a true control, triggering unintended changes in family eating-related behaviour. This interpretation is supported by the high proportion of control group participants who guessed correctly that the focus of the study was food or eating, even though their intervention made no such reference. Nevertheless, questions about family eating behaviours (along with questions about other health behaviours to avoid focusing on healthy eating alone) were unavoidable for both groups, and may have been enough to prompt a focus on food and eating in their behaviours at home. Given that most participants who responded in both conditions realised that the study was about healthy eating, it may also be the case that demand characteristics played a role in the self-reported eating-related behaviour changes across the sample. Although this interpretation seems unlikely given that several explicitly eating-related outcome measures showed no change in either group.

Arguably, a control group that does not participate in an active intervention or a wait-list control condition would have addressed these possibilities. In this study, the

decision was taken not to include such a control for pragmatic reasons; there was understandable ethical concern that Netmums members might be unhappy signing up to the study and receiving ‘nothing’ in return for completing questionnaires. Moreover, the similarity of the Kids’ Wellbeing programme to the Healthy Happy Family Eating programme in this study can be argued to be a strength, as the results highlight the importance of having an authentic control condition in randomised controlled trials. One of the features of a randomised controlled trial is effective concealed randomisation (Kendall, 2003). This is notoriously difficult in behaviour change research (see Snuggs et al., 2019b) because participants cannot be given a placebo in the same way they can in a medical trial, and research participation alone can influence behaviour change (MacNeill, Foley, Quirk, & McCambridge, 2016). In this study, it is possible that the similarity between the conditions led both groups to believe they were receiving the ‘active’ programme, which would serve to limit the influence of any response biases by those receiving the true intervention. Kendall (2003) states that poorly designed studies are dangerous because of their potential to influence practice based on flawed methodology. Given that pilot pre-/post- testing of the intervention indicated efficacy (Snuggs, et al., 2019), a less robustly designed control condition might have reiterated the conclusion in the larger trial. Future work might introduce a wait-list condition to examine whether it is the act of study participation or receiving a health-related email programme that prompted behaviour change.

Limitations.

The sample in this study scored highly on the primary outcome measures in advance of participating in the behaviour change intervention. For example, when comparing this study to other cross-sectional studies (e.g. Hammons & Fiese, 2011), participants in the current study appear to have atypically high family dinner frequency,

supporting claims that interventions of this kind often result in self-selected samples, and fail to reach ‘those who really need it’ (Snuggs et al., 2019). This bias in the sample also means that there was less scope for improvement than there might have been had more participants with low scores on the baseline primary outcome measures participated.

Retention rates, although comparable to similar studies (Mathieu, McGeechan, Barratt, & Herbert, 2013), were low, leading to small sample sizes at T2 and T3. This meant the study was under-powered. Low retention rates are common in online studies, and attempts were made during data collection to maximise the number of participants by supplementing the sample recruited via Netmums with a convenience sample (see Participants section), thus mitigating the impact of a likely high attrition rate.

The style and format of the emails used for the trial were well researched and piloted, but swiftly developing technology may have resulted in the trial becoming outdated more quickly than anticipated. The Netmums team reported a general decrease in audience enthusiasm for survey and research participation during the period of the study. Furthermore, our recent systematic review (Snuggs et al., 2019b) found that printed information interventions aimed at improving family eating behaviours (e.g. leaflets, booklets) tend to be less successful than more interactive interventions. Email format may be perceived as less novel now than when the intervention was first designed, and more similar to traditional printed information health campaigns. Some participants reported that the emails did not ‘teach them anything they didn’t already know’, indicating that they would have liked more novel, practical or interactive elements to the programme. It is possible that parents are generally more knowledgeable about healthy eating now than when the intervention was piloted.

Conclusions.

The findings indicate that there may be potential for behaviour change in individuals engaged with this programme but that this is unlikely to be related to the specific content of emails. Future research into interventions of this kind with larger samples could consider whether certain sub-groups exist for whom the interventions are beneficial. For example, individuals who particularly struggle with one or more of the main aims of the programme, (e.g. healthy eating or shared family meals). Further research on the HHFE intervention might usefully recruit participants who are motivated to change but who are not already achieving high scores on outcome measures at baseline. Revising the intervention so that it is more interactive and engaging could also be worthwhile, possibly delivering it via a smartphone app that follows the principles of the email programme. Digital health apps are expensive both to develop and to maintain (Bartle, 2015), which is one of the reasons email format was chosen in this programme. However, mobile health (mHealth) intervention is an expanding field and one with which the general public is becoming increasingly comfortable (WHO, 2017) and this format might support a more engaging intervention.

Declarations

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Availability of data and materials.

The dataset is available from the corresponding author.

Ethics approval and consent to participate.

This study was granted approval to proceed by the University of Reading Research Ethics Committee. Informed consent was obtained from participants.

Competing interests.

There were no competing interests.

Authors' contributions.

SS, CHP and KH were all involved in the conception of the study, data analysis and the writing of this manuscript. SS was responsible for data collection.

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Chapter 6: Supplementary information on trial design

6.1 Rationale & aim

As discussed in Chapter 3, Netmums presented an ideal platform from which to deliver the Healthy Happy Family Eating (HHFE) intervention; the audience comprises millions of parents (mostly mothers) from across the UK, and the purpose of the website is to offer help, support and entertainment (Netmums, 2019). Website content has a strong focus on food (with a wide array of recipes) and on family health. Netmums created the original HHFE course in 2009 and consequently, although it was in need of refinement and updating, systems were already in place to accommodate email delivery on a large scale. The collaboration between Netmums and the University of Reading provided a unique opportunity to draw together academic rigour and journalistic experience to support an intervention that could be evidence-based and engage the audience. The randomised controlled trial is reported in the RCT paper but some detail around the design was beyond the scope of the journal article. The following thesis section therefore describes some of the logistics, challenges and decision making involved in the study.

The study was registered on the ISRCTN database and was granted ethical approval by the University of Reading Research Ethics Committee (see Appendices 3 & 4).

6.2 Choosing a control

When deciding on the nature and design of the control condition, it was important to balance the quality of the study design with the requirements of the Netmums team. Several options for the control condition design were considered: wait-list control group, control group who receive no emails at all, or control group who

receive a series of emails about something other than family eating. Ideally, and with a large enough sample, the study could have had two control groups, one of which received ‘equivalent’ emails and one of which received none (which could be a wait-list control group). This would allow for more detailed examination of any intervention effects. However, the Netmums team were concerned that their members would feel short-changed if they signed up and did not receive any email programme at all. Consequently, it was agreed that there would be one control condition and that participants allocated to this group would receive a series of emails that focussed on ‘Kids’ Wellbeing’ (KW, further details available in the RCT paper). Both the research team and the Netmums team were keen that these control emails should feel substantial and should come across as an authentic and viable alternative programme. The Netmums website was used to provide links to articles about relevant topics (e.g. bullying) to reflect the structure of the HHFE emails. Care was taken to ensure that the KW emails did not include any information about food or eating with the aim of avoiding eating-related behaviour change (caused by the emails) in the control group. Similarly, no information was included in the KW emails that encouraged bringing families together to spend more time with one another because a main focus of the HHFE emails was encouraging shared family meals. The study was entitled ‘Healthier Lives’, reflecting the potential of both programmes to support parents to improve their children’s health. It is important but difficult to effectively conceal randomisation in behaviour change studies (Kendall, 2003; Snuggs, Houston-Price, & Harvey, 2019). Collectively, the study title and the control email contents offered as close to concealment as possible.

6.3 Software

The original HHFE course was delivered through Campaign Monitor, a global technology company that provides an email marketing platform. This is a platform that Netmums use for newsletters and other courses, and they have conducted extensive research into the formats and templates that are most enjoyed and engaged with by their audience.

The questionnaires for the pilot work in Chapters 3 and 4 were hosted by Survey Monkey. However, participants reported a number of frustrations with this platform, especially those who were using smartphones to fill in the survey. Other platforms (including Online Surveys, formerly Bristol Online Surveys, Playbuzz and Gorilla) were considered and GetFeedback.com appeared to be appropriate for the following reasons: 1) appearance of the surveys was attractive and intuitive on smartphones, tablets and desktop computers; 2) GetFeedback has an official partnership with Campaign Monitor which allowed for questionnaire completion to trigger email delivery.

Getfeedback's data security was also satisfactory; Thames Valley Clinical Trials Unit advised that personal data collected online should be 'AES256 encrypted' and Getfeedback confirmed that their security company, Heroku, did indeed use this level of encryption (Appendix 5).

6.4 Randomisation

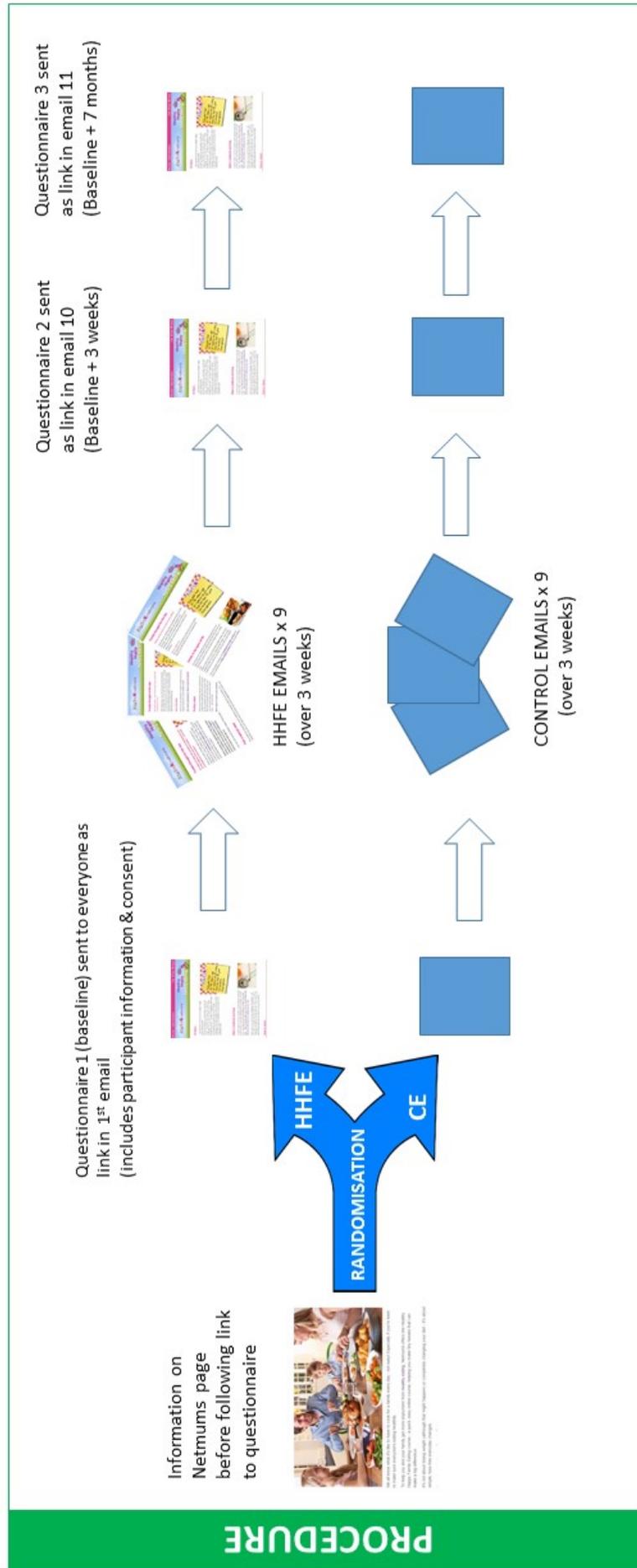
The GetFeedback platform has a question function in which participants can be asked to provide their email address and this can trigger an email to be sent by Campaign Monitor (in this case, it triggered a series of emails). However, this feature did not allow for randomisation to occur at the point of survey completion because all

participants would receive the same email. With this in mind, participants were instead randomly allocated to one of two baseline questionnaires when they first clicked to indicate interest in the study. These questionnaires were identical but one triggered the HHFE email chain and the other triggered the KW chain. Consequently, randomisation occurred before informed consent and baseline data were collected (see figure 6.1).

The only way that participants could be randomly allocated after informed consent involved an awkward procedure whereby participants would need to be directed back to the Netmums website after they had completed their baseline questionnaire. At this point, they would need to log into the Netmums website and they would also need to register with Netmums if they were not already members. They would then be asked to tick a box to indicate that they were happy to receive the email programme and at this point would be randomly allocated to receive one of the two options. This was similar to the procedure used in the pilot work, and many participants reported it as annoying and unwieldy.

Consultations were held with the Thames Valley Clinical Trials Unit (TVCTU) to confirm that the procedure outlined in the first scenario above was methodologically robust. The research team were specifically concerned about whether it was ethically acceptable to randomise participants before obtaining informed consent. TVCTU agreed that the first scenario was considerably more straightforward for participants and that, because participants were not being asked actively to do anything before they provided informed consent, there were no ethical concerns.

Figure 6.1: Graphic representation of randomisation procedure



6.5 Recruitment

The pilot study conducted in 2009 (Court et al., 2010) recruited over 2000 participants over the course of a few weeks without difficulty.

For the current study, Netmums ran a recruitment campaign on their website which involved adding a ‘widget’ (a webpage button which was embedded into many of the recipe and health-related pages), articles in their regular newsletter, and tweets from the Netmums Twitter account. Figure 6.2 shows a caption from the regular newsletter. This campaign lasted two months, after which time the study was regularly mentioned in the newsletter but no further active campaigning occurred.

Figure 6.2:

Netmums newsletter insert example

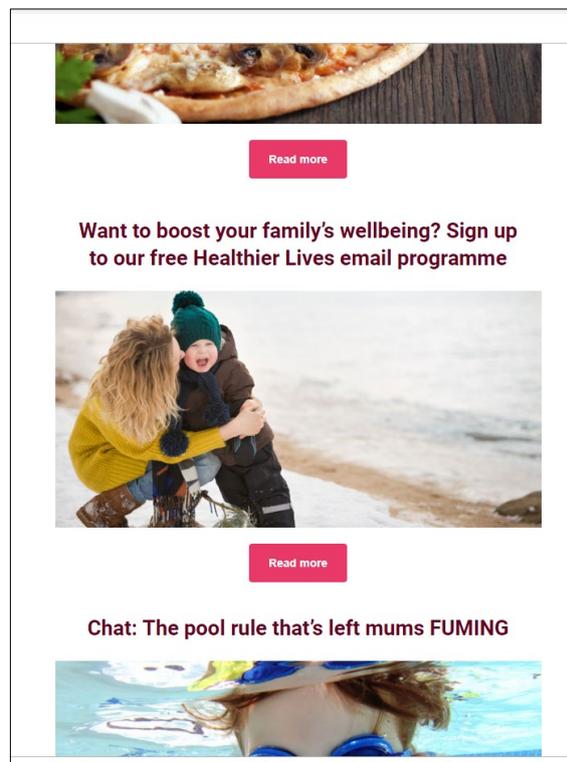


Table 6.1 provides an overview of promotion activities and an approximation of how many responses each activity prompted (this provides some insight into which

activity may have prompted interest but is an estimate because many of the promotion activities occurred concurrently).

Table 6.1

Netmums recruitment campaign activities

Action	Date	Approx. response no.	Cumulative response
Live on dedicated page on website	03/11/2016	0	0
Link inserted into a few wellbeing pages	08/11/2016	0	0
Newsletter	17/11/2016	13	13
Text link on homepage (duration approximately 6 hours)	17/11/2016	25	38
Tweet: 'Get a kick start on your New Year's resolution and take part in our online survey today'	23/11/2016	0	38
Newsletter	24/11/2016	9	47
Tweet: 'Take part in our Healthier Lives Programme to get a kick start your New Year's resolution'	24/11/2016	17	64
Tweet 'If your NY's resolution is to get fit and healthy, kick start it early with our online program'	05/12/2016	1	65
Newsletter	08/12/2016	4	69
Widget added to four food-related articles	08/12/2016	2	71
Landing page content updated	08/12/2016	16	87
Landing page content updated	16/12/2016	1	88
Widget added to 20 further articles	19/12/2016	10	98
Widget added to all new articles (ongoing)	01/01/2017	27	125
Story leading home page (duration unclear)	01/01/2017		125
Tweet 'Sign up to Netmums' free Healthier Lives programme for great ideas straight to your inbox'	09/01/2017	0	125

**After the New Year campaign, Netmums included regular links in their weekly newsletter but otherwise conducted no more promotional activities. Recruitment ended on 16th May 2017 with a total of 352 Netmums participants signed up to the study.*

The RCT was scheduled to recruit for 6 months. It was anticipated that recruitment would play out similarly to the previous study and that the long study period would allow for a substantial sample. It was agreed with Netmums that, if necessary, recruitment would be stopped at 8000 participants in order to protect their costs (in terms of expenses incurred with the Campaign Monitor account). In practice, as reported in Paper 4, the final sample size was much smaller than this (final N = 488). Furthermore, only 352 of these participants signed up through the Netmums campaign

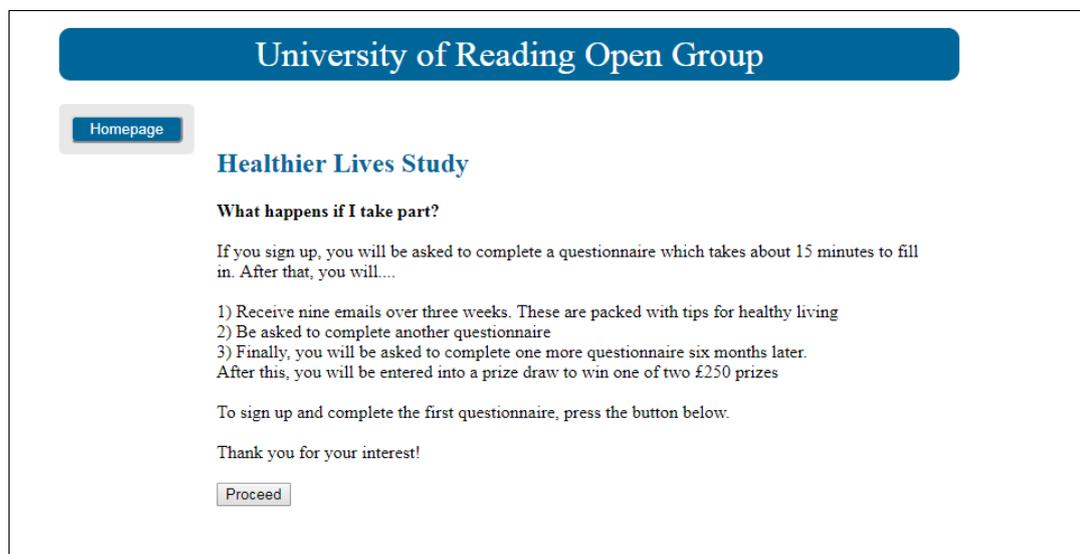
When it became evident that the large numbers hoped for would not be recruited, further steps were taken to recruit participants through the University of Reading (UoR), with the agreement of the Netmums team. Seventy three primary school head teachers in and around Reading were emailed and invited to circulate a flyer advertising the study (Appendix 6) to school parents. Of these, 13 agreed to insert a brief invitation to take part in the study into their school newsletter. All the newsletters were electronic and it was therefore possible to insert a link into the invitation which parents could click on and go straight to the participant information as with the other recruitment methods. One head teacher also offered to advertise through the school's social media channels and one responded to say that they received too many requests of this kind to participate. The remaining 59 emails were unanswered. An email was also circulated around UoR staff and PhD students inviting them to take part. Because all of these advertisements included the same link to the study, it is not possible to extrapolate how many participants signed up through UoR emails and how many through primary school newsletters. Overall the campaign to recruit through schools and the University resulted in 136 participants who were included in the study.

In order to achieve this method of recruitment, a new link to the baseline questionnaire was designed and set up, hosted by the University of Reading Open

Group (figure 6.3). This webpage was not as aesthetically attractive as the Netmums landing page, but it contained the same information and performed the same function of randomly sending participants to one of two questionnaires through one unique link before presenting the participant information and collecting informed consent.

Figure 6.3:

Screenshot of UoR landing page



6.6 Reflections on the Netmums recruitment campaign

As the recruitment campaign unfolded and it became clear that recruitment was not as high as expected, discussions were held with Netmums to consider why this might be the case.

Table 6.1 (p.114) shows a breakdown of when individuals signed up to the study, broken down by the promotion activity taking place at the time.

The table does not show a systematic pattern that indicates a particular promotional activity having more impact. The two activities that were apparently the most successful in achieving participants were advertising the study on the main

Netmums home page (which only happened once) and adding the widget to all articles (this was an ongoing activity but appeared only to prompt more responses immediately after introduction of new widgets).

Netmums has a notable presence on Facebook and Instagram, but as part of their registration with these companies, they are not permitted to conduct ‘promotions’ through these outlets. Even though this project was not-for-profit, it was considered to be a promotion for these purposes. The Netmums team were happy to include links to the study in their newsletter but were reluctant to lead the newsletter with this or include it in the subject title as they were concerned it would be off-putting to audience-members who did not have an interest in the study. It is difficult to know whether more promotional work through these channels might have had more effect.

The Netmums team felt that audience enthusiasm for surveys and research projects had generally waned in recent years. As a related point, it may be that individuals were put off participation not by lack of enthusiasm about the intervention but by the procedures involved in signing up (i.e. survey completion, informed consent and providing email addresses).

Nevertheless, during the period 3rd November 2016 – 16th May 2017, there were 11,091 page views of the landing page, representing 9,341 unique users. It is not possible to tell how many people proceeded to click on the link after reading the initial information. However, the survey software, GetFeedback, indicates that 565 people started the questionnaire. In practice, this means they progressed at least as far as the participant information sheet which is present on the first page of the questionnaire. Of these, 352 completed the baseline questionnaire and were included in the study. Although there are gaps in this information around attrition, it is impossible to ignore

the fact that a substantial number of people visited the landing page, indicating some level of interest, and that this did not translate into a large pool of participants. Overall, 6% of participants who visited the page were still interested enough after reading to click on the study link, and less than 4% of the total viewers went on to participate. This indicates either that the landing page content was unengaging, or that this type of study is, on the whole, not interesting to the Netmums audience.

Chapter 7: Supplementary analysis to RCT paper

7.1 Rationale & aim

The RCT paper reports the main outcomes of the Healthy Happy Family Eating (HHFE) Randomised Controlled Trial (RCT). Although the secondary measures are also reported, this is necessarily brief in the paper due to space constraints and the scope of the journal. This thesis section therefore aims to explore some of the secondary measures in more detail, with a particular view to understanding whether there are specific sub-groups for whom this intervention (or similar interventions) might be useful.

The following supplementary analysis is presented in three sections:

7.2 Participant engagement

7.3 Sub-group analysis

7.4 Mealtime goals and goal conflict

7.2 Participant engagement

Maintenance of engagement in digital behaviour change interventions is both essential to accomplish behaviour change (Yardley et al., 2016) and notoriously difficult to achieve (Eysenbach, 2005). Across the literature, the term engagement is used with a variety of meanings. Yardley et al. (2016) categorise these as ‘micro’ (moment-to moment engagement with the intervention) and ‘macro’ (engaging and identifying with the wider intervention goals).

The attrition rate in the HHFE RCT was high, but not more so than other comparable trials (Eysenbach, 2005). Eysenbach also suggests that high attrition in eHealth interventions is both ‘natural’ and ‘typical’. He advises, for this reason, that researchers should also consider the subpopulation who ‘stay in the trial and use it’.

Given that there was some indication of behaviour change in this study, but that it was not consistent, this seems particularly pertinent.

The following analysis examines ‘micro’ engagement using information about participants’ history of opening emails and following the links they contained. The mealtime goal analysis (section 7.4, p.128) looks at whether participants engaged with the wider intervention goals.

The following analyses aim to address the following hypothesis and research question:

- 1) Participants who open more emails and follow more links exhibit more behaviour change than those who open fewer
- 2) Do ‘more engaged’ participants hold particular characteristics that could inform the participants that future work might best target?

7.2.1 Method & Data Analysis

Unless otherwise stated, methods in this chapter were the same as those in the RCT paper.

Participants in the HHFE condition were given engagement scores by calculating the sum of the number of emails they opened and the number of links they clicked on within those emails. This method was adopted to take into consideration a) whether participants continued to engage over time by opening (rather than ignoring) the emails and b) whether the content interested them enough to click on the links to read more. Across the nine emails, there were 41 unique links that participants could click on. The lowest possible engagement score was therefore zero, with no limit to how many times a participant could click on any given link, so no maximum possible engagement score.

Participants were categorised as ‘high’ or ‘low’ in engagement using the median score to split the group.

To address the first question above, two-way repeated ANOVAs were conducted with each of the primary outcome measures to investigate whether there was a between-groups difference on behaviour change scores. Time and primary outcome measures were entered as within-subjects factors and engagement status (high or low) was entered as a between-subjects factor. To address the second question, chi-square tests were run to assess whether there was a between group difference in categorical demographic data. Mann Witney tests were conducted (due to non-parametric data) to look for differences between continuous demographic variables.

7.2.2 Results.

Descriptives.

All 239 participants receiving the HHFE email programme were given an engagement score. These ranged from 0 – 35 (median = 9.00, mean = 9.05, SD = 5.65). Participants with a score of 9 or lower were categorised as ‘low engagement’ and those with a score higher than 9 were categorised as ‘high engagement’.

Do participants who open more emails and follow more links exhibit more behaviour change than those who open fewer?

Two-way repeated ANOVAS were conducted for each primary outcome measure as described in section 7.2.1. For each of *healthy environment*, *enjoyment of food* or *family dinner frequency*, between Time 1 and Time 2 there was no effect of engagement status (high/low) (all $ps > 0.05$) and no time by engagement interaction (all $ps > 0.05$). Again, between Time 1 and Time 3 there was no effect of engagement status (all $ps > 0.05$) and no time by engagement interaction (all $ps > 0.05$).

Do ‘more engaged’ participants hold particular characteristics that could inform the participants that future work might best target?

Likewise, there were no significant differences between high and low engagement participants on child age, participant age or baseline motivation scores (all $ps > 0.05$).

There were also no significant differences between high and low engagement participants on any of the primary outcome measures at baseline (all $ps > 0.05$).

These calculations were repeated looking only at the upper quartile of engagement scorers (> 10) and the same pattern of results was found.

7.2.3 Micro-engagement conclusions.

The RCT indicated that some people benefitted and changed behaviour as a result their email programme but it cannot be concluded that behaviour changed directly as a result of the HHFE intervention, given that changes also occurred in the control group. Because mechanisms for change were unclear, it was important to consider how engagement levels might fit into this picture. However, the results indicate that higher levels of engagement did not predict behaviour change, and nor did any baseline or demographic measures predict engagement.

This means that the question as to who, if anyone, should be expected to benefit from the HHFE intervention remains.

It is possible that the method of measuring engagement here was not a true reflection of how involved participants were with the intervention. Participants’ engagement scores reflected whether they opened an email or link, not how many times they did so. The decision to calculate the score this way was based on the idea that opening emails multiple times (one person opened an email 35 times) may not reflect

higher engagement, and might reflect a different issue, such as an IT problem. However, someone who has come back to visit an email on two or three occasions to check information could arguably be more engaged than a person who opened the email once and barely read it. Engagement, as it is scored here, does not reflect this difference. Furthermore, participants were not asked whether they implemented any of the strategies or ideas in the programmes. This might have provided a better impression of whether people were committing to the programme. As operationalised in this study, engagement levels with this intervention do not appear to affect behaviour change outcomes.

7.3 Subgroup analysis

The HHFE study was intentionally inclusive and parents of children between the ages of 1 and 16 years were all eligible to take part. Evidence indicates that parents are likely to be the most effective agents of change for younger children's eating behaviours (Golan, 2006) but it is less clear whether adolescents benefit from parental involvement in the same way (McLean, Griffin, Toney, & Hardeman, 2003). It is therefore feasible that parents of younger children may benefit from the HHFE intervention more than those with older children.

With a similar rationale, it is also possible that people who scored lower on the outcome measures at baseline (i.e. provided a less healthy environment, had children who enjoyed food less and/or had fewer shared family dinners) might demonstrate more changes because they have more scope to change, or room for improvement.

With these groups in mind, the following analysis examines whether specific groups demonstrated more or less behaviour change than others when taking part in the HHFE RCT.

Specifically, it was hypothesised that one of the age range groups might demonstrate more behaviour change (with no a-priori prediction as to which one), and that parents who had lower scores on the primary outcome measures at baseline would also demonstrate more behaviour change.

7.3.1 Method & Data Analysis.

Each participant was allocated to an age group (categories reflect UK schooling) according to the age of their target child; *preschool* (1-4 years), *primary* (5-11 years) or *secondary* (12-16 years). Two-way ANOVA analyses for the *preschool* and *primary* groups were conducted with time as a within-subjects factor and condition (HHEF or KW) as a between-subjects factor. Analysis was not conducted for the *secondary* group because of the small sample (n=38 at Time 1).

Participants were also allocated to a 'high' or 'low' score group for each of the primary outcome measures, using the median to split the groups. Three-way ANOVAs were conducted with time as a within-subjects factor and condition and 'high/low' as between-subjects factors.

7.3.2 Results.

Descriptives.

The *preschool* group comprised 178 participants, the *primary* group included 254 and the *secondary* group contained 38 participants.

The 'low environment' group comprised 254 participants all of whom had a score of 3.25 or lower. The 'high environment' group comprised 216 participants and all had a score higher than 3.25.

The 'low enjoyment' group comprised 279 participants all of whom had a score of 4 or lower. The 'high enjoyment' group comprised 203 participants all of whom scored higher than 4.

The 'low family dinner frequency' group comprised 246 participants, all of whom had a score of 3.29 or lower. The 'high family dinner frequency' group comprised 242 participants, all with a score of higher than 3.29.

Age groups.

Preschool parents: There was a main effect of time between Time 1 and Time 2 on the *healthy environment measure* ($F(1,35) = 6.22, p=0.02$)⁵. There was no Time by Condition interaction ($p=0.45$).

There was no effect of time between Time 1 and Time 2 on *enjoyment of food or family dinner frequency*. There were no Time by Condition interactions (all $ps > 0.05$).

Between Time 1 and Time 3, there was no main effect of Time for any of the *healthy environment, enjoyment of food or family dinner frequency* measures and no time*condition interactions (all $ps > 0.05$).

Primary parents: There was a main effect of time between Time 1 and Time 2 ($F(1,61)=6.82, p=0.01$). There was also a Time by Condition interaction for *healthy environment* such that KW participants improved their score by more than HHFE participants ($F(1,61)=4.32, p=0.042$). There was no main effect of time on the other measures between Time 1 and Time 2 and no further significant interactions (all $ps > 0.05$).

Between Time 1 and Time 3, there was no effect of time on any of the outcome measures. There were also no Time by Condition interactions (all $ps > 0.05$).

High/low scorers.

Participants were categorised as high or low scorers on each of the primary outcome measures (split by the median in each case).

⁵ The discrepancy between ns in descriptives and degrees of freedom in analysis is due to missing data on the outcome measures.

Three-way ANOVAs were run for the three primary outcome measures with Score Status (i.e. high or low) and Condition as between-subjects factors and Time as a within-subjects factor. The aim of this analysis was to examine whether any three-way interactions existed such that high/low scores at baseline in primary outcome measures might affect the overall analysis as run in the RCT paper. A three-way interaction (Time by Condition by Score Status) may be indicative of two-way interaction (Time by Condition) within either the high or low scoring groups (see Tables 7.1 and 7.2).

Table 7.1

*p values for three-way interactions (time*condition*score status) between Time 1 and Time 2*

	<i>Measure</i>		
	<i>Healthy environment</i>	<i>Enjoyment of food</i>	<i>Family dinner frequency</i>
<i>Outcome measure the sample is split by at baseline:</i>			
Healthy environment (n=67)		0.23	0.12
Enjoyment of food (n=66)	0.43		0.13
Family dinner frequency (n=41)	0.82	0.52	

Table 7.2

*p values for three-way interactions (time*condition*score status) between Time 1 and Time 3*

	<i>Measure</i>		
	<i>Healthy environment</i>	<i>Enjoyment of food</i>	<i>Family dinner frequency</i>
<i>Outcome measure the sample is split by at baseline:</i>			
Healthy environment (n=54)		0.03	0.30
Enjoyment of food (n=55)	0.08		0.29
Family dinner frequency (n=31)	0.63	0.94	

Tables 7.1 and 7.2 show only one significant three-way interaction of this kind, indicating a difference in how children from high and low healthy environments at baseline showed change in their enjoyment of food from Time 1 to Time 3 dependent on condition. Follow up 2 x 3 ANOVAs revealed a significant two-way interaction between time and condition in the low scoring *Healthy Environment* group only ($F(1,43)=871.93, p=0.048$).

To explore this interaction, a *Healthy Environment Change* score was calculated for participants by subtracting the score at Time 1 from the score at Time 3. ‘Low scorers’ in the HHFE condition decreased their *Enjoyment of food* score very slightly ($M=-0.06, SD=0.45$) and those in the KW condition increased scores ($M=2.3, SD=0.51$). A t-test indicated that this difference was significant ($t(1,56)=-2.27, p=0.027$). This result should be treated with caution, given the high number of post-hoc comparisons involved in the analyses.

7.3.3 Subgroup conclusions.

This section seeks to examine whether certain sub-groups benefited from the HHFE intervention. Although there were a small number of significant p values within the analysis, these were not consistent either in terms of which variables or which condition they related too. Furthermore, it is to be expected that one or two tests might produce Type II errors, given the large number of tests involved. For this reason, interpretation of the significant results should be treated with caution.

Overall, none of these groups appear systematically to show more behaviour change across time. It does not appear that there was more behaviour change in any of the age groups, and nor was there more change in those who had low primary outcome

scores at baseline. This adds further weight to the possibility that the intervention is not effective across the population.

7.4 Participants' mealtime goals

As described in the Mealtime Goals paper, there is a well evidenced relationship between individuals' goals and their behaviour. It is therefore surprising that very little attention has been given to parents' feeding goals and their potential relationship with feeding practices. Further to that, none of the studies identified in the literature review in Chapter 2 took parents' goals or requirements into consideration during intervention design. This seems counterintuitive; if researchers assume that they know what parents want (or assume that this does not matter), they run the risk of designing interventions that may be evidence-based on their potential to change behaviour when engagement is high, but which may not interest or engage parents.

The purpose of including the Family Mealtime Goal Questionnaire (FMGQ) in the RCT was to investigate whether parents who endorsed particular goals were more or less likely to benefit from the HHFE intervention. Unfortunately, the small sample sizes rendered this difficult to explore comprehensively. However, an interesting by-product arising from its inclusion is the existence of a data-set that includes feeding practice measures from the Comprehensive Feeding Practice Questionnaire and goal measures from the FMGQ. Using this data, this section aims to address the following questions:

- 1) What goals did the RCT participants hold?
- 2) Are mealtime goals related to feeding practices?
- 3) Does goal conflict influence these relationships?

The first research question is exploratory and therefore did not relate to a specific hypothesis. The second and third research questions are associated with the

specific hypotheses that mealtime goals would be related to feeding practices and goal conflict will mediate the relationship between feeding goals and feeding practices.

Throughout the following section about mealtime goals, only baseline RCT data has been used.

7.4.1 Method.

Methods relating to the collection of this data are described in the RCT paper. No further variables were calculated to address the research questions above.

In addition to the Family Mealtime Goal Questionnaire, four goal conflict items were administered as part of the RCT in an attempt to examine whether participants found healthy family eating challenging as a result of their mealtime goals. These measures were beyond the scope of the RCT paper, and are described below:

- 1) Do you ever find it difficult to choose healthy food because you're worried your family won't like it? (*family preference conflict*)
- 2) Do you ever find it stressful trying to find healthy things to cook? (*stress conflict*)
- 3) Do you ever have a hard time choosing healthy food because you're trying to prepare food quickly? (*convenience conflict*)
- 4) Do you ever find yourself having a hard time choosing healthy food because you're trying to keep costs down? (*cost conflict*).

In each case participants were asked to indicate their agreement to each question on a visual analogue scale of 1 – 99 (1 = never, 99 = always)⁶.

⁶ This scale was presented as 1-99 (as opposed to 1-100) for technical reasons; the survey software set visual analogue scale questions to have a beginning setting of 1, 50 or 100. If participants did not answer the question, their score was therefore indicated as the baseline number. For this reason, participants were actively asked to move the bar away from its original position to indicate their agreement levels. If a participant returned a score of 100, they were not included in the analysis.

7.4.1.1 Data Analysis

A table of descriptive data was generated to examine levels of goal endorsement. Correlations between the feeding goals and available feeding practice data were run to investigate relationships between the two. Correlations and mediation analysis were conducted to investigate the potential role of goal conflict in the relationship between feeding goals and feeding practices.

7.4.2 What goals did RCT participants hold?

Table 7.3 shows levels of endorsement for each family mealtime goal by the whole sample. It is not possible to compare endorsement levels of each goal with one another directly because the questionnaire is not designed to measure individuals' priorities. However, the scores indicate that *homemade food*, *shared family food* and *stress avoidance* were particularly important to the study population. This is important because these goals are the most directly relevant to the principles of the Healthy Happy Family Eating programme. Thus, it appears that the conditions for 'macro' engagement outlined in 7.2 (p.119) were met by the sample recruited to the RCT.

Table 7.3

Endorsement of mealtime goals (RCT data)

	n	Mean	Min	Max	SD
<i>Homemade food</i>	473	4.39	1.00	5.00	0.54
<i>Shared family food</i>	474	4.38	1.00	5.00	0.63
<i>Stress avoidance</i>	473	4.36	2.33	5.00	0.53
<i>Price</i>	475	4.19	2.00	5.00	0.72
<i>Family involvement</i>	474	4.03	1.33	5.00	0.59
<i>Ease of preparation</i>	474	3.89	1.00	5.00	0.79
<i>Occasional treats</i>	474	3.83	1.00	5.00	0.65
<i>High & low fat regulation</i>	474	3.71	1.50	5.00	0.77

7.4.3 Are mealtime goals related to feeding practices?

Spearman rank correlations were run (due to non-parametric data) between the eight goals listed in Table 7.3 and the five feeding practice subscales collected as part of the RCT (*healthy environment, family dinner frequency, modelling, involvement and encourage balance & variety*). Table 7.4 presents the statistically significant correlations arising from this analysis.

Table 7.4:

Significant correlations between mealtime goals and feeding practices (n = 363-461)

		Healthy environment	Family dinner frequency	Modelling	Involvement	Balance
Homemade food	r_s	0.23	0.16	0.25	0.13	0.28
	p	<0.001	<0.001	<0.001	<0.001	<0.001
Stress avoidance	r_s					0.14
	p					0.01
Family involvement	r_s		0.16	0.13	0.33	0.17
	p		<0.001	0.01	<0.001	<0.001
Shared family food	r_s		0.21			0.13
	p		<0.001			0.01
Ease of preparation	r_s	-0.18	-0.11	-0.11	-0.09	
	p	<0.001	0.04	0.02	0.04	
High & low fat regulation	r_s				0.16	
	p				<0.001	
Price	r_s					0.16
	p					<0.001
Occasional treats	r_s	-.226**				
	p	<0.001				

(Notably fewer people completed the family dinner frequency measure than the other feeding practice questions. The reasons for this are unclear).

Table 7.4 shows that the *homemade food* goal was positively associated with all five of the feeding practices. The *family involvement* goal was positively associated with all but one of the practices (*healthy environment*). Ease of preparation as a goal was also associated with all but one of the behaviours (*encourage balance & variety*), but the correlations were negative, indicating that high levels of endorsement of this goal are related to lower implementation of the associated practices.

7.4.4 Does goal conflict influence these relationships?

Correlation analyses.

Spearman's rank correlations were run between the conflict variables and the mealtime goals. Table 7.5 shows the arising statistically significant correlations.

Table 7.5

Significant correlations between mealtime goal and goal conflict measures (n=473-474)

		Cost conflict	Convenience conflict	Family preference conflict	Stress conflict
Homemade food	r_s				
	p				
Stress avoidance	r_s		0.12	0.13	0.18
	p		<0.001	0.002	<0.001
Family involvement	r_s				
	p				
Shared family food	r_s				
	p				
Ease of preparation	r_s		0.25	0.18	0.27
	p		<0.001	<0.001	<0.001
High & low fat regulation	r_s	0.16			
	p	<0.001			
Price	r_s	0.31			0.16
	p	<0.001			<0.001
Occasional treats	r_s			0.12	
	p			<0.001	

Stress avoidance and *ease of preparation* goals were both significantly associated with the *convenience*, *family preference* and *stress conflict* measures. Further notable correlations included *price* and *cost conflict*, and *occasional treats* and *family preference conflict*.

Mediation analyses & results.

The results in 7.4.4 above indicate that certain specific mealtime goals may be related to positive or negative feeding practices. It is feasible, however, that it is goal conflict rather than the goals themselves that influence these relationships. For

example, if an individual has a goal of avoiding stress and does not perceive feeding their child healthy food as stressful, this goal should not pose a problem. If, however, they *do* believe that providing healthy food is stressful, healthy feeding practices may be compromised as a result of the *stress avoidance* goal. With this in mind, goal conflict may mediate relationships between goals and practices.

The questions administered in the RCT were not designed with this specific hypothesis in mind, therefore the following mediation analyses are merely exploratory. The correlational data in tables 7.4 and 7.5 indicate that the *ease of preparation* goal may be a particularly strong predictor of feeding practices and conflict and for this reason it is used in the analyses below as the independent variable. *Healthy environment* has been selected as the outcome variable because it appears to be the feeding practice that most closely captures the selection and availability of healthy food referred to in the conflict measures. *Convenience conflict* has been selected as the mediating variable because the questionnaire item describes the independent and dependent variables conflicting, thus appears to be appropriate to test the mediation theory.

Baron & Kenny (1986) state that four conditions must be met in order to satisfy a fully mediated relationship.

- 1) The independent variable (*ease of preparation goal*) must predict the dependent variable (*healthy environment*).
- 2) The independent variable (*ease of preparation goal*) must predict the mediator (*convenience conflict*).
- 3) The mediator (*convenience conflict*) should predict the dependent variable (*healthy environment*), controlling for the independent variable.

4) When the independent variable and the mediator are both in a regression model, the path between the independent and dependent variables should be reduced to non-significance.

Mediation analyses were conducted and the results for each of the above statements are presented below.

1) *Ease of preparation* significantly (negatively) predicts *healthy environment* ($\beta=-1.61$, $t(459)=-3.90$, $p<0.001$)

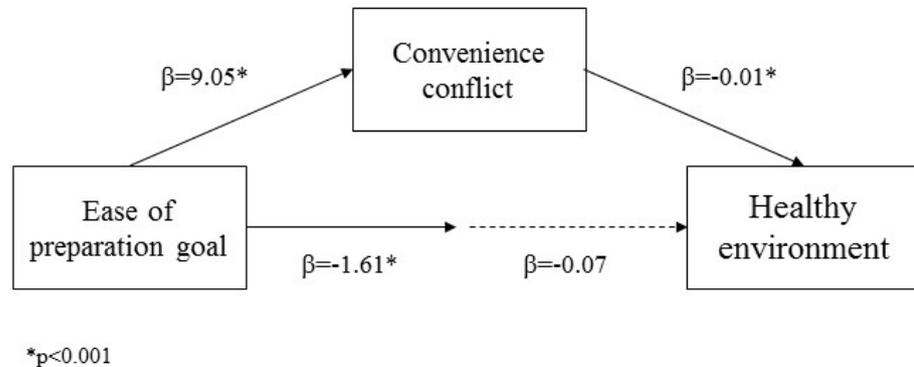
2) *Ease of preparation* significantly predicts *convenience conflict* ($\beta=9.05$, $t(459)=5.86$, $p<0.001$)

3) *Convenience conflict* significantly (negatively) predicts *healthy environment* ($\beta=-0.01$, $t(458)=-8.54$, $p<0.001$)

4) When controlling for the *convenience conflict*, *ease of preparation* no longer predicts *healthy environment* ($\beta=-0.07$, $t(458)=-1.80$, $p=0.073$).

Figure 7.1

Conflict as a mediator between goals and practice (example)



Mediation discussion.

The mediation analyses described above indicate that the conflict for parents between desire for quick meal preparation and healthy food for their children may mediate the negative relationship between the *ease of preparation* goal and the *healthy environment* factor. In other words, parents who perceive it to be difficult to prepare healthy meals quickly may account for the negative relationship between a goal of easy preparation and the provision and availability of healthy food.

However, the β values in these results are very small, suggesting that any influence that this particular goal and conflict has on *healthy environment* is likely to be limited. It is also important to remember that the conflict questions were not designed to map onto the mealtime goals in this way, and nor have they been psychometrically tested.

Nonetheless, there is some indication that conflict may have a role to play in this type of model. Future directions could include improving the conflict questions to

reflect the goals more closely and to give careful consideration over which feeding practices might be relevant.

7.4.5 Mealtime goal conclusions.

Collectively, these three sets of analyses indicate that parents in the RCT sample held goals that were aligned to the main aims of the intervention, that these goals were (to some extent) associated with their feeding practices and that goal conflict may mediate this relationship (although within this data-set, this relationship was only established with one specific goal, namely *ease of preparation*).

The correlational data in this study indicate that some goals may be broadly positively associated with ‘positive’ feeding practices, while others may be negatively associated with these. For example, the goal of *homemade food* was positively related to *healthy environment, family dinner frequency, modelling, involvement* and *encourage balance and variety* (all of which have been shown to relate to children’s healthy eating behaviours, Mitchell et al., 2013; Musher-Eizenman & Holub, 2007). *Ease of preparation*, on the other hand, was negatively associated with nearly all of these practices. This supports previous research that found that parental ‘convenience’ goals were associated with negative feeding practices such as using food as reward, and in turn with unhealthier eating by children (Hoffmann, Marx, Kiefner-Burmeister, & Musher-Eizenman, 2016; Kiefner-Burmeister, Hoffmann, Meers, Koball, & Musher-Eizenman, 2014). The same group also found that a general ‘health’ goal was associated with healthier feeding practices and eating behaviours. Conclusions from the current dataset are necessarily tentative because a broad range of feeding practices was not measured. Given that the Family Mealtime Goal Questionnaire examines feeding goals in a more specific way than the instruments used in previous research, it would be

interesting to further investigate the relationships between feeding goals and practices in more detail.

Similarly, the mediation model presented should be treated with caution. The β values are small and the p-value at Step 4 only just failed to meet the significance threshold. Nevertheless, the model warrants further research. The conflict measures were not designed with a mediation hypothesis in mind and have not been validated. Furthermore, they do not map directly onto the independent and dependent variables (i.e. the goal and the practice) so it is perhaps unsurprising that the model is weak.

The next step in this line of investigation could include administering the Comprehensive Feeding Practices Questionnaire (Musher-Eizenman & Holub, 2007), the Family Mealtime Goal Questionnaire and some carefully designed conflict measures to a large group of parents. This would provide the cross-sectional data and detail required to further examine the role that parents' goals and goal conflict might play in family mealtimes.

Chapter 8: Discussion & Synthesis

8.1 Introduction

This thesis comprises: a Systematic Review of healthy family eating interventions delivered in the family home: a detailed account of the development of an intervention targeting family eating: and a description of the randomised controlled trial to evaluate the efficacy of this intervention. It has also considered parents' principal motivators relating to their children's eating and the goals, and goal conflict that may affect both feeding practice and intervention outcomes.

The overarching aim of the research reported in this thesis was to investigate what help parents might seek from family eating interventions and to consider whether a focus on healthy, enjoyable family mealtimes might improve family eating behaviours.

8.2 Research Question 1: What strategies to improve family eating behaviours are effective?

8.2.1 Theory & evidence base

The Systematic Review in Chapter 2 concluded that, to be successful, healthy eating interventions for children and families should have a strong evidence base and be theoretically driven. Those studies that reported formative work around the intervention were notably more likely to report successful outcomes. It is unclear whether that is due to the nature of the formative work (e.g. consideration of theory) or whether it is a wider reflection of higher research and development quality, specifically attention to detail, transparent methodology and good reporting.

8.2.2 Delivery mode

No consistent mode of delivery was found to increase the likelihood of successful outcomes of these interventions. There did, however, appear to be a broad

difference in outcomes between interventions that were ‘person-delivered’ (where that person was a professional worker such as a psychologist, healthcare professional or trained telephonist) as opposed to ‘information-led’ (e.g. newsletters, information packs, etc.) whereby the person-delivered interventions appeared to be more effective.

8.2.3 Delivery mode: Mobile Health (mHealth)

The thesis has particularly focussed on mHealth because it seems to offer an up to date, practicable delivery mode. The Systematic Review findings supported this to a certain extent; although they emphasised the need for theory-led interventions in this field, it was also highlighted that the field is still in early stages of development and that some of the mHealth intervention studies included showed promise. This led to the design of the robustly evidence-based online intervention described in the chapters following the Review.

It is unclear how mHealth fits into the person/information distinction; some of the mHealth interventions included in the review follow a similar format to the ‘printed information’ interventions in the form of online newsletters or handouts. Others are more interactive, for example, requiring electronic responses from participants, sending reminders when individuals do not adhere to instructions and providing games or activities for participants and/or their children. Indeed the intervention reviewed that was arguably the most successful (EMPOWER, Knowlden & Sharma, 2016) was an mHealth intervention and demonstrated long term significant behaviour change in terms of children’s fruit and vegetable intake. Disappointingly, in spite of further published work reporting on this intervention (Knowlden, Sharma, Cottrell, Wilson, & Johnson, 2015), including careful description of the formative work as recommended above, there are no published details about what the ‘web-based’ intervention involved for the participants or about its contents. Without this kind of detail, it is impossible to

further unpick which elements of mHealth interventions may be more or less helpful. Attrition rates within mHealth studies tended to be high and more in line with the information/technology-delivered interventions described than those that were person-delivered. These attrition rates may be a reflection of engagement or enjoyment which in turn may explain why these types of interventions demonstrated less success. However, it has been suggested that mHealth attrition is ‘natural and typical’ (Kendall, 2003) and it is possible that low retention rates in some mHealth intervention studies have a different explanation than those in printed information studies, for example, recruiting participants who do not fall into the target audience.

8.2.4 Audience

The majority of the studies included in the review targeted parents as the agent of change. This is in line with current rationale (Golan, 2006). Of the studies that targeted children or adolescents, there was no systematic pattern as to whether particular modes or models appeared more effective. The RCT was intentionally inclusive of children’s ages, recruiting families with children aged 1 – 16 years. This decision was taken to facilitate sub-group analysis according to age. Unfortunately, both the small sample and the absence of between-group differences on outcome measures meant that it was difficult to establish whether any particular age groups had benefitted more or less than others.

Nevertheless, the review highlighted the importance of having a clear target audience. Interventions with a detailed description of target participant characteristics tended to be more successful. Conversely, one study (Croker et al., 2012) was notable in that its authors observed that participants were unclear about which family members the intervention was targeting. Perhaps unsurprisingly, this intervention was not deemed

effective. This evidence supports the concept that studies with closer attention to detail and higher quality reporting may be more likely to lead to success.

8.2.5 Exposure-based studies

Another finding in the Systematic Review was a relatively consistent short-term effect of exposure to healthy foods. In these studies, researchers typically encouraged parents to expose their child to a specific target fruit or vegetable for a series of days and then measured their liking of or willingness to taste the food at the end of the exposure period. Unfortunately, there were no similar studies with long term follow up so it is unclear whether there is a sustained effect, or whether parents would need to continue to expose their child to the target vegetable on a daily basis to maintain any behaviour change. This is arguably not a practical expectation, especially given the burden some parents reported in their feedback even after a relatively short period of time. On the other hand, a change in acceptance could mean that children continue to eat the target food and consequently continue to be exposed to it; exposure is arguably only burdensome when children do not accept the target food. Further work should explore the longer term effects resulting from exposure studies of this kind.

8.2.6 Effective strategies: conclusions

There is clear evidence to indicate that strategies to improve family eating behaviours should be theory- and evidence-based and that the target audience should be considered carefully. Further research could focus particularly on longer term exposure studies and on untangling the more effective elements of mHealth interventions.

8.3 Research Question 2: What goals do parents have around preparing meals and do they relate to feeding practices?

8.3.1 Goals

Some of the initial pilot work reported in the Intervention Development paper showed that parents were enthusiastic about a healthy eating intervention aimed at reducing stress around mealtimes and promoting happy meals, indicating that some parents might have feeding goals beyond health, such as stress reduction or shared family meals. The pilot work reported in Chapter 4 also identified the absence of an appropriate instrument to measure parents' mealtime goals, rendering further exploration of this idea difficult. This led to the analysis in the Mealtime Goals paper, which found seven mealtime goals that were psychometrically robust and emerged systematically from analyses of a range of different samples. The goals were: *stress/conflict avoidance, homemade food, shared family food, family involvement in mealtimes, price, occasional treats and high/low fat regulation. Ease of preparation* also emerged as a goal in some samples but this was not consistent and appeared to be a more coherent goal for parents of older children. Each of the goals is summarised below, followed by examination of the evidence from the Intervention Development paper and the RCT paper about how these goals might relate to feeding practices.

8.3.1.1 Stress/conflict avoidance.

This goal supports previous research that has indicated that stress and anxiety around mealtimes is widespread for parents (Bowen et al., 2014; Mascola, Bryson, & Agras, 2010) and that parents are keen to reduce such stress. It is perhaps not surprising then, that *stress/conflict avoidance* was the most strongly endorsed goal across all age groups. The individual items that form this goal have a focus on family arguments, indicating that parents would prefer to avoid such arguments and that they are a problem in the context of mealtimes.

8.3.1.2 Shared family food.

The *shared family food goal* was consistently and strongly endorsed by participants in all the questionnaire development studies and across age groups. This is encouraging because there is an extensive body of literature that describes the benefits of shared family meals, as noted in Chapter 1 (p.2). Individual items on this component focus particularly on family consumption of the same food, rather than on the mealtime itself. As noted in the introduction, parents cite stress and anxiety as barriers to shared family meals (p.2). The samples in the questionnaire development studies also strongly endorsed the *stress-avoidance* goal, indicating that these two goals might conflict for some parents. It is not possible to directly compare these goals from the current datasets to examine whether parents prioritise one goal over the other because the questions were not designed to assess this. Future work could explore this relationship by investigating parents' priorities and conflicts within the Family Mealtime Goals Questionnaire.

8.3.1.3 Homemade food.

The *homemade food* goal comprised three items which mostly focussed on the content of the food (i.e. raw or natural ingredients). Home-prepared food is more nutritious than processed and 'ready-made' food (Mills et al., 2017). This goal can therefore also be seen as a positive one and it is, again, encouraging to see that it was strongly endorsed.

8.3.1.4 Family involvement in mealtimes.

Evidence indicates that children's involvement in food choice and preparation can discourage neophobia and may contribute to a more balanced diet (Allirot et al., 2016). So *family involvement in mealtimes* can be seen as another 'positive' goal. This goal demonstrated higher variability in scores than some of the more strongly endorsed

goals. This may represent a difference in attitude; some parents may perceive children's involvement as helpful (e.g. laying the table), while others might be more inclined to see it as extra work (e.g. involving the child in cooking could lead to extra mess). It may, therefore, be useful to measure endorsement of the goal in the context of interventions encouraging more family involvement; as these might be more effective with parents who place importance on involving their children in mealtime preparations.

8.3.1.5 Price.

Price and budget have been reported in a number of qualitative studies as important motivators in parents' food choices for themselves and for their children (Carnell, Cooke, Cheng, Robbins, & Wardle, 2011; Moore, Tapper, & Murphy, 2010). It was therefore unsurprising that *price* emerged in the Mealtime Goals paper as a goal.

8.3.1.6 Occasional treats

Occasional treats measures endorsement of infrequent provision of unhealthy food and sugary snacks. The items are cautious in their wording, using the word 'sometimes' in both cases, hence the conclusion that these treats are occasional. Unfortunately, that means that it is not possible to use this questionnaire to measure frequency of unhealthy treats or levels of importance that parents place on their children receiving junk food and sugary snacks. No items with stronger wording reached the latter stages of the questionnaire development and parents did not express a desire to feed their children unhealthy food in the qualitative stages. This may be because parents are unlikely to have such a goal, but it might also be because of demand characteristics; they know they are not 'supposed to' feed their children unhealthy food and may be reluctant to report it as a goal. In reality, there are

convincing reasons parents might feed their children unhealthy food (e.g. palatability, reward, soothing, hedonism); if the questionnaire were to be developed further it might be interesting to revisit this factor and consider whether careful and non-emotive language could extract this goal (if indeed, it exists).

8.3.1.7 High and low fat regulation.

High and low fat regulation demonstrated the most variability of all the goals and it did not maintain its psychometric strength when examining only parents of pre-schoolers. This likely reflects mixed messages from health professionals about when and how to introduce ‘low fat’ options to young children (Vanderhout et al., 2019). It may also relate to weight control in some cases, which did not emerge as a goal in this study.

8.3.1.8 Ease of preparation.

Ease of preparation is the goal in the questionnaire that most closely aligns with ‘Convenience’, which has been used in previous research into feeding goals (Hoffmann et al., 2016; Kiefner-Burmeister et al., 2014; Roos, Lehto, & Ray, 2012). However, it is notably different in that it does not consider elements of convenience such as how easy it is to source the food, only how easy the food is to prepare (i.e. level of difficulty, speed of preparation). Arguably, *stress/conflict avoidance* addresses another element of Convenience in that it describes a goal of making life easier by reducing mealtime arguments. For some people, *family involvement in mealtimes* may even represent an aspect of Convenience because family members helping could reduce the work of the primary meal-preparer. This research therefore challenges some of the assumptions in previous literature around parents’ convenience goals. In particular, previous research has assumed that Convenience is a negative goal, associated with negative feeding

practices (see below for further discussion) and in conflict with a more global goal of 'Health'. The Family Mealtime Goals Questionnaire does not make such assumptions and by extrapolating different aspects of Convenience may aid future research in considering which elements facilitate healthy feeding and eating behaviours and which ones are obstacles to healthy behaviours.

It is also noteworthy that *ease of preparation* did not remain in the Confirmatory Factor Analysis (CFA) models as a coherent factor for pre-school or primary parents in the final sample. This was particularly interesting because both items on the component were, on average, strongly endorsed by all groups but the CFA models did not support their inclusion on the same factor, indicating that the items may not be interrelated. Given the psychometric strength of *ease of preparation* in other development analyses, it remains in the questionnaire for further investigation. On first reflection though, this may indicate ease of preparation means something different to parents of older children than those of younger children.

8.3.1.9 Absence of a global health goal.

The Family Mealtime Goals Questionnaire development work did not extract a more global 'health' goal, which was initially surprising. Existing studies have all considered 'health' as an important goal for parents when choosing food for their children (Hoffmann et al., 2016; Kiefner-Burmeister et al., 2014) and intuitively, one might expect health to be a priority for parents. However, the explanation for why the items related to general health were dropped in the questionnaire development sheds some light on this. The initial exploratory analyses did find a factor with high loadings whose items appeared to represent health more generally than some of the final specific components (e.g. 'I want to ensure my child has a balanced diet overall'). However,

these items were all severely skewed and received almost universal endorsement, rendering them unhelpful in terms of trying to differentiate parents' goals. For this reason, and in accordance with scale development advice (DeVellis, 2017; Hair, 2010), they were not included in the final questionnaire. In practice, this likely reflects the idea that 'health' is a universal goal across all parents (or at least all claim to endorse it) and therefore not a particularly useful element to measure in research. There remains the possibility that this might not be the case for certain sub-groups (for example, the samples in the Mealtime Goals paper were skewed towards more advantaged backgrounds) and for this reason, the 'global health' items are included as an appendix to the paper.

8.3.1.10 Other absent goals.

More widely, it is possible that the rigidity of the questionnaire design procedure has led to some mealtime goals dropping out of the questionnaire. Examples include avoiding fussy eating, food preferences/palatability, and satiation. Palatability (i.e. how much the child likes the food) is notably absent as it is commonly cited as a source of stress at mealtimes by parents (e.g. Bowen et al., 2014). All of the examples were cited in the qualitative work consistently but none emerged as psychometrically strong factors in the final questionnaire. This may be because they do not exist as coherent goals. However, it could also be due to the sample or to the wording of the items involved. For this reason, further work could consider re-introducing these concepts if the questionnaire is developed further.

8.3.3 Goals & feeding practices

The Intervention Development paper and the supplementary analyses to the RCT paper in Chapter 7 (p.132-133) both indicate that feeding goals do indeed relate to feeding practices. This supports previous research (Kiefner-Burmeister et al., 2014).

Broadly, it is possible to categorise the feeding practices measured in these two studies as positive practices, which are associated with children's healthy eating behaviours (*healthy environment, family dinner frequency, modelling, involvement, encourage balance & variety* in addition to *monitoring* in both studies, and *teaching about nutrition* in the pilot study only) and negative practices (*restriction, child control, emotion regulation, food as reward, and pressure*, all only measured in the pilot study).

In the supplementary analysis to the RCT, the goals *homemade food* and *family involvement in mealtimes* are consistently positively associated with positive feeding practices. In contrast, the goal *ease of preparation* is negatively associated with positive feeding practices. This is supported by the pilot work which, using the adapted Food Choice Questionnaire (Stephoe et al., 1995), found that *natural content* was associated with a number of positive feeding practices and negatively associated with negative practices. Conversely, *convenience* was negatively associated with positive practices and vice versa (p.51).

Goals, practices & conflict.

It is perhaps not surprising that feeding goals and practices should be associated with one another; behaviour change theories (e.g. Michie, 2014; Prochaska, 1982) would posit that parents who have a goal, and arguably therefore an intention, to carry out a specific feeding practice would be more likely to implement this practice than those who do not. The importance of the association between feeding practices and feeding goals may become apparent with further investigation into how goal conflict

fits into this relationship. It is thought that goal attainment is hindered when two goals conflict (Boudreaux & Ozer, 2013; Emmons & King, 1988). As described in the Mealtime Goals paper, the ‘negative’ goals described here may only present a problem to parents who hold one or more of these goals and perceive them to be mutually exclusive with a ‘positive’ goal. For example, a parent may endorse both the *homemade food* goal and the *ease of preparation* goal and find easy and quick ways of making homemade food. If, however, they believe that it is not easy to prepare homemade food, the goals can be said to conflict and one of them will likely be prioritised at the expense of the other (Papies, 2012).

The supplementary analysis in Chapter 7 (p.132-134) indicated that goal conflict might mediate the relationship between goals and practices, such that it is the conflict, rather than the goal itself which accounts for the association. The beta values in this analysis were weak and the study was not designed with this analysis in mind. Consequently any conclusions from this dataset are very tentative, but certainly provide enough evidence to warrant further investigation in the future.

8.4 Research Question 3: Can an online intervention, designed to support an enjoyable mealtime experience, help improve family eating behaviours?

Chapters 3, 4 and 5 reported the robust and careful design of, first, a healthy eating intervention delivered by email and, second, a randomised controlled trial (RCT) to test its efficacy. The intervention was evidence and theory-based with detailed accounts of the formative work as recommended in section 8.2.1 of this synthesis. Furthermore, the main themes of the intervention (healthy, happy, family) were in line with popular mealtime goals for parents (*homemade food*, *stress/conflict avoidance* and *shared family food*). It was surprising, therefore, that the RCT appeared to show no

greater effect on recipients of the intervention than recipients of a similar control email programme which focused on other health topics.

There are a number of reasons why the intervention may have been unsuccessful in this sense. The Systematic Review in Chapter 2 indicated that printed information interventions were not well-received by parents and did not tend to result in behaviour change. Although an email programme containing numerous links to appropriate web-based resources is arguably an 'online' intervention, it may be that in practice it resembles printed information too much for parents. To a certain extent, the decision to deliver an email programme (as opposed to a smartphone application or interactive website, for example) was a pragmatic one. Netmums had already set up the technology necessary to deliver the email programme and budget was limited so the development of a new smartphone application was not feasible. There was some indication in the Systematic Review that mHealth more generally could offer an effective channel for behaviour change intervention, however this did not result in a specific recommendation to develop more email programmes. Indeed, had the project aim been to develop an intervention from scratch, as opposed to refining an existing one, the intervention may have looked very different. Furthermore, when the original intervention was first piloted, nearly ten years ago, email newsletters were less common whereas nowadays, many people receive several communications from private organisations every day, sometimes referred to as 'email overload' (Grevet et al., 2014). These communications often involve marketing and recruitment campaigns and may be perceived as a nuisance. It is feasible that participants were more likely to classify the HHFE emails as 'nuisance emails' in 2019 than they were during the 2010 study, and perhaps even the 2016 study.

The review also suggested that participants may be more likely to respond to interactive mHealth interventions than those which are purely information-led. These may involve, for example, requests for responses, prompts or games and quizzes. In this sense, the HHFE offered very little interaction (participants were invited to contribute to an online chat-room, but none did). A study examining attrition rates in internet health interventions found that participants were more likely to stay in a study if they had 'live' follow up with a researcher rather than automated follow up (Geraghy et al., 2012). This study may help explain the HHFE RCT results in two ways; it is both an indicator that participants prefer interaction or human contact to fully automated contact and also explains the high attrition rate at follow up, which was fully automated.

Aside from the format of the intervention, it is also possible that the content was off-putting for parents. As described in the Intervention Development paper, substantial research was conducted into the topics that parents would like addressed in an intervention of this kind, as well as into ensuring the language was well-received and the key messages were enjoyed. However, it is still possible that the emails were perceived as overly prescriptive and that this might be interpreted as patronising. The intervention premise emphasised health and happiness. Revisiting the goal study outcomes, 'health' did not emerge as a clear goal for parents. It is viable that parents might therefore be more responsive to interventions simply focused on the 'happy' element; future intervention studies of this kind could consider promoting a stress-free, happy environment for family mealtimes, with less (or no) emphasis on health.

8.5 Strengths and limitations of the studies

Individually, the strengths and limitations of the studies have been considered in the separate papers. This section therefore aims to consider the studies collectively with regards to strengths and limitations.

In all three empirical papers (i.e. Intervention Development paper, Mealtime Goals paper and RCT paper), samples lacked diversity. As a whole, participants represented higher than average education levels, were disproportionately employed in managerial and professional positions and were predominantly white. Furthermore, in the RCT paper, parents reported higher baseline levels of positive feeding behaviours than many other studies using the same measures. This presents two potential problems: 1) the sample may not truly represent the proportion of the population that would like and would benefit from help with family mealtimes and 2) methodologically, there is little scope for improvement on some of the measures, rendering it difficult to establish whether the intervention could have greater impact in other groups. On a related note, the Mealtime Goals paper notes that the skewed sample means that it is not possible to establish whether the goals found in this study represent those of the wider parenting population.

However, the studies also shared some strengths. All three papers were robustly grounded in theory. Most also had substantial sample sizes. The exception to this was the RCT, for which recruitment was a struggle. Chapter 5 outlines some of the possible reasons for this; briefly, these reasons likely relate to the pragmatic decisions taken around recruitment methods and intervention design, potentially targeting the ‘wrong’ group (i.e. people already engaged with improving their children’s health) and/or losing engagement due to intervention delivery method.

8.6 Implications arising from the thesis

A number of implications arise from this body of work, most of which centre of the design and delivery of relevant interventions. Although unconfirmed, it seems likely that one of the off-putting elements of the HHFE intervention was its delivery method. This is supported by the Systematic Review findings and indicates that future research should consider carefully what delivery methods might be preferred by recipients, remembering also that this might vary between different groups. The thesis has also noted the consistently high socio-economic status of participants, both in the thesis studies and those included in the Systematic Review. This indicates that further work should be undertaken to understand how best to recruit parents from a lower socio-economic status, but also how to engage their interest. All the preliminary work in the thesis studies suffered from the same challenge, so it remains unclear whether people from other demographics would have the same priorities as those expressed in the formative work for this intervention.

No evidence has arisen during the course of these studies to suggest it is not wise to consider what parents want when designing children's eating behaviour interventions; in this sense considering mealtime motivations when designing the intervention remains pertinent. However, the research has highlighted that there could be mismatches in this context; either between what people say they want and what they actually want (e.g. some of the expected goals dropping out due to complete endorsement) or mismatches between different groups' goals and motivations (i.e. according to characteristics such as number of children, child age, socio-demographic status etc.). A further implication of the research overall, therefore, is the idea that researchers in this field should continue to try to understand parents' desires, priorities

and motivations and to cross-check these against their intervention contents to ensure the intervention remains attractive and is perceived as useful.

8.7 Future work

Goals and goal conflict in the context of family eating remain poorly understood. Family healthy eating interventions may need to be more closely aligned with parents' goals. Previous research into family healthy eating interventions has looked at goal setting from a selection of prescribed goals (e.g. Draxten, Flattum, & Fulkerson, 2016) but no studies to date have asked more broadly about feeding goals and then tailored interventions to these goals. For example, the Family Mealtime Goals Questionnaire could be administered to parents at the start of an intervention study, and the intervention they then receive could be based on their levels of endorsement. Someone who endorsed *stress/conflict avoidance*, for example, could receive an intervention focussed on reducing arguments and stress around mealtimes while someone who endorsed *family involvement in meal preparation* could receive a similar intervention but with more emphasis on finding ways to involve the children in food preparation and food choice. This could result in more engaged and motivated participants and, potentially, greater behaviour change. *Stress/conflict avoidance* is of particular interest because there is evidence to suggest that this goal might hinder healthy feeding practices. The questionnaire would likely need further development for this; specifically, it would be useful to find a way of measuring parents' priorities against each other (i.e. do they endorse one goal specifically more than another) and of measuring goal conflict.

Further research should also consider the mechanisms that are thought to drive the health associated with shared family eating. These are currently unclear (Hammons

& Fiese, 2011), but it is possible that simply encouraging and increasing stress-free family meals could lead to a healthier family eating environment. If that is the case, there is a rationale for ignoring the health message altogether if it is found to be off-putting for parents.

The main limitations in the thesis studies, outlined in the papers themselves and in section 8.5 (i.e. lack of diversity in the sample, self-selective recruitment), highlight a further line for future enquiry. It is disappointing but perhaps not surprising that these limitations remained in spite of efforts to counter them; many other studies have faced the same challenges as highlighted in the Systematic Review. Before even more new interventions are developed, it would be wise to step back and research more deeply the motivations and preferences of parents from lower-socio economic backgrounds. This would be in terms both of their mealtime motivations and also the barriers and facilitators to engaging with interventions and intervention studies (these might be different across the two areas). This would likely take the form of qualitative research in the first instance to try and gather a much deeper understanding.

A similar approach would be appropriate when considering the different challenges and approaches that may exist between parents of children of different ages. Research in this field has predominantly involved parents of younger children; understanding around adolescents in a family eating context is more limited. Parents likely face different challenges and have different mealtime motivations but qualitative research around this is scarce. If in-depth qualitative research can begin to explore these ideas, intervention designers might be able to deliver more tailored and appropriate support.

As discussed in section 8.2.3, mHealth family eating interventions may need to be more interactive. Smartphone applications (apps) offer a variety of features that could aid this demand (e.g. games, communications, reminders etc.). These are expensive to maintain (Bartle, 2015) but as smartphones become increasingly commonplace, there may be an expectation amongst parents that this is how interventions of this kind should be delivered; it may be the most convenient mode of delivery and therefore the most likely to maintain engagement.

Finally, there is some evidence to indicate that parents are reasonably aware of what constitutes a healthy diet for their children and of how they might go about delivering this (McDonald, Dawkins-Moultin & McWhinney, 2018). The evidence base considering motivations for healthy feeding practices is increasing, but there is very little information available about what drives parents to implement negative feeding practices. Future work could investigate facilitators to negative feeding practices as well as barriers to positive ones.

8.8 Conclusions

Collectively, the studies reported in this thesis indicate that research in the field of children's eating behaviours should consider what parents *want* in terms of help with their children's eating rather than what researchers think they need. The Systematic Review concluded that family healthy eating interventions need to be theoretically driven with detailed formative work in order to be successful. This guidance was implemented in the design procedure of the Healthy Happy Family Eating programme. Despite extensive pilot work establishing the goals and intervention expectations of the target audience, the intervention did not appear to invoke behaviour change above and beyond the change that resulted within the control condition. Future interventions

should consider parents' mealtime goals, how these interact with feeding practices and whether, in order to achieve family eating behaviour change, the 'healthy' message should be disregarded altogether.

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Appendix 1: Complete online questionnaire for pilot study in Chapter 4 including participant information & consent

*[NB UoR logo was provided on screen as with other consent forms and
information sheets]*

Title of Study: Healthy Happy Eating Course: A Pilot

PARTICIPANT INFORMATION

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Experimenters:

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We would be grateful to you if you could assist us by participating in our study exploring family healthy eating. This involves participating in an online course that Netmums, the parenting website, has designed. The aim of the course is to help parents and families eat more healthily and happily.

If you agree to participate, first you would complete an online questionnaire. This would take about 25 minutes. You will then be signed up to the online course. The course consists of 9 emails sent over a 4-week period, which offer tips, suggestions and challenges around family eating. When the course has finished, you will be asked to complete another questionnaire, similar to the one you completed at the start.

Your data will be kept confidential and securely stored, with only an anonymous number identifying it. Information linking that number to your name will be stored securely and separately from the data you provide us. All information collected for the project will be destroyed after a period of 3 years

from the completion of the project has elapsed. Taking part in this study is completely voluntary; you may withdraw at any time without having to give any reason. Please feel free to ask any questions that you may have about this study at any point.

This application has been reviewed by the University Research Ethics Committee and has been given a favourable ethical opinion for conduct

Thank you for your help.

CONSENT

I understand that my participation in this study is voluntary and that I may withdraw any time without giving any reason. *(Agree/disagree)*

I have read the information above about this study. *(Agree/disagree)*

I have been given the opportunity to ask any questions that I may have about the study and these have been answered to my satisfaction. *(Agree/disagree)*

[Participants could then press 'next'. If they had agreed to all consent questions they were taken through to the following questionnaire. If they had not, they were taken to a screen that thanked them for their time and explained that on this occasion they were not eligible to take part due to their disagreement with one or more of the statements]

QUESTIONNAIRE

[Demographic questions were delivered at Time 1 only. Feedback questions were delivered at Time 2 only. All other questions were administered at Time 1 and Time 2]

Demographics

How many children do you have who reside with you at least half of the time over the age of 1 year and under the age of 16 years? *[Number only response accepted]*

[Participants who entered '0' were directed to a page thanking them for their time and explaining that they were not eligible to take part because they had indicated that they did not have any children]

For each child you have who is over 1 year old and under 18 years old, please indicate their age: (If you have more than 6 children, please enter the ages of

the youngest 6). *[Boxes to enter the ages of up to six separate children provided]*

Over the survey, we will be asking you some questions about your children and their eating habits. We would like you to choose one child and answer the questions about that child throughout the survey. You can choose whoever you like. Please enter the first name of the child you have chosen. This information will only be used as a reminder for your own use throughout the survey. It will not be kept on our records and all information you give us will remain anonymous. *[Open-ended]*

Is there a particular reason why you chose that child? If so, what was it?
[Open-ended]

What is your relationship to this child? *[Open-ended]*

And roughly how many meals each week are you responsible for providing?
[Number only response accepted]

What is your age? *[Number only response accepted]*

What is your gender? *[Male/Female]*

Which of the following most closely describes your working status? *(Higher managerial, administrative or professional/Intermediate managerial, administrative or professional, Supervisory or clerical and junior managerial, administrative or professional, Skilled manual worker/Semi-skilled or unskilled manual worker/unemployed/student/retired/other (please specify)).*

[The following questionnaires are labelled within the Appendix but participants did not see questionnaire titles on screen]

Adult neophobia scale

Please answer the questions below with reference to **the past month**.

Please tick the box that best describes **YOUR OWN** attitude towards food.

I am constantly sampling new and different foods

I don't trust new foods

If I don't know what is in a food, I won't try it

I like foods from different countries

I am put off by the appearance of food from other cultures

At dinner parties, I will try a new food

I am afraid to eat things I have never had before

I am very particular about the foods I will eat

I will eat almost anything

I like to try new restaurants that serve food from other cultures

[Agree strongly, Agree moderately, Agree slightly, Neither agree nor disagree, Disagree slightly, Disagree moderately, Disagree strongly]

Child neophobia scale

Please answer the questions below with reference to **the past month**.

Please tick the box that best describes your child, XXX's attitude towards food.

My child does not trust new foods

If my child doesn't know what's in a food, s/he won't try it

My child is afraid to eat things s/he has never had before

My child will eat almost anything

My child is very particular about the foods s/he will eat

My child is constantly sampling new and different foods

[Strongly agree, Agree, Disagree, Strongly disagree]

Child liking of fruit & vegetables

In general, how much does your child XXX like fruit?

[Never tried, Strongly dislikes, Dislikes, Neither likes nor dislikes, Likes, Strongly likes]

In general, how much does your child XXX like vegetables?

[Never tried, Strongly dislikes, Dislikes, Neither likes nor dislikes, Likes, Strongly likes]

Child fruit & vegetable consumption & availability

For each of the foods below, please indicate how often you offer the food to your child, XXX and how often they consume it.

Apples

Pears

Oranges, Satsuma or Mandarin

Bananas

Grapes

Melon

Peaches

Plums

Apricots

Strawberries
Raspberries
Kiwi fruits
Tinned fruit (e.g. Peaches)
Dried fruit (e.g. raisins)
Fruit juice/ Smoothie
Artichoke
Asparagus
Aubergine
Baked beans
Beans and pulses
Beetroot
Broad beans
Broccoli
Brussel Sprouts
Butternut squash
Carrot
Cauliflower
Celery
Chard
Courgette
Cucumber
Endive (chicory)
Fennel
Green beans
Green cabbage (eg: Savoy or Sweetheart)
Kale
Kohlrabi
Leeks
Lettuce
Mangetout
Marrow
Mixed vegetables – frozen or tinned
Mushrooms
Onions

Pak choi
Parsnip
Peas
Peppers
Potato
Pumpkin
Radishes
Red cabbage
Rocket
Runner beans
Spinach
Spring greens
Spring onions
Swede
Sweet corn
Sweet potato
Tomatoes
Turnips
Watercress
White cabbage
Other fruit or veg (please specify)

*[Offered: never, less than monthly, fortnightly, weekly, several days per week.
Consumed: never, less than monthly, fortnightly, weekly, several days per week]*

Child Eating Behaviour Questionnaire (CEBQ)

For the statements on the following table, please indicate how often each one is true of your child, XXX.

My child loves food
My child eats more when worried
My child has a big appetite
My child finishes his/her meal quickly
My child is interested in food
My child is always asking for a drink
My child refuses new foods at first

My child eats slowly
My child eats less when angry
My child enjoys tasting new foods
My child eats less when s/he is tired
My child is always asking for food
My child eats more when annoyed
If allowed to, my child would eat too much
My child eats more when anxious
My child enjoys a wide variety of foods
My child leaves food on his/her plate at the end of a meal
My child takes more than 30 minutes to finish a meal
Given the choice, my child would eat most of the time
My child looks forward to mealtimes
My child gets full before his/her meal is finished
My child enjoys eating
My child eats more when she is happy
My child is difficult to please with meals
My child eats less when upset
My child gets full up easily
My child eats more when s/he has nothing else to do
Even if my child is full up s/he finds room to eat his/her favourite food
If given the chance, my child would drink continuously throughout the day
My child cannot eat a meal if s/he has had a snack just before
If given the chance, my child would always be having a drink
My child is interested in tasting food s/he hasn't tasted before
My child decides that s/he doesn't like a food, even without tasting it
If given the chance, my child would always have food in his/her mouth
My child eats more and more slowly during the course of a meal
[Never, Rarely, Sometimes, Often, Always]

Parent Eating Behaviour Questionnaire (adapted from CEBQ)

For the statements on the following table, please indicate how often each one is true of you.

I love food

I eat more when I am worried
I have a big appetite
I finish my meals quickly
I am interested in food
I always like to have a (non-alcoholic) drink
I reject new foods at first
I eat slowly
I eat less when I am angry
I enjoy tasting new foods
I eat less when I am tired
I always want food
I eat more when I am annoyed
If I could, I would eat too much
I eat more when I am anxious
I enjoy a wide variety of foods
I leave food on my plate at the end of a meal
I take more than 30 minutes to finish a meal
Given the choice, I would eat most of the time
I look forward to mealtimes
I get full before my meal is finished
I enjoy eating
I eat more when I am happy
I am difficult to please with meals
I eat less when I am upset
I get full up easily
I eat more when I have nothing else to do
Even if I'm full up, I find room to eat my favourite food
If given the chance, I would drink (non-alcoholic) drinks continuously through the day
I cannot eat a meal if I have had a snack just before
If given the chance, I would always be drinking a (non-alcoholic) drink
I am interested in tasting food I haven't tasted before
I decide that I don't like a food, even without tasting it
If given the chance, I would always have food in my mouth
I eat more and more slowly during the course of a meal

[Never, Rarely, Sometimes, Often, Always]

Comprehensive Feeding Practices Questionnaire (CFPQ)

For each of the statements below, please think about your **child XXXX** and tell us how often each of the statements applies to you.

How much do you keep track of the sweet foods (sweets, ice cream, cake, pies, pastries) that your child eats?

How much do you keep track of the snack food (e.g. crisps) that your child eats?

How much do you keep track of the high-fat foods that your child eats?

How much do you keep track of the sugary drinks (e.g. fizzy drinks) this child drinks?

Do you let your child eat whatever s/he wants?

At dinner, do you let this child choose the foods s/he wants from what is served?

When this child gets fussy, is giving him/her something to eat or drink the first thing you do?

Do you give this child something to eat or drink if s/he is bored even if you think s/he is not hungry?

Do you give this child something to eat or drink if s/he is upset even if you think s/he is not hungry?

If this child does not like what is being served, do you make something else?

Do you allow this child to eat snacks whenever s/he wants?

Do you allow this child to leave the table when s/he is full, even if your family is not done eating?

Do you encourage this child to eat healthy foods before unhealthy ones?

Most of the food I keep in the house is healthy.

I involve my child in planning family meals.

I keep a lot of snack food (e.g. crisps) in my house.

My child should always eat all of the food on his/her plate.

I have to be sure that my child does not eat too many high-fat foods.

I offer my child his/her favourite foods in exchange for good behaviour.

I allow my child to help prepare family meals.

If I did not guide or regulate my child's eating, s/he would eat too much of his/her favorite foods.

A variety of healthy foods are available to my child at each meal served at home.

I offer sweets (sweets, ice cream, cake, pastries) to my child as a reward for good behavior.

I encourage my child to try new foods.

I discuss with my child why it's important to eat healthy foods.

I tell my child that healthy food tastes good.

I encourage my child to eat less so he/she won't get fat.

If I did not guide or regulate my child's eating, he/she would eat too much junk food.

I give my child small helpings at meals to control his/her weight.

If my child says, "I'm not hungry," I try to get him/her to eat anyway.

I discuss with my child the nutritional value of foods.

I encourage my child to participate in grocery shopping.

If my child eats more than usual at one meal, I try to restrict his/her eating at the next meal.

I restrict the food my child eats that might make him/her fat.

There are certain foods my child shouldn't eat because they will make him/her fat.

I withhold sweets/dessert from my child in response to bad behaviour.

I keep a lot of sweets (sweets, ice cream, cake, pies, pastries) in my house.

I encourage my child to eat a variety of foods.

If my child eats only a small helping, I try to get him/her to eat more.

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

I don't allow my child to eat between meals because I don't want him/her to get fat.

I tell my child what to eat and what not to eat without explanation.

I have to be sure that my child does not eat too many sweets (sweets, ice cream, cake, or pastries).

I model healthy eating for my child by eating healthy foods myself.

I often put my child on a diet to control his/her weight.

I try to eat healthy foods in front of my child, even if they are not my favourite.

I try to show enthusiasm about eating healthy foods.

I show my child how much I enjoy eating healthy foods.

When he/she says he/she is finished eating, I try to get my child to eat one more (two more, etc.) bites of food.

[Never, Rarely, Sometimes, Mostly, Always OR Disagree, Slightly disagree, Neutral, Slightly agree, Agree].

Frequency of family meals

How many times in the last week has your child, XXX, eaten...

With parents and brothers/ sisters/other children

With another adult (e.g. relative, child minder) and brothers/sisters/other children

With parent(s) only

With other adults only

With other children only

Alone

[Number response required for each option]

Food Choice Questionnaire

Please think about how important the following things are when choosing the food you eat on a typical day **for yourself**, and when choosing food for your child, XXX.

Is easy to prepare

Contains no additives

Is low in calories

Tastes good

Contains natural ingredients

Is not expensive

Is low in fat

Is familiar

Is high in fibre and roughage

Is nutritious

Is easily available in shops and supermarkets

Is good value for money

Cheers me up

Smells nice

Can be cooked very simply

Helps me cope with stress

Helps me control my weight

Has a pleasant texture

Is packaged in an environmentally friendly way

Comes from countries I approve of politically
Is like the food I ate when I was a child 0-66
Contains a lot of vitamins and minerals
Contains no artificial ingredients
Keeps me awake/alert
Looks nice
Helps me relax
Is high in protein
Takes no time to prepare
Keeps me healthy
Is good for my skin/teeth/hair/nails etc
Makes me feel good
Has the country of origin clearly marked
Is what I usually eat
Helps me to cope with life
Can be bought in shops close to where I live or work
Is cheap

[Very important, Important, Not important, Not at all important. Boxes provided to respond for participant and for child]

Mindful Eating Questionnaire

Please indicate how strongly you agree or disagree with the statements below.

I stop eating when I'm full even when eating something I love.
When a restaurant portion is too large, I stop eating when I'm full.
When I eat at "all you can eat" buffets, I tend to overeat.
If there are leftovers that I like, I take a second helping even though I'm full.
If there's good food at a party, I'll continue eating even after I'm full.
When I'm eating one of my favorite foods, I don't recognize when I've had enough.
When I'm at a restaurant, I can tell when the portion I've been served is too large for me.
If it doesn't cost much more, I get the larger size food or drink regardless of how hungry I feel.
I notice when there are subtle flavours in the foods I eat.
Before I eat I take a moment to appreciate the colours and smells of my food.

I appreciate the way my food looks on my plate.
When eating a pleasant meal, I notice if it makes me feel relaxed.
I taste every bite of food that I eat.
I notice when the food I eat affects my emotional state.
I notice when foods and drinks are too sweet.
I recognise when food advertisements make me want to eat.
I notice when I'm eating from a dish of sweets just because they're there.
I recognise when I'm eating and not hungry.
I notice when just going into a cinema makes me want to eat sweets or popcorn.
When I eat a big meal, I notice if it makes me feel heavy or sluggish.
At a party where there is a lot of good food, I notice when it makes me want to eat more food than I should.
When I'm sad I eat to feel better.
When I'm feeling stressed at work I'll go find something to eat.
I have trouble not eating ice cream, cookies, or chips if they're around the house.
I snack without noticing that I am eating.
My thoughts tend to wander while I am eating.
I think about things I need to do while I am eating.
I eat so quickly that I don't taste what I'm eating.
[Strongly agree, Agree, Disagree, Strongly disagree]

Three-factor Eating Questionnaire

Please indicate how true the following statements are for you.

I get so hungry that my stomach often seems like a bottomless pit.
I am always hungry so it is hard for me to stop eating before I finish the food on my plate.
When I smell a delicious food, I find it very difficult to keep from eating, even if I have just finished a meal.
Do you go on eating binges though you are not hungry?
Sometimes when I start eating, I just can't seem to stop.
I am always hungry enough to eat at any time.
When I see a real delicacy, I often get so hungry that I have to eat right away.
Being with someone who is eating often makes me hungry enough to eat also.
I consciously hold back at meals in order not to gain weight.

I deliberately take small helpings as means of controlling my weight.

I do not eat some foods because they make me fat.

When I feel blue, I often overeat.

When I feel anxious, I find myself eating.

When I feel lonely, I console myself by eating.

[Definitely true, Mostly true, Mostly false, Definitely false]

How frequently do you avoid 'stocking up' on tempting foods?

[Almost never, Seldom, Usually, Almost always]

How likely are you to consciously eat less than you want?

[Unlikely, Slightly likely, Moderately likely, Very likely]

How often do you feel hungry?

[Only at mealtimes, Sometimes between meals, Often between meals, Almost always]

On a scale of 1 to 8, where 1 means no restraint in eating and 8 means total restraint, what number would you give yourself?

[Number response required]

Raw ingredients measure

On roughly how many occasions in the last week have you cooked a meal from scratch for your family?

[Number response required]

Food expenditure measure

Please indicate on the scale below how much money you have spent on you and your family's food this week, including any money you have spent on eating out (if you're not sure, please make a guess):

£0 ←—————→ £500

Netmums measure

How strongly do you agree with the following questions on a scale of 1 to 10, where 1 means strongly disagree and 10 means strongly agree?

We have happy mealtimes in our house.

I am well organised when it comes to family eating and mealtimes.

I am inspired to try new recipes and food ideas.

I am happy to cook

I am concerned that we aren't eating a healthy diet (R)

I feel confident about using food labels

I often choose unhealthy options because they are more convenient (R)

[Scale of 1-10 presented]

Feedback

We are very interested in hearing about your experiences of the HHFE course. In the boxes below, please tell us about 3 things that you enjoyed, or thought were positive about the course, and 3 things that you did not like, or thought were negative.

First positive thing:

[Open-ended]

And on a scale of 1 to 5, how positively did you feel about this, where 1 is slightly positive and 5 is extremely positive?

[Scale of 1 – 5 presented]

Second positive thing:

[Open-ended]

And on a scale of 1 to 5, how positively did you feel about this, where 1 is slightly positive and 5 is extremely positive?

[Scale of 1 – 5 presented]

Third positive thing:

[Open-ended]

And on a scale of 1 to 5, how positively did you feel about this, where 1 is slightly positive and 5 is extremely positive?

[Scale of 1 – 5 presented]

First negative thing:

[Open-ended]

And on a scale of 1 to 5, how negatively did you feel about this, where 1 is slightly negative and 5 is extremely negative?

[Scale of 1 – 5 presented]

Second negative thing:

[Open-ended]

And on a scale of 1 to 5, how negatively did you feel about this, where 1 is slightly negative and 5 is extremely negative?

[Scale of 1 – 5 presented]

Third negative thing:

[Open-ended]

And on a scale of 1 to 5, how negatively did you feel about this, where 1 is slightly negative and 5 is extremely negative?

[Scale of 1 – 5 presented]

Thank you for completing this questionnaire. Your responses will help us better understand people's attitudes around food in the family home.

SECTION 1: APPLICATION DETAILS**1.1 Project and Dates**Project title: **Healthy Happy Eating Course: A Pilot**Date of submission: **05-Jan-2016**Start date: **15-Jan-2016**End date: **30-Sep-2019****1.2 Applicant Details****Principal Investigator**Name: **Dr Kate Harvey**Position: **Academic Staff**Institution/Department: **PCLS**Email: **k.n.harvey@reading.ac.uk**Office room number: **297**

Internal tel.:

Other tel.: [Click here to enter text.](#)

(Please note that an undergraduate or postgraduate student cannot be a named principal investigator for research ethics purposes. The supervisor must be declared as Principal Investigator)

Other ApplicantsName: **Sarah Snuggs**Position: **Student**Institution/Department: **PCLS**Email: **s.j.snuggs@pgr.reading.ac.uk**Name: [Click here to enter text.](#)Position: [Choose an item.](#)Institution/Department: [Click here to enter text.](#)Email: [Click here to enter text.](#)Name: [Click here to enter text.](#)Position: [Choose an item.](#)Institution/Department: [Click here to enter text.](#)Email: [Click here to enter text.](#)Name: [Click here to enter text.](#)Position: [Choose an item.](#)Institution/Department: [Click here to enter text.](#)Email: [Click here to enter text.](#)**1.3 Project Submission Declaration**

I confirm that to the best of my knowledge I have made known all information relevant to the Research Ethics Committee and I undertake to inform the Committee of any such information which subsequently becomes available whether before or after the research has begun.

I understand that it is a legal requirement that both staff and students undergo Disclosure and Barring Service checks when in a position of trust (i.e. when working with children or vulnerable adults).

I confirm that if this project is an interventional study, a list of names and contact details of the participants in this project will be compiled and that this, together with a copy of the Consent Form, will be retained within the School for a minimum of five years after the date that the project is completed.

 (Signed, Principal Investigator)
05-Jan-2016

Date

 (Signed, Other named investigator)
[Click here to enter a date.](#)

Date

 (Signed, Other named investigator)
[Click here to enter a date.](#)

Date

 (Signed, Other named investigator)
[Click here to enter a date.](#)

Date

 (Signed, Other named investigator)
[Click here to enter a date.](#)

Date**1.4 University Research Ethics Committee Applications**

Projects expected to require review by the University Research Ethics Committee (such as, for example, research involving NHS patients, research involving potential for distress to participants) must be reviewed by the Chair of the School Ethics Committee or the Head of School before submission. Please ask PCLSEthics@reading.ac.uk if unsure whether your project needs UREC approval.

 (Signed, Chair of School Research Ethics Committee)
14-Jan-2016

Date

 (Signed, Head of School)
[Click here to enter a date.](#)

Date

1.5 External Research Ethics Committees

Please provide details below of other external research ethics committees to which this project has been submitted, or from whom approval has already been granted (e.g. NHS Committee)

Name of committee	Date of submission/approval	Reference	Status
Click here to enter text.	Click here to enter a date.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter a date.	Click here to enter text.	Click here to enter text.
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SECTION 2: PROJECT DETAILS

2.1 Lay Summary

Please provide a summary of the project in non-specialist terms, which includes a description of the scientific background to the study (existing knowledge), the scientific questions the project will address and a justification of these. Please note that the description must be sufficient for the committee to take a reasonable view on the likely scientific rigour and value of the project.

Background

Unhealthy diets in children are a major problem in the UK and can put children at risk of a wide range of health issues, initially in childhood, and then adulthood (Unicef, 2013; WHO, 2015). There is evidence to suggest that positive eating behaviours encouraged at home can protect children against some of these health issues (Mitchell, Farrow, Haycraft, & Meyer, 2013). There is also some suggestion that parents may employ more positive feeding strategies if they are not anxious themselves (Ogden, 2014). Therefore, interventions to improve healthy eating in children should focus not only on teaching parents healthy eating habits and feeding strategies, but also on encouraging a relaxed and stress-free environment in which to implement them.

Netmums, the parenting website, recognised the need for such an intervention and created The Healthy Happy Family Eating (HHFE) course. This consists of nine emails, delivered to parents over a 4-week period. The emails provide information on food swaps, healthy recipes, tips to encourage 'fussy' eaters and ideas for activities to focus the family on food and cooking. There is an emphasis on enjoyment and 'happy' mealtimes. In 2010, a pilot study was conducted to assess the effectiveness of the HHFE, with positive results (Court, Vince-Cain, & Jefferson, 2010). Participants (N=528) answered questions on 7 Likert-scale measures (e.g. 'I am happy to cook') before and after completing the course, and scores increased significantly on all measures.

In 2016, a large randomised controlled trial (RCT) will be conducted by the University of Reading (UoR) to evaluate the HHFE course. Ahead of this trial, there is a need to refine the course to ensure that the evidence base for each element of the intervention is robust and that it is acceptable to parents. The current proposal outlines plans for a new pilot study designed to inform the RCT.

Aims & Objectives

- To establish the acceptability and feasibility of the HHFE course by obtaining qualitative and quantitative feedback from parents
- To determine the best primary and secondary outcome measures for the RCT from a pool of potential instruments.
- To determine appropriate inclusion/exclusion criteria for the RCT (e.g. to consider whether there should be an upper age limit for the children of participating parents)

2.2 Procedure

Please briefly describe what the study will involve for your participants and the instruments and methodology to be undertaken.

Think-aloud stage

Because some of the measures have been developed by the researchers, it is important to establish face validity. An effective way of achieving this is to invite an opportunity sample (N=5) to complete the questionnaire while thinking aloud (Ericsson & Simon, 1993, Darker & French, 2009). It will be explained to these participants that we will shortly be starting a study looking into children's eating behaviours and that we want to check that people understand questions in the way in which they are meant. They will be asked to 'think aloud' and say everything they are thinking as they read each question and will be encouraged to talk constantly. The frequency of problems for each question will be recorded, along with the proportions of different kinds of problems. The questionnaire will be amended accordingly to ensure that it is easy to understand and to complete.

See Appendices 1 & 2 for consent and information sheets for the think-aloud stage of the study.

Procedure

The main pilot study will be advertised on the Netmums website. Netmums members from the South-East will be asked to volunteer for the study by emailing the study manager. They will be asked to fill in an initial online questionnaire containing the measures outlined below. They will then complete the 4-week HHFE course, before completing the post-intervention questionnaire.

Two focus groups will then be conducted, each with 6-12 participants. One of these will be held at a Netmums venue and one at the University of Reading. Expenses will be paid. The purpose of these focus groups will be to explore participants' experiences of the course in a more detailed way and, in particular, to consider what parents believe the barriers are to providing their children with a healthy diet. The groups will also provide an opportunity to obtain qualitative feedback about the questionnaires. It is anticipated that this information will inform refinements to the HHFE course to ensure that it is relevant and appropriate for the Netmums audience.

See Appendix 3 for consent and information for the survey stage of the study (to be delivered online).

See Appendices 4 & 5 for information sheet and consent for the focus group stage of the study (to be delivered on paper).

Method*Design*

A mixed-methods design will be used. Questionnaire measures will be delivered pre and post intervention (see *Measures* for further details) and two focus groups will be held with participants after they have completed the course. Focus groups will be audio-recorded and transcribed verbatim. See Appendix 6 for the topic guide for focus groups, which will be used flexibly.

Participants

A sample of parents (N=40) will be recruited through the Netmums website. Participants will need to be able to read and understand English and to have at least one child under the age of 18, but there will be no further exclusion criteria. The primary aim of the study is to identify appropriate primary and secondary outcome measures for the RCT, so a power analysis is not required. Participants for the focus groups will be recruited from those participating in the intervention study. Consistent with qualitative methodology, purposive sampling will be used to obtain a diverse range of backgrounds and experiences. Typically, focus groups comprise 6-12 participants per group; 2 focus groups will be conducted as recommended (Howitt, 2013).

Measures

A range of measures will administered, only some of which will be used in the RCT. In particular, measures judged to provide data of limited interest and those that are considered burdensome or lacking in face validity will be omitted. Pilot participants will be advised how long it will take to complete the questionnaires before they agree to take part.

Questionnaires will be self-administered online. Measures to be included are listed below, with the time points for each one indicated in brackets.

- Demographics (pre-intervention only) [developed by the researchers, based on standard demographic questions]
- Adult food neophobia scale (pre and post-intervention) [Pliner & Hobden, 1994]
- Child food neophobia questionnaire (pre and post-intervention)* [Pliner, 1994]
- Child's fruit and vegetable liking scale (pre and post-intervention)* [Owen et al., in press]
- Food availability and consumption measure (pre and post-intervention)* [developed by the researchers based on previous research]
- Children's eating behaviour questionnaire (pre and post-intervention)* [Wardle et al., 2001]
- Children's eating behaviour questionnaire - Parent Version (pre and post-intervention) [Wardle et al., 2001]
- Comprehensive feeding practices questionnaire (pre and post-intervention)* [Musher-Eizenmann & Holub, 2007]
- Frequency of family meals (pre and post-intervention) [developed by the researchers, based on previous research]
- Feeding goals measure (pre and post-intervention) [based on the Food Choice Questionnaire, Steptoe et al., 1997, but developed to separate adults' own feeding goals and parental feeding goals for children]
- Mindful Eating Questionnaire (pre and post-intervention) [Framson et al., 2010]
- Revised 3-Factor Eating Questionnaire (pre and post-intervention) [Hood & Moore, 2000]
- Ready meal/cooking from scratch measure (pre and post-intervention)* [developed by the researchers as no previously validated questionnaires in the literature]
- Family expenditure measure (VAS) (pre and post-intervention) [developed by the researchers as no previously validated questionnaires in the literature]
- Feeding confidence measure (pre and post-intervention) [developed by the researchers as no previously validated questionnaires in the literature]
- Original Netmums questions from previous pilot research [Court et al., 2010]
- Feedback questionnaire (asking for 3 positive and 3 negative aspects of the course and a rating for each of those things) (post-intervention only) [developed by the researchers]

*Participants will be asked how many children < 18 years they have at the beginning. In the event that parents have more than one child, they will be asked to name one of them and questions about children's behaviours and attitudes will ask about the named child specifically. They will also be asked why they chose that particular child.

Information will also be collected on levels of participant engagement (e.g. whether they follow hyperlinks provided as part of the HHFE course emails) and general questionnaire behaviour (e.g. how long participants take to complete each of the measures).

See Appendix 9 for the full questionnaire; note that the questionnaire will be delivered online and so will be formatted at that stage.

Analysis

Exploratory analysis of the questionnaire data will be performed to look for potential relationships between the various measures. However, due to the small sample size, no formal statistical analysis will be conducted.

Data from the focus groups will be analysed using content analysis which will allow emergent themes to be identified.

2.3 Location

Where will the project take place? The online questionnaire will be delivered electronically. The two focus groups will be held at UoR and the Netmums central office in London (Henry Wood House 2 Riding House Street W1W 7FA or another venue suggested by them).

If the project is to take place in schools, please confirm that you have informed the SREC (PCLSethics@reading.ac.uk):

If you plan to do home visits for the data collection, you need to perform a risk assessment and provide information about what safety measures you will take: [Click here to enter text.](#)

2.4 Funding

Is the research supported by funding from a research council or other external sources (e.g. charities, business)? **Yes**

If “Yes”, please give details: Netmums, the parenting website, is supporting this project via an ESRC SEDTC Case Studentship of one of the researchers, Sarah Snuggs. Additionally, they will provide resources such as appropriate IT support and office space.

Please note that some Research Councils or other external funding sources may require that the project is reviewed by the University Research Ethics Committee. If this is the case, then the project should be submitted to the University Committee. This does not apply to postgraduate activity funded by Research Councils.

2.5 Ethical Issues

Could this research lead to any risk of harm or distress to the participants? Please explain why this is necessary and how any risk will be managed.

It is not believed that this research will lead to any risk of harm or distress to the participants. There is a possibility that reflecting on their families’ eating will cause concern for some participants. At the end of the questionnaire, participants will be given the contact email of the principle investigator to discuss any concerns. The principle investigator will refer participants who are concerned to NHS web-sites for information, or their GP/health visitor for advice. Participants will also be given an information sheet containing text that explains who they should contact if distressed (Appendix 8).

2.6 Deception

Will the research involve any element of intentional deception at any stage (i.e. providing false or misleading information about the study)? **No**

If “Yes”, please justify why: [Click here to enter text.](#)

Please note you must append a description of the debriefing procedure if the study involves deception.

2.7 Payment

Will you be paying your participants for their involvement in the study? **Yes**

If “Yes”, please justify the amount paid: Participants will be paid £20 each to attend the focus groups. This is to incentivise them to attend and to reimburse travel expenses.

Please note that excessive payment may be considered coercive and therefore unethical. Travel expenses need not to be declared.

2.8 Data Protection, Confidentiality, Disposal of Data

What steps will be taken to ensure participant confidentiality? How will the data be stored? When will the data be destroyed?

Please note that consent forms have to be kept for 5 years after the end of the study. There is no requirement for data, such as paper questionnaires, to be kept for 5 years.

All data will be stored securely and will be anonymised after collection.

Data will be kept for the duration of the PhD studentship and will be destroyed after the dissemination of results for both the pilot and the main RCT.

2.9 Consent

Please describe the process by which participants will be informed about the nature of the study and the process by which you will obtain consent.

Please note that a copy of consent forms and information letters for all participants must be appended to this application.

Participants in the think aloud stage will be given an information sheet and consent form (Appendices 1 & 2). The information sheet informs them about the study requirements and explains that participation is voluntary, and that they are free to withdraw from the study at any time. Participants in the questionnaire study will be given a Participant Information Sheet as the first page of the online survey. This information informs them about the study requirements, and explains participation is voluntary and that they are free to withdraw from the study at any time. Consent for the questionnaire will be via a question “I have seen and read the information about the study. I have been given the opportunity to ask questions about the study, and these have been answered to my satisfaction. I understand that all personal information will remain confidential to the Investigator and arrangements for the storage and eventual disposal of any identifiable material have been made clear to me. I understand that participation is voluntary, and that I can withdraw at any time without having to give an explanation.”. Only participants who tick “yes” to this question will be able to continue with the survey (Appendix 3).

At the end of the survey, participants will be asked to provide contact details if they are willing to participate in a future focus group. If they say yes, it will be explained to them that they are under no obligation to take part, and they will be given an information sheet (Appendix 4). Ahead of the beginning of the focus group, they will also be given a consent form (Appendix 5).

SECTION 3: PARTICIPANT DETAILS

3.1 Sample Size

How many participants do you plan to recruit? Please provide a brief justification for this number.

Five participants will be recruited for the think-aloud stage, and 40 to complete the questionnaire. We judge that this number will give us a range of opinions. Because participants for the main RCT will be recruited from the same source, we do not wish to recruit more people who would consequently be unable to take part in the RCT. As there will be no formal statistical analysis, statistical power is not relevant.

Twelve participants will be recruited for each focus group (i.e. 24 in total). Between 8-10 participants is recommended for focus groups (Howitt, 2013), and by over-recruiting, we will accommodate attrition.

3.2 Sample Characterisation

Will the research involve children or vulnerable adults (e.g. adults with mental health or neurological conditions)? **No**

If “Yes”, how will you ensure these participants fully understand the study and the nature of their involvement in it and freely consent to participate?

[Click here to enter text.](#)

Please append letters and, if relevant, consent forms, for parents, guardians or carers. Please note: information letters must be supplied for all participants wherever possible, including children. Written consent should be obtained from children wherever possible in addition to that required from parents.

3.3 Sample Age

Will your research involve children under the age of 18 years? **No**

Will your research involve children under the age of 5 years? **No**

3.4 NHS and Social Services Involvement

Will your research involve NHS patients or Clients of Social Services? **No**

Please note that if your research involves NHS patients or Clients of Social Services your application will have to be reviewed by the University Research Ethics Committee and by an NHS research ethics committee.

3.5 Recruitment

Please describe the recruitment process and append any public advertising if used (*advertisements on the Research Panels do not need to be appended*).

Participants will be recruited through advertisements on the Netmums website (See Appendix 7).

IMPORTANT NOTES

1. *The Principal Investigator must complete the Checklist below to ensure that all the relevant steps have been taken and all the appropriate documentation has been appended*
2. *If you expect that your application will need to be reviewed by the University Research Ethics Committee you must also complete the [Project Submission Form](#)*
3. *For template consent forms and information sheets see the document “example consent forms and information letters”*
4. *If the research is being carried out by undergraduates for their Final Year project, a special consent form must be used. This is shown in the “example consent forms and information letters” document*

CHECKLIST

This form must be completed by the Principal Investigator.

This form should be used if you submit your application to the School Research Ethics Committee

Please tick to confirm that the following information has been included and is correct. Indicate (N/A) if not applicable:

Information Sheet

Is on headed notepaper and the information in the header is up-to-date	Yes	
Includes Investigator’s name and email / telephone number	Yes	
Includes Supervisor’s name and email / telephone number	Yes	
Does not include student mobile phones / personal e-mails	Yes	
Includes the title of the study	yes	
Includes the aims of the study	yes	
Includes information about what the participants will be asked to do	yes	
Statement that participation is voluntary	yes	
Statement that participants are free to withdraw their co-operation	yes	
Reference to the ethical process using the sentence: ‘ <i>This application has been reviewed by the University Research Ethics Committee and has been given a favourable ethical opinion for conduct.</i> ’	yes	
Reference to Disclosure using the following sentence: ‘ <i>All investigators on this project have had criminal records checks and have been approved by the School to work with children.</i> ’		N/A
Reference to confidentiality, storage and disposal of personal information collected. Note, consent forms have to be kept for 5 years	yes	

Consent Form(s)

Please note that if researchers are undergraduates, you must use the “Undergraduate Project Consent Form” in Blackboard, and include researcher names

Other Relevant Material

Questionnaires	yes	N/A
Interviews	yes	N/A <input type="checkbox"/>
Letters	yes	N/A <input type="checkbox"/>
Other (please specify)	yes	N/A <input type="checkbox"/>

Advert

Expected duration of the project (months) 3 years

PRINCIPAL INVESTIGATOR

Name: [Click here to enter text.](#)

(Signed, Principal Investigator)

13-Jan-2016

Date

Appendix 3: ISRCTN registration

Netmums healthier lives study

[#]

Condition category

Nutritional, Metabolic, Endocrine

Date applied

07/11/2016

Date assigned

07/12/2016

Last edited

12/01/2017

Prospective/Retrospective

Retrospectively registered

Overall trial status

Completed

Recruitment status

No longer recruiting

Plain English Summary

Background and study aims

Unhealthy eating in young people is a major problem in the UK and can put children at risk of a wide range of health issues, initially in childhood, and then adulthood. There is evidence to suggest that positive eating behaviours encouraged at home can protect children against some of these health issues and that parents may be more likely to employ positive feeding strategies when they are not anxious about mealtimes. This study involves two online programmes that Netmums and the University of Reading have designed. One of these focuses on healthy family eating, and the other on kids' wellbeing. The aim of this study is to find out which programme is more effective at improving family eating behaviours.

Who can participate?

Adults with at least one child aged between 1 and 16 years old who is living with them.

What does the study involve?

Participants are randomly allocated to one of two groups. Those in the first group receive the healthy family eating programme. This involves receiving a series of nine emails over a period of three weeks that provide information on food swaps, healthy recipes, tips to encourage fussy eaters and ideas for activities to focus the family on food and cooking, emphasizing enjoyment and happy mealtimes. Those in the second group receive the kids' wellbeing programme. This involves receiving a similarly formatted series of nine emails over a period of three weeks that provide information on general wellbeing topics such as tooth brushing and screentime. At the start of the study, after the three week programmes finish and then six months later, participants complete a number of questionnaires in order to measure family eating habits.

What are the possible benefits and risks of participating?

There is a chance that participants may benefit from a healthier family diet, improved long-term health outcomes and decreased anxiety around family mealtimes for those who receive the family eating programme. There is a small risk that some participants may become distressed or anxious about their family's diet. This is addressed at each data collection point by suggesting that anyone concerned should either visit their GP or contact the Principal Investigator.

Where is the study run from?

University of Reading (UK)

When is the study starting and how long is it expected to run for?

January 2016 to December 2018

Who is funding the study?

Economic and Social Research Council (UK)

204

Who is the main contact?

1. Dr Kate Harvey (scientific)

k.n.harvey@reading.ac.uk

2. Ms Sarah Snuggs (public)

s.j.snuggs@pgr.reading.ac.uk

Trial website

□

Contact information

Type

Public

Primary contact

Ms Sarah Snuggs

ORCID ID

□

Contact details

School of Psychology & Clinical Language Sciences

Harry Pitt Building

University of Reading

Reading

RG6 7BE

United Kingdom

s.j.snuggs@pgr.reading.ac.uk [<mailto:s.j.snuggs@pgr.reading.ac.uk>]

Type

Scientific

Additional contact

Dr Kate Harvey

ORCID ID

□

Contact details

School of Psychology & Clinical Language Sciences

Harry Pitt Building

University of Reading

Reading

RG6 7BE

United Kingdom

k.n.harvey@reading.ac.uk [<mailto:k.n.harvey@reading.ac.uk>]

Additional identifiers

205

EudraCT number**ClinicalTrials.gov number****Protocol/serial number**

N/A

Study information**Scientific title**

Healthy Happy Family Eating: A randomised controlled trial of an online family eating intervention

Acronym

HHFE RCT

Study hypothesis

The aim of this study is to evaluate an online intervention designed to improve family eating behaviours.

Null hypothesis:

There will be no difference between the intervention group and the control group on family eating outcome measures.

Alternative hypothesis:

The intervention group will show greater improvement on these measures compared to the control group.

Ethics approvalUniversity of Reading School of Psychology & Clinical Sciences Research Ethics Committee, 01/08/2016
Amendment to the questionnaire approved on 28/09/2016**Study design**

Randomised controlled trial

Primary study design

Interventional

Secondary study design

Randomised controlled trial

Trial setting

Internet

Trial type

Quality of life

Patient information sheet

See additional files

Condition

206

Unhealthy eating

Intervention

Participants will be randomly assigned to one of two groups electronically when signing up to the study.

Intervention group - Healthy Happy Family Eating programme: Participants receive a series of nine emails that provide information on food swaps, healthy recipes, tips to encourage fussy eaters and ideas for activities to focus the family on food and cooking. There is an emphasis on enjoyment and happy mealtimes. The intervention has been designed through a collaboration between the University of Reading and the parenting website Netmums. The team also consulted a nutritional therapist on the intervention's content.

Control group - Kids' Wellbeing programme: Participants receive a series of nine emails, similar in format to the emails in the intervention condition, that provide information on general wellbeing topics such as tooth brushing and screentime. The emails are based on existing information on the Netmums website and do not include any topics that might encourage families to eat more healthily or participate in more activities together as a family.

Both the active and the control interventions last for three weeks, during which participants will receive nine emails. Data is collected at three time-points with the use of online questionnaires; baseline (immediately before receiving the first email - questionnaire completion triggers the first email), immediately after the ninth email has been received (i.e. baseline + 3 weeks) and six month follow up (i.e. six months after intervention completion).

Intervention type

Behavioural

Phase

Drug names

Primary outcome measure

1. Healthy environment/healthy food availability in the home is measured using the Healthy Environment subscale of the Child Feeding Practice Questionnaire (CFPQ)
2. Child enjoyment of food is measured using the Enjoyment of Food subscale of the Child Eating Behaviour Questionnaire (CEBQ)
3. Shared family meal frequency is measured using a measure developed by the researchers for the purpose of this study

All measures will be collected at baseline, immediately after the intervention period and 6-months after the intervention period has ended.

Secondary outcome measures

1. Parental modelling of eating healthy food, parental encouragement of balance and variety, and involvement of children in meal planning and preparation is measured using three further subscales of the CFPQ: Modelling, Balance & Variety and Involvement
2. Children's food fussiness is measured using one further subscale of the CEBQ: Food fussiness
3. Home-cooking/use of raw ingredients measure (developed by the researchers, based on a measure used in the pilot work)
4. Weekly food budget is measured using a visual analogue scale

All measures will be collected at baseline, immediately after the intervention period and 6-months after the intervention period has ended.

Overall trial start date

11/01/2016

Overall trial end date

207

31/12/2018

Reason abandoned (if study stopped)

Eligibility

Participant inclusion criteria

1. Able to read and understand English
2. Have at least one child under the age of 16 and over the age of 1 year living with them some of the time
3. An existing member of the parenting website Netmums or willing to join as a member

Participant type

All

Age group

Adult

Gender

Both

Target number of participants

1,500 (more to be recruited in the first instance to establish attrition rates)

Participant exclusion criteria

Not meeting inclusion criteria.

Recruitment start date

15/11/2016

Recruitment end date

31/03/2017

Locations

Countries of recruitment

United Kingdom

Trial participating centre

University of Reading
School of Psychology and Clinical Language Sciences
Reading
RG6 7BE
United Kingdom

Sponsor information

Organisation

208

Netmums

Sponsor details

Henry Wood House
2 Riding House Street
London
W1W 7FA
United Kingdom

Sponsor type

Other

Website

<http://www.netmums.com/> [<http://www.netmums.com/>]

Funders

Funder type

Research council

Funder name

Economic and Social Research Council

Alternative name(s)

ESRC

Funding Body Type

government organisation

Funding Body Subtype

Federal/National Government

Location

United Kingdom

Results and Publications

Publication and dissemination plan

Planned publication in a high-impact peer reviewed journal.

IPD Sharing plan:

The current data sharing plans for the current study are unknown and will be made available at a later date.

Intention to publish date

31/03/2018

Participant level data

209

To be made available at a later date

Basic results (scientific)

Publication list

Publication citations

Additional files

- [ISRCTN11278880_PIS_10Nov16.docx \[/editorial/retrieveFile/38839156-88f7-40a3-806e-b1d03e77f3d5/32801\]](#) Uploaded 12/01/2017

Editorial Notes

12/01/2017: Participant information sheet uploaded.

Appendix 4: Ethics application for Randomised Controlled Trial

SECTION 1: APPLICATION DETAILS

1.1 Project and Dates

Project title: Healthy Happy Family Eating: A Randomised Controlled Trial

Date of submission: 19-Jul-2016

Start date: 01-Sep-2016

End date: 30-Sep-2019

1.2 Applicant Details

Principal Investigator

Name: Dr Kate Harvey

Position: Academic Staff

Institution/Department: PCLS

Email: k.n.harvey@reading.ac.uk

Office room number: 297

Internal tel.:

Other tel.: [Click here to enter text.](#)

(Please note that an undergraduate or postgraduate student cannot be a named principal investigator for research ethics purposes. The supervisor must be declared as Principal Investigator)

Other Applicants

Name: Sarah Snuggs

Position: Student

Institution/Department: PCLS

Email: s.j.snuggs@pgr.reading.ac.uk

Name: [Click here to enter text.](#)

Position: Choose an item.

Institution/Department: [Click here to enter text.](#)

Email: [Click here to enter text.](#)

Name: [Click here to enter text.](#)

Position: Choose an item.

Institution/Department: [Click here to enter text.](#)

Email: [Click here to enter text.](#)

Name: [Click here to enter text.](#)

Position: Choose an item.

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Email: [Click here to enter text.](#)

Name: [Click here to enter text.](#)

Position: Choose an item.

Institution/Department: [Click here to enter text.](#)

Email: [Click here to enter text.](#)

Name: [Click here to enter text.](#)

Position: Choose an item.

Institution/Department: [Click here to enter text.](#)

Email: [Click here to enter text.](#)

1.3 Project Submission Declaration

I confirm that to the best of my knowledge I have made known all information relevant to the Research Ethics Committee and I undertake to inform the Committee of any such information which subsequently becomes available whether before or after the research has begun.

I understand that it is a legal requirement that both staff and students undergo Disclosure and Barring Service checks when in a position of trust (i.e. when working with children or vulnerable adults).

I confirm that if this project is an interventional study, a list of names and contact details of the participants in this project will be compiled and that this, together with a copy of the Consent Form, will be retained within the School for a minimum of five years after the date that the project is completed.

(Signed, Principal Investigator)

27-Jul-2016

Date

(Signed, Other named investigator)

27-Jul-2016

Date

(Signed, Other named investigator)

[Click here to enter a date.](#)

Date

(Signed, Other named investigator)

[Click here to enter a date.](#)

Date

(Signed, Other named investigator)

[Click here to enter a date.](#)

Date

(Signed, Other named investigator)

[Click here to enter a date.](#)

Date

(Signed, Other named investigator)

[Click here to enter a date.](#)

Date

1.4 University Research Ethics Committee Applications

Projects expected to require review by the University Research Ethics Committee (such as, for example, research involving NHS patients, research involving potential for distress to participants) must be reviewed by the Chair of the School Ethics Committee or the Head of School before submission. Please ask PCLSethics@reading.ac.uk if unsure whether your project needs UREC approval.

(Signed, Chair of School Research Ethics Committee)

Click here to enter a date.

Date

(Signed, Head of School)

Click here to enter a date.

Date

1.5 External Research Ethics Committees

Please provide details below of other external research ethics committees to which this project has been submitted, or from whom approval has already been granted (e.g. NHS Committee)

Name of committee	Date of submission/approval	Reference	Status
Click here to enter text.	Click here to enter a date.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter a date.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter a date.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter a date.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter a date.	Click here to enter text.	Click here to enter text.
Click here to enter text.	Click here to enter a date.	Click here to enter text.	Click here to enter text.

SECTION 2: PROJECT DETAILS

2.1 Lay Summary

Please provide a summary of the project in non-specialist terms, which includes a description of the scientific background to the study (existing knowledge), the scientific questions the project will address and a justification of these. Please note that the description must be sufficient for the committee to take a reasonable view on the likely scientific rigour and value of the project.

Background:

Unhealthy diets in children are a major problem in the UK and can put children at risk of a wide range of health issues, initially in childhood, and then adulthood (Unicef, 2013; WHO, 2015). There is evidence to suggest that positive eating behaviours encouraged at home can protect children against some of these health issues (Mitchell, Farrow, Haycraft, & Meyer, 2013). There is also some suggestion that parents may employ more positive feeding strategies if they are not anxious themselves (Ogden, 2014). Therefore, interventions to improve healthy eating in children should focus not only on teaching parents healthy eating habits and feeding strategies, but also on encouraging a relaxed and stress-free environment in which to implement them.

Netmums, the parenting website, recognised the need for such an intervention and created The Healthy Happy Family Eating (HHFE) course. This consisted of nine emails, delivered to parents over a 4-week period. The emails provide information on food swaps, healthy recipes, tips to encourage 'fussy' eaters and ideas for activities to focus the family on food and cooking. There is an emphasis on enjoyment and 'happy' mealtimes. In 2010, a pilot study was conducted to assess the effectiveness of the HHFE, with positive results (Court, Vince-Cain, & Jefferson, 2010). Participants (N=528) answered questions on 7 Likert-scale measures (e.g. 'I am happy to cook') before and after completing the course, and scores increased significantly on all measures.

Between February and June 2016, we conducted a pilot study looking into the HHFE course. Its main aims were to assess the feasibility and acceptability of the course, to determine the best primary and secondary outcome measures for the upcoming randomised controlled trial (RCT) and to determine appropriate inclusion/exclusion criteria for the RCT. The findings from both the 2010 and 2016 studies informed substantial changes to the HHFE; collaboration between Netmums and UoR has resulted in nine rewritten emails which are now robustly evidence-based, written in a style known to be acceptable to the Netmums audience and adjusted to account for feedback received from previous participants. (See Appendix 1 for email content).

The current ethics application describes an RCT which is designed to evaluate this healthy eating intervention.

Aims & Objectives:

To establish whether the HHFE is effective in improving family eating behaviours

To address whether this intervention is more effective for certain sub-groups

2.2 Procedure

Please briefly describe what the study will involve for your participants and the instruments and methodology to be undertaken.

Methods

Design

The study will be a Randomised Controlled Trial (RCT) with two conditions: Intervention (HHFE) and Control emails (CE). Participants will be asked to complete an online questionnaire at baseline and will be randomised into one of the two conditions. Those allocated to the HHFE condition will receive the nine HHFE emails over the subsequent three weeks. Those in the Control condition will receive 9 'control emails'. These will consist of existing Netmums website content and will focus on general wellbeing topics, such as toothbrushing and screentime but will specifically avoid topics that might encourage families to eat more healthily or participate in more activities together as a family (See Appendix 2 for CE content). All participants will complete a second questionnaire 3-weeks post recruitment (i.e. shortly after they have completed their programme of emails), and a third one 6 months later. Participants who do not complete the second or third questionnaire will be sent a reminder 1 week after each questionnaire has been delivered. Participants from both groups will also be entered into a prize draw for a £250 voucher at the point of delivery of questionnaire 3, should they wish. All elements of the intervention and data collection will be delivered online.

Participants

Participants (N=8000) will be Netmums members who have not previously participated in the HHFE course. Participants will need to be able to read and understand English and to have at least one child under the age of 16 and over the age of 1 year, but there will be no further exclusion criteria. They will be recruited through a series of campaigns on the Netmums website, including a 'Back to School' campaign in September and a 'New Year' campaign in January. The recruitment period is expected to last from September 2016 to May 2017.

Procedure

Participants will first express an interest in the study by following a link on the Netmums website. This link will direct them to further information about the study. If a participant wishes to take part, they will click on a further link that will trigger an email containing the first questionnaire to be sent. They will be randomly assigned to one of the two groups electronically at this point, although the groups will not receive anything different from one another until the second email. The participant information sheet (Appendix 3) and consent form (Appendix 4) will be embedded into this questionnaire. Participants will only be permitted to

complete the questionnaire if they consent. Both groups will complete the same questionnaire and at the end of the questionnaire will be told to expect their next email shortly. Both groups will receive 9 emails over the following three weeks. After they have completed their respective email programmes, they will receive a tenth email inviting them to take part in questionnaire 2. They will receive their final email, containing a link to questionnaire 3, 6 months after they completed the 3-week intervention period. Because 6-month follow up is important to the analysis and historically attrition has been high, participants in both groups will be incentivised to complete questionnaire 3 with a prize draw for one prize of a £250 voucher. (See Appendix 5 for a diagram of procedure).

Measures

There will be three primary outcome measures, designed to measure each of the three main elements of the course, 'Healthy', 'Happy' and 'Family':

HEALTHY: The Healthy Environment subscale of the Child Feeding Practice Questionnaire (CFPQ) [Musher-Eizenmann & Holub, 2007]

HAPPY: The Enjoyment of Food subscale of the Child Eating Behaviour Questionnaire (CEBQ) [Wardle et al. 2001]

FAMILY: Shared family meal frequency measure [Horning et al., 2016]

There will be 6 further secondary outcome measures:

Three further subscales of the CFPQ: Modelling, Balance & Variety and Involvement [Musher-Eizenmann & Holub, 2007]

One further subscale of the CEBQ: Food fussiness [Wardle et al. 2001]

Home-cooking/use of raw ingredients measure [developed by the researchers, based on a measure used in the pilot work]

Weekly food budget measure [developed by the researchers]

Family meal frequency measure [developed by the researchers]

On the basis of feedback from the pilot work, the measures used have been carefully considered and limited to as small a number as possible. All questionnaires will be hosted by *GetFeedback*, online survey software that is specifically aimed at presenting surveys on smartphones, tablets and other devices.

All of the above measures will be included in questionnaires 1, 2 and 3. Additional demographic questions will be asked in questionnaire 1. Furthermore, questions measuring motivation for behaviour change and for taking part will be administered at baseline in order to control for between-groups motivation differences as well as the Food Choice Questionnaire [Steptoe et al., 1995] to explore whether there are differences in outcome according to parents' feeding goals. See Appendix 6 for the complete questionnaires.

2.3 Location

Where will the project take place? Online

If the project is to take place in schools, please confirm that you have informed the SREC (PCLSethics@reading.ac.uk):

If you plan to do home visits for the data collection, you need to perform a risk assessment and provide information about what safety measures you will take: n/a

2.4 Funding

Is the research supported by funding from a research council or other external sources (e.g. charities, business)? Yes

If "Yes", please give details: Netmums, the parenting website, is supporting this project via an ESRC SEDTC Case Studentship of one of the researchers, Sarah Snuggs. Additionally, they will provide resources such as appropriate IT support. They do not require that we submit our ethics application to the University Research Ethics Committee.

Please note that some Research Councils or other external funding sources may require that the project is reviewed by the University Research Ethics Committee. If this is the case, then the project should be submitted to the University Committee. This does not apply to postgraduate activity funded by Research Councils.

2.5 Ethical Issues

Could this research lead to any risk of harm or distress to the participants? Please explain why this is necessary and how any risk will be managed.

It is not believed that this research will lead to any risk of harm or distress to the participants. There is a possibility that reflecting on their families' eating will cause concern for some participants. At the end of the questionnaires, participants will be given the contact email of the principal investigator to discuss any concerns. The principal investigator will refer participants who are concerned to NHS websites for information, or their GP/health visitor for advice. Participants will also be given information that explains who they should contact if distressed at the end of each questionnaire (Appendix 6).

Steps have been taken to ensure that the prize draw is fair and transparent. In keeping with Market Research Society guidelines, the nature of the prize (1 x £250 voucher for each condition), the closing date and procedure for notifying winners will all be clear. Participants will not be required to complete the questionnaire in order to enter the draw, and instead will indicate at the beginning of the questionnaire that they would like to be entered.

2.6 Deception

Will the research involve any element of intentional deception at any stage (i.e. providing false or misleading information about the study)? **No**

If “Yes”, please justify why: n/a

Please note you must append a description of the debriefing procedure if the study involves deception.

2.7 Payment

Will you be paying your participants for their involvement in the study? **No**

If “Yes”, please justify the amount paid: There will be no payment but participants in both conditions will be entered into a prize draw to win a voucher for £250 at the end of questionnaire 3.

Please note that excessive payment may be considered coercive and therefore unethical. Travel expenses need not to be declared.

2.8 Data Protection, Confidentiality, Disposal of Data

What steps will be taken to ensure participant confidentiality? How will the data be stored? When will the data be destroyed?

Please note that consent forms have to be kept for 5 years after the end of the study. There is no requirement for data, such as paper questionnaires, to be kept for 5 years.

All data will be stored securely and will be anonymised as soon as possible.

Data will be kept for the duration of the PhD studentship and will be destroyed after the dissemination of results.

Participants will be informed that their data will be confidential. The survey software, GetFeedback, uses AES 256 encryption, as recommended by a representative of the Thames Valley Clinical Trials Unit, to ensure that data is stored and downloaded securely.

2.9 Consent

Please describe the process by which participants will be informed about the nature of the study and the process by which you will obtain consent.

Please note that a copy of consent forms and information letters for all participants must be appended to this application.

General information about the study will be posted on the Netmums website and accessed by anyone who clicks on any of the campaign links to the study. If after reading it, they would like to take part, they will be taken to questionnaire 1, the first page of which will contain the participant information sheet (Appendix 3). The following section of the questionnaire will contain consent questions (Appendix 4), and participants will only be able to proceed with the questionnaire if they provide consent.

At all time points, it will be clear both that participants are under no obligation to take part and that they can contact the researchers with any questions.

SECTION 3: PARTICIPANT DETAILS

3.1 Sample Size

How many participants do you plan to recruit? Please provide a brief justification for this number.

We are aiming to recruit 8000 participants. The sample number is high to account for potentially high attrition rates. Although steps will be taken to avoid attrition (e.g. prize draw, regular contact, reminders), attrition rates have been high in previous pilot work (retention at 4-weeks has been 28% and 24% in the 2010 and 2016 pilot work respectively). Based on a conservative retention rate of 20%, therefore, a sample of 8000 participants should allow for 800 responses in each condition at 3-weeks. Consultation with the Netmums team has shown they believe that 8000 participants is ambitious but achievable.

3.2 Sample Characterisation

Will the research involve children or vulnerable adults (e.g. adults with mental health or neurological conditions)? **No**

If “Yes”, how will you ensure these participants fully understand the study and the nature of their involvement in it and freely consent to participate?

n/a

Please append letters and, if relevant, consent forms, for parents, guardians or carers. Please note: information letters must be supplied for all participants wherever possible, including children. Written consent should be obtained from children wherever possible in addition to that required from parents.

3.3 Sample Age

Will your research involve children under the age of 18 years? **No**

Will your research involve children under the age of 5 years? **No**

3.4 NHS and Social Services Involvement

Will your research involve NHS patients or Clients of Social Services? **No**

Please note that if your research involves NHS patients or Clients of Social Services your application will have to be reviewed by the University Research Ethics Committee and by an NHS research ethics committee.

3.5 Recruitment

Please describe the recruitment process and append any public advertising if used (*advertisements on the Research Panels do not need to be appended*).

Participants will all be Netmums members, recruited through the Netmums website. Recruitment will be conducted through a range of campaign pages and will focus on seasonally appropriate topics (e.g. 'Back to School', 'New Year'). The recruitment text will form part of articles that Netmums would routinely be sending out anyway, and will be based on the Participant Information (Appendix 3). The recruitment period is expected to last from September 2016 to May 2017.

IMPORTANT NOTES

1. *The Principal Investigator must complete the Checklist below to ensure that all the relevant steps have been taken and all the appropriate documentation has been appended*
2. *If you expect that your application will need to be reviewed by the University Research Ethics Committee you must also complete the [Project Submission Form](#)*
3. *For template consent forms and information sheets see the document “example consent forms and information letters”*
4. *If the research is being carried out by undergraduates for their Final Year project, a special consent form must be used. This is shown in the “example consent forms and information letters” document*

CHECKLIST

This form must be completed by the Principal Investigator.

This form should be used if you submit your application to the School Research Ethics Committee

Please tick to confirm that the following information has been included and is correct. Indicate (N/A) if not applicable:

Information Sheet

- | | | |
|---|--------------------------|------------------------------|
| Is on headed notepaper and the information in the header is up-to-date | <input type="checkbox"/> | |
| Includes Investigator’s name and email / telephone number | <input type="checkbox"/> | |
| Includes Supervisor’s name and email / telephone number | <input type="checkbox"/> | |
| Does not include student mobile phones / personal e-mails | <input type="checkbox"/> | |
| Includes the title of the study | <input type="checkbox"/> | |
| Includes the aims of the study | <input type="checkbox"/> | |
| Includes information about what the participants will be asked to do | <input type="checkbox"/> | |
| Statement that participation is voluntary | <input type="checkbox"/> | |
| Statement that participants are free to withdraw their co-operation | <input type="checkbox"/> | |
| Reference to the ethical process using the sentence: ‘ <i>This application has been reviewed by the University Research Ethics Committee and has been given a favourable ethical opinion for conduct.</i> ’ | <input type="checkbox"/> | |
| Reference to Disclosure using the following sentence: ‘ <i>All investigators on this project have had criminal records checks and have been approved by the School to work with children.</i> ’ | <input type="checkbox"/> | N/A <input type="checkbox"/> |
| Reference to confidentiality, storage and disposal of personal information collected. Note, consent forms have to be kept for 5 years | <input type="checkbox"/> | |

Consent Form(s)

Please note that if researchers are undergraduates, you must use the “Undergraduate Project Consent Form” in Blackboard, and include researcher names

Other Relevant Material

- | | | |
|---|--------------------------|------------------------------|
| Questionnaires | <input type="checkbox"/> | N/A <input type="checkbox"/> |
| Interviews | <input type="checkbox"/> | N/A <input type="checkbox"/> |
| Letters | <input type="checkbox"/> | N/A <input type="checkbox"/> |
| Other (please specify) | <input type="checkbox"/> | N/A <input type="checkbox"/> |
| Click here to enter text. | | |
| Expected duration of the project (months) | | Click here to enter text. |

PRINCIPAL INVESTIGATOR

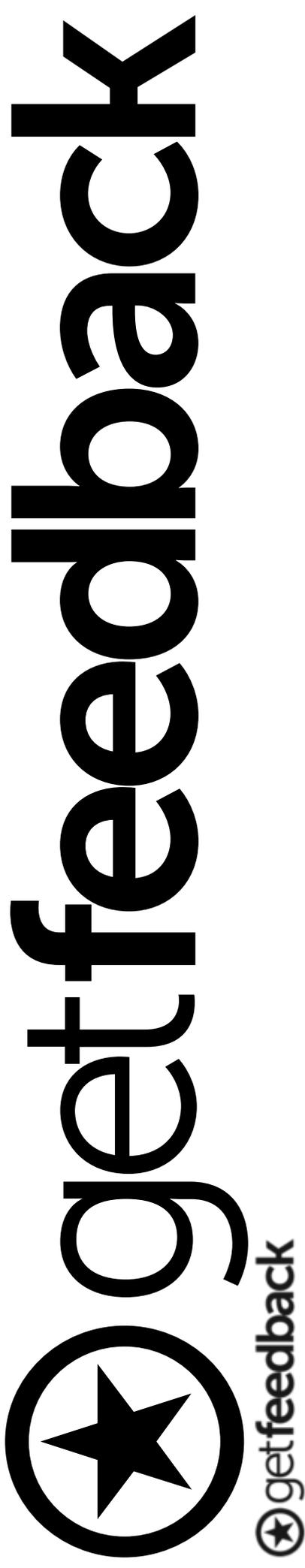
Name:

(Signed, Principal Investigator)

27-Jul-2016

Date

**Appendix 5: Security documentation for GetFeedback survey
software**



Security FAQ

Company

GetFeedback was acquired by Campaign Monitor in November of 2014. Campaign Monitor is a well-established leader in email marketing, with 117 employees across 20 cities, and 120,000 paying customers worldwide. GetFeedback will continue to grow quickly and expand its offering as a wholly owned subsidiary of Campaign Monitor.

Security

GetFeedback runs on the trusted Salesforce Heroku platform. We chose Heroku as our platform for a variety of reasons; trust, security, and reliability being top of mind. Heroku has a thorough security policy published here:

<https://www.heroku.com/policy/security>

Where are your servers located?

GetFeedback runs in the Salesforce Heroku platform's US region, which runs in Amazon Web Services (AWS)'s main data center located in Northern Virginia.

What security certifications do you or your vendors have?

Our platform provider Heroku hosts services at Amazon Web Services, whose facilities are accredited under:

- ISO 27001
- SOC 1 and SOC 2/SSAE 16/ISAE 3402 (Previously SAS 70 Type II)

- PCI Level 1
- FISMA Moderate
- Sarbanes-Oxley (SOX)

What security provisions and practices are in place at your data center(s)?

Our data center facilities feature 24-hour manned security, biometric access control, video surveillance, and physical locks. All systems, networked devices, and circuits are constantly monitored.

Heroku provides this regarding their data centers: <https://devcenter.heroku.com/articles/regions#data-center-locations>

What security monitoring do you offer?

Information about Heroku's vulnerability assessment, reporting and management practices, as well as information on physical, network and data security, can be found on their security page: <https://www.heroku.com/policy/security>

How is data backed up?

GetFeedback utilizes Heroku's PG Backups to store a full backup of all data daily. More here: <https://devcenter.heroku.com/articles/heroku-postgres-backups>

Is our data encrypted?

All communications with and between GetFeedback servers is encrypted using industry-standard TLS/SSL.

GetFeedback runs on Heroku's Premium Postgres tier, which automatically encrypts all data on-disk. More here: <https://devcenter.heroku.com/articles/heroku-postgres-plans>

Does your company have an information security infrastructure and organization policy?

Yes. You can review it here: https://docs.google.com/document/d/1w0albNvAJvDOYINauZS8OWXR8sT_6Mn4BvHdi87Tpk/pub

Does your hiring process require a full background check?

Yes. All prospective employees are screened by a leading background checking service.

Does your company have a program in place to periodically test security controls?

GetFeedback is currently developing a program to periodically test security controls. This page will be updated as the program develops.

Does your company outsource any portion of your information security?

GetFeedback relies on industry-leading vendors like Heroku, Google, Amazon and Dropbox to provide services like application hosting, corporate email security and corporate file security.

What controls are in place to protect my credit card information?

GetFeedback's credit card processing vendor uses the latest 128-bit Secure Socket Layer (SSL) technology for secure transactions. Our vendor is certified as compliant with card association security initiatives, like the Visa Cardholder Information Security and Compliance (CISP), MasterCard® (SDP), and Discovery Information Security and Compliance (DISC).

Credit card numbers are never stored on GetFeedback servers. They are routed directly to our PCI DSS certified credit card processing vendor.

Data privacy

GetFeedback's Privacy Policy is here: <https://getfeedback.com/privacy>

The Heroku platform has certified that it adheres to the Safe Harbor Principles. The Heroku Privacy Policy is here: <https://www.heroku.com/policy/privacy>

Where is our data stored?

GetFeedback runs in the Salesforce Heroku platform's US region, which runs in Amazon Web Services (AWS)'s main data center located in Northern Virginia.

Who owns our data?

Your survey content is owned by you, and only you choose with whom to share your surveys. Survey responses are owned and managed by the survey creator.

Who has access to our data?

Only GetFeedback administrators and customer/technical support managers have access to your survey content. Our staff will not access your survey content, grant access to third parties or otherwise disseminate your survey content. If there is a request for support, or if you hire our consulting services, then the person assigned to the request may, with your permission, log into your account for the purpose of troubleshooting and correcting the reported issue or performing the requested task.

The policies and practices of GetFeedback, and of the Salesforce Heroku and Amazon Web Services platforms on which GetFeedback is hosted, are consistent with the objectives of the Health Insurance Portability and Accountability Act (HIPAA) with regard to data security and data privacy.

In the following limited situations, we may disclose information that we collect or that you provide to us:

- To our contractors, service providers and other third parties we use to support our business and who are obligated to keep personal information confidential and use it only for the purposes for which we disclose it to them.
- In an aggregated or anonymized format where no individual can be identified or linked to any part of the information.
- To comply with any court order, law or legal process, including responding to a governmental or regulatory request.
- To enforce our rights arising from any contracts entered into between you and us and for billing and collection.
- To a buyer or other successor in the event of a merger, sale or transfer of some or all of Matchbook Labs, Inc.'s assets.
- For any other purpose disclosed by us when you provide the information.
- With your consent.

We only use information that we collect about or from survey takers, including any personal information, to:

- Improve our Services and resolve technical issues.
- Provide customer support.
- Fulfill any other purpose for which you provide it.

Do you guarantee full erasure of data?

Deleting your content may not immediately remove the content you have published from our systems, because of caching, backups, or other references to your account. GetFeedback guarantees full erasure of deleted data within 90 days of deletion.

What controls are in place to ensure that when another customer's data is compromised our data would not also be compromised?

Though of course not every possible type of malicious data access can be anticipated, GetFeedback's application security architecture ensures segregation of customer data.

Availability/Reliability

What practices / controls are in place to maximize uptime?

GetFeedback runs in facilities powered by redundant power, each with UPS and backup generators. Heroku's application deployment model minimizes the risk that changes to the GetFeedback application will significantly disrupt service.

What is your uptime?

GetFeedback's availability over the most recent 12-month period was above 99.9%.

The Heroku platform has exceeded 99.9% uptime in each of the most recent 12 months.

How do you communicate with customers when there is a problem with the application?

We tweet from @getfeedback, though this is rarely necessary. Enterprise customers can elect to be notified of any problems via email.

Heroku publishes their uptime here: <https://status.heroku.com/uptime>

How is downtime scheduled?

Our deployment platform usually obviates the need for downtime when we make changes to GetFeedback. However, we will notify customers by email at least 24 hours in advance of any planned downtime.

Have you ever had any major downtime?

No. The most severe incident in GetFeedback's history prevented access to the service for one hour, with no data loss.

223 Access control

What controls are in place to manage access to GetFeedback applications and infrastructure?

Internal access to GetFeedback servers is controlled by restricting traffic to a specific set of network IP addresses.

All access to GetFeedback is governed by access rights, authenticated by username and password.

Passwords are always encrypted, never stored as plain text.

Your GetFeedback administrator can provision more granular access privileges for your users, such as read/write access to a Salesforce integration.

What controls are in place to keep a customer's data separate from other customers'?

GetFeedback's application security architecture ensures segregation of customer data.

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Heroku Redis Technical Characterization

🕒 Last updated 09 September 2015

☰ Table of Contents

- ┆ Performance characteristics
- ┆ Multitenancy
- ┆ Architecture, vCPU, RAM and I/O

 All the information in this document is subject to change as Heroku adapts the service to better handle customer workloads.

The Heroku Redis Hobby, and Premium tier (<https://elements.heroku.com/addons/heroku-redis>) plans offer different performance characteristics based on their multitenancy, CPU, RAM and I/O architectures. This article provides a technical description of the implementation of these plans, and some of the performance characteristics of each.

Performance characteristics

The following table outlines our plans along with relevant specifications about the underlying hardware.

Plan	vCPU	RAM	PIOPS	Multitenant	Connection Limit
hobby-dev	2	25 MB	200	yes	20
premium-0	2	50 MB	500	yes	40
premium-1	2	100 MB	500	yes	80
premium-2	2	250 MB	500	yes	200
premium-3	2	500 MB	500	yes	400
premium-4	2	750 MB	500	yes	700
premium-5	2	1 GB	500	yes	1000
premium-7	2	7 GB	500	no	5000
premium-9	4	10 GB	500	no	5000
premium-10	8	25 GB	500	no	5000

premium-12	io	cpu	mem	cpu	io	cpu
premium-14	32	100 GB	1000	no	no	5000

Premium plans are encrypted at rest by using AES-256, block-level storage encryption.

Multitenancy

Heroku Redis instances currently run on virtualized infrastructure provided by AWS EC2. Higher level Heroku Redis plans benefit from higher levels of resource isolation than lower level plans.

There are two main variants of deployment architectures on Heroku Redis: multi-tenant and single-tenant.

For multi-tenant plans, several LXC containers are created within a single large instance. Each LXC container holds a single Redis service and provides security and resource isolation within the instance.

Resource isolation and sharing on multi-tenant plans is imperfect and absolutely fair resource distribution between tenants cannot be guaranteed under this architecture.

For single-tenant plans, a customer's Redis instance and related management software are the sole residents of resources on the instance, offering more predictable and less variable performance. However, virtualized infrastructure is still subject to some resource contention and minor performance variations are expected.

Architecture, vCPU, RAM and I/O

All Heroku Redis plans run on 64-bit architectures, ensuring best performance for Redis operations.

vCPU are the number of virtual processors on the underlying instance. Having a larger number of vCPUs provides better performance on the virtual server or instance.

All instances are backed by EBS optimized instances where EBS disks with provisioned IOPs (PIOPs) are attached. PIOPs are a measure of how many I/O operations the underlying disks can perform per second. The amount of IOPs provisioned for each plan determines its I/O throughput.

Appendix 6: Flyer for school recruitment for the RCT



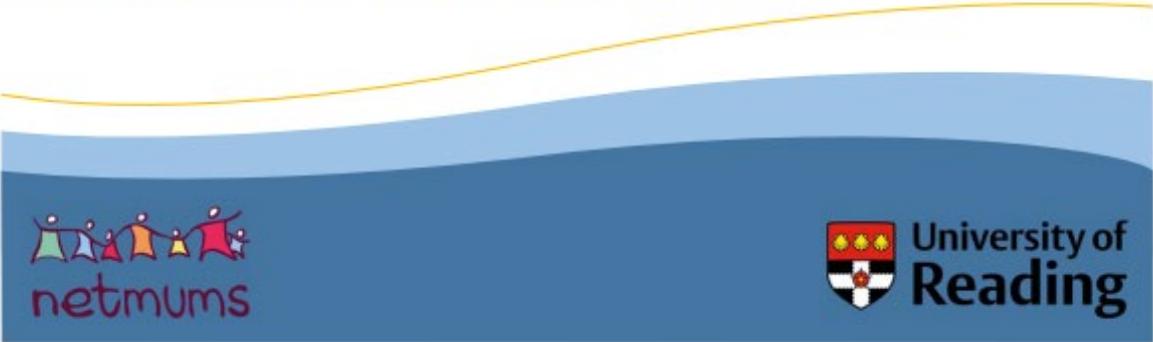
All parents invited to take part in
our Healthier Lives Study!

The University of Reading has teamed up with Netmums to develop two online programmes to help parents and kids get more healthy and active

One is focussed on kids' wellbeing and the other on healthy eating. Now we're looking for parents to help us see if they work

Not only will you get free access to a three-week course - packed with tips and ideas - you'll also be entered into a prize draw to win one of two £250 prizes

To find out more or take part [click here](#)



Appendix 7: Complete online questionnaire for RCT in Chapter 5 including participant information & consent

PARTICIPANT INFORMATION

Supervisor:

Dr Kate Harvey

Email:

k.n.harvey@reading.ac.uk

Phone:

Experimenter:

Sarah Snuggs

Email:

s.j.snuggs@pgr.reading.ac.uk

We would be grateful to you if you could assist us by participating in our study exploring healthy living.

What does the study involve?

It involves participating in one of two online programmes that Netmums and the University of Reading have designed. One of these focuses on healthy family eating, and the other on kids' wellbeing. Both are delivered by email. If you decide to take part, you will be randomly allocated to receive one of these programmes. We hope that both programmes will help parents and kids to improve their lifestyles and become a bit healthier. The aim of the study is to compare the programmes to each other.

Who can take part?

Anyone can take part, as long as you have a child between the ages of 1 and 16 years old living with you some of the time.

What will happen if I take part?

If you agree to participate, you will first be randomly allocated to one of the programmes and complete an online questionnaire. This will take about 15 minutes. Both programmes consist of 9 emails sent over a 3-week period which offer tips, suggestions and ideas around healthy living. When the email programme has finished, you will be asked to complete another questionnaire, similar to the one you completed at the start and then a final one 6 months later, when you can also be entered into a prize draw to win one of two £250 prizes we have on offer.

After the study is complete, if you would like to take part in the other course, you can.

Your data will be kept confidential and securely stored. All information collected for the project will be destroyed after a period of 3 years from the completion of the project has elapsed. Taking part in this study is completely voluntary; you may withdraw at any time without having to give any reason. Please feel free to ask any questions that you may have about this study at any point.

This application has been reviewed by the University Research Ethics Committee and has been given a favourable ethical opinion for conduct.

Please press on the arrow on the right to continue.

CONSENT

Please indicate whether you agree or disagree with the following statement:

I understand that my participation in this study is voluntary and that I may withdraw any time without giving any reason. [*Agree, Disagree*]

Please indicate whether you agree or disagree with the following statement:

I have read the information above about this study. [*Agree, Disagree*]

Please indicate whether you agree or disagree with the following statement:

I have been given the opportunity to ask any questions that I may have about the study and these have been answered to my satisfaction. [*Agree, Disagree*]

[If participants agreed with all consent questions they were taken through to the following questionnaire. If they had not, they were taken to a screen that thanked them for their time and explained that on this occasion they were not eligible to take part due to their disagreement with one or more of the statements]

QUESTIONNAIRE

[Demographic questions were delivered at Time 1 (baseline) only. Feedback about the intervention was only collected at Time 2 (immediately post-intervention). All other questions were delivered at Times 1, 2 and 3 (6 months post intervention completion)].

Demographics

How many children aged between 1 and 16 years live with you some or all of the time?

(0, 1, 2, 3, 4, 5, 6, 6+)

[In the event that a participant answered 0, they were re-routed to an exit page with the following text:

Thank you for agreeing to take part in our study. Because you have indicated that you do not have any children between the age of 1 and 16, you are not eligible to take part on this occasion.

Please click on the link below to return to the Netmums website.

In the box below, please enter your email address. All your answers are confidential and this will only be used to link up future questionnaire answers to this questionnaire*

[Text box provided, answer must be in email address format to continue]

In this survey we will be asking you some questions about your family and their health.

Please enter your child's name or initial in the box below. If you have more than one child, enter the child whose name begins with the letter closest to the beginning of the alphabet.

(E.g. if you had two children called Emma and Oliver, you would enter the name 'Emma' in the box below).

You can choose whoever you like as long as they are between 1 and 16 years old. Please enter the first name of the child you have chosen. This information will only be used as a reminder for your own use throughout the survey. It will not be kept on our records and all information you give us will remain anonymous.

[Text box provided, participants could leave blank if they prefer]

How old is XXX?

[Text box provided, answer must be a number]

What is XXX's gender?

(Male, Female)

What is your relationship to XXX? (e.g. mother, grandparent, carer etc.)

[Text box provided, open-ended]

How old are you?

[Text box provided, answer must be a number]

What is your gender?

(Male, Female)

Which of the following most closely describes your occupation?

(Higher managerial, administrative or professional/Intermediate managerial, administrative or professional, Supervisory or clerical and junior managerial, administrative or professional, Skilled manual worker/Semi-skilled or unskilled manual worker/unemployed/student/retired/other (please specify))

Which of the following groups do you belong to?

(White-British/White-Irish/White- Any other White background/Mixed-White & Black Caribbean/Mixed- White & Black African/Mixed- White & Asian/ Mixed-

Any other mixed background/Black or Black British-Caribbean/Black or Black British-African/Black or Black British- Any other Black background/Asian or Asian British-Indian/Asian or Asian British- Pakistani/ Asian or Asian British-Bangladeshi/Chinese/Other ethnic group/Prefer not to say)

Please select the furthest level of education that you have completed:

(Did not complete Secondary Education/Secondary Education (GCSE/O-Levels), Post-Secondary Education (College, A-Levels, NVQ3 or below, or similar, Vocational Qualification (Diploma, Certificate, BTEC, NVQ 4 and above, or similar), Undergraduate Degree (BA, BSc etc.)/Post-graduate Degree (MA, MSc etc.)/Doctorate (PhD), Other)

Motivation

On a scale of 1 to 5, how motivated do you feel at the moment to become healthier, where 1 is not motivated at all, and 5 is very motivated?

(1-5)

On a scale of 1 to 5, how motivated do you feel right now about implementing the ideas you get from the email programme, where 1 is not motivated at all and 5 is very motivated?

(1-5)

Comprehensive Feeding Practice Questionnaire (CFPQ): Healthy Environment, Modelling, Encourage Balance & Variety and Involvement subscales

How strongly do you agree with the following statements?

Most of the food I keep in the house is healthy

I keep a lot of snack food (e.g. crisps) in the house

A variety of healthy foods are available to my child at each meal served at home

I keep a lot of sweets (sweets, ice cream, cake, pastries etc.) in my house

I model healthy eating for my child by eating healthy foods myself

I try to eat healthy foods in front of my child, even if they are not my favourite

I try to show enthusiasm about eating healthy foods

I show my child how much I enjoy eating healthy foods

I encourage my child to try new foods

I tell my child that healthy food tastes good

I encourage my child to eat a variety of foods

I involve my child in planning family meals

I allow my child to help prepare family meals

I encourage my child to participate in grocery shopping

[Disagree, Slightly disagree, Neutral, Slightly agree, Agree]

Do you encourage XXX to eat healthy foods before unhealthy ones?

(Never, Rarely, Sometimes, Mostly, Always)

Additional questions designed to mirror CFPQ questions to limit insight into the fact the trial focussed on eating behaviours (presented randomly amongst CFPQ questions)

Please read the following statements and tick the boxes most appropriate to your child XXX's eating behaviour.

I try to limit my child's screen time

I keep a close eye on what websites my child visits

I encourage my child to exercise regularly

I make sure that my child knows about the importance of sun cream

I make sure that my child sees me brushing my teeth regularly

I make sure I don't use my phone too much in front of my child

I try to show enthusiasm about exercise

I show my child how much I enjoy exercise

I encourage my child to try new activities

I tell my child that exercise makes me feel good

I encourage my child to talk to me about what they do on the internet

I encourage my child to tell me if they're having difficulty at school

I check how long my child brushes their teeth for

I encourage my child to help around the house

(Never, Rarely, Sometimes, Mostly, Always)

Children's Eating Behaviour Questionnaire (CEBQ): Enjoyment of Food and Food Fussiness scales

How strongly do you agree with the following statements?

My child loves food

My child is interested in food

My child looks forward to mealtimes

My child enjoys eating

My child refuses new foods at first

My child enjoys tasting new foods

My child enjoys a wide variety of foods

My child is difficult to please with meals

My child is interested in tasting food s/he hasn't tasted before

My child decides that s/he doesn't like a food, even without tasting it

(Never, Rarely, Sometimes, Mostly, Always)

Additional questions designed to mirror CEBO questions to limit insight into the fact the trial focussed on eating behaviours (presented randomly amongst CEBO questions)

My child loves playing computer games

My child brushes their teeth (or has their teeth brushed) at least twice a day

My child looks forward to exercise

My child enjoys exercise

My child surfs the internet

My child enjoys new activities

My child applies their own sun cream

My child does not often enjoy screen time

My child is interested in trying activities s/he hasn't tried before

(Never, Rarely, Sometimes, Mostly, Always)

Family meal arrangements

During the last seven days, roughly how many times did you and most of your family sit down to eat dinner together?

[Presented on visual analogue scale, 0-7]

Approximately how many times in the last week has your family had a meal prepared at home with raw ingredients?

[Presented on visual analogue scale, 0-21]

Roughly how much money would you estimate that you have spent on food for your family in the last week (including eating out)? If you're not sure, please make a guess.

[Presented on visual analogue scale, £0-£500]

Family arrangement measures design to mirror family arrangements above to limit insight into the fact the trial focussed on eating behaviours (presented alternately with the meal measures above)

Roughly how many times a week does XX do at least 30 minutes' exercise?

[Box provided for number]

Roughly how much money would you estimate that you have spent on extra-curricular activities for your family in the last week? If you're not sure, please make a guess.

[Presented on visual analogue scale, £0-500]

How many hours a week does XX spend in front of a screen (i.e. tablet, tv, smartphone, games console or PC)?

[Box provided to fill in answer]

Family Mealtime Goals Questionnaire

Thinking about your child's mealtimes, how strongly do you agree with the following statements?

I want to prepare food for my child using natural ingredients

I want to give my child home-cooked food

I want to prepare food for my child using raw ingredients

I want to make sure I don't lose my temper at mealtimes

I want to avoid arguments at mealtimes

I don't want to get stressed thinking about mealtimes

I want the whole family to help out with mealtimes

I want to get my child involved with things like setting the table or clearing up

I want to choose food that my child can help prepare

I want my child and I to eat the same food

I don't want to prepare different foods for different family members

I want to prepare food that all my family will eat

I don't want to spend a long time preparing food for my child

I want to choose food for my child that is easy for me to prepare

I want to give my child food that is low in fat

I don't want to give my child fatty foods

I want to keep to my budget

I want to keep costs down

I want to give my child sugary treats sometimes

I want my child to be free to eat unhealthy food sometimes

I want to give my child enough fruit and veg

I want to ensure my child has a balanced diet overall

I want to give my child food that is nutritious

(Strongly disagree, Disagree, Neither agree nor disagree, Agree, Strongly agree)

Goal Conflict Questions

On a scale of 0 to 99 (where 0 means never and 99 means always) do you ever find yourself having a hard time choosing healthy food because you're trying to keep costs down?

If you would like to indicate 'always', please move the slider slightly from its current position at 100.

Do you ever find yourself having a hard time choosing healthy food because you're trying to keep costs down?

Do you ever find yourself having a hard time finding the time to take your child to activities?

Do you ever have a hard time choosing healthy food because you're trying to prepare food quickly?

Do you ever find it difficult to decide how much screen time to allow your child?

Do you ever find it difficult to choose healthy food because you're worried your family won't like it?

Do you ever find yourself suggesting screen time to your child so that you can get on with things you need to do?

Do you ever find it stressful trying to find healthy things to cook?

[All 4 questions presented on a Visual Analogue Scale, 0 – 100]

Final baseline questions

Would you be willing for us to contact you via email about future research we conduct?

We will not use your email address for anything else, or share your data with any other person/organisation. Agreeing we can contact you in the future does not mean you have to take part in any future research. If you would prefer not to take part in future research, please leave this box blank and go onto the next page.

(Yes, No)

Please enter your Netmums account email address into the box below. This is the address that your email programme will be sent to.*

[Text box provided, must be in email format to continue]

Thank you very much for completing the questionnaire. You have been allocated to the Kids' Wellbeing/Healthy Happy Family Eating email programme [delete as appropriate] and will receive your first email within the next hour.

If you would be willing to take part in future research that we conduct, please provide an email address below. We will not use your email address for anything else, or share your data with any other person/organisation. Agreeing we can contact you in the future does not mean you have to take part in any future research. If you would prefer not to take part in future research, please leave this box blank and go onto the next question.

Thank you very much for completing the questionnaire. You will receive an email to let you know what happens next shortly. If participating in this study has caused you any concern about your own or your children's health, please feel free to contact the study's principal research, Dr Kate Harvey, who is based at the University of Reading (k.n.harvey@reading.ac.uk) or your GP.

Questionnaire 2 (Immediately post-intervention) extra questions

Do you have any comments or feedback about the emails that you have received from us in the last few weeks?

[Text box provided]

Which of the following emails did you find useful? (Please tick all that apply):

HHFE: Get cooking with kids, Planning & budgeting, Five a day, Healthy happy breakfasts, Portion control, Sugar, Salt, Happy Mealtimes, Fat, Protein, Water

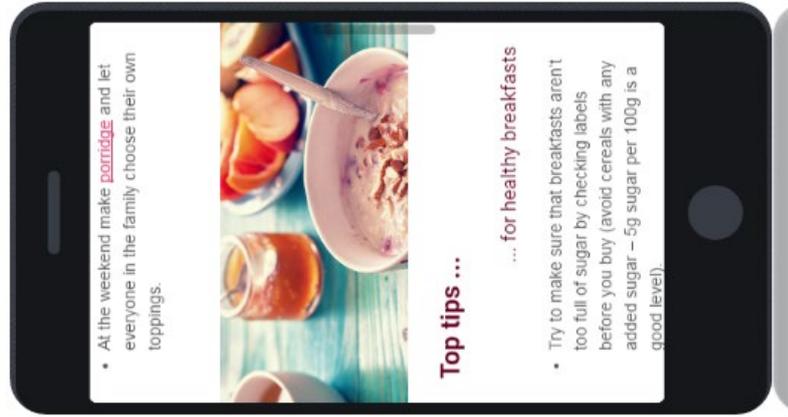
Kids' Wellbeing: Screen time, Bullying, Getting Active, Medicine Cabinet Essentials, Internet Safety, Child Benefit, SunSense, Tooth brushing, Water, Five a Day, Vaccinations

[Underlined questions indicate topics that were not covered to assess whether participants were paying attention]

Thank you very much for completing the questionnaire. If participating in this study has caused you any concern about your own or your children's health, please feel free to contact the study's principal research, Dr Kate Harvey, who is based at the University of Reading (k.n.harvey@reading.ac.uk) or your GP.

*Mandatory question

Appendix 8: Example appearance of the HHFE emails



Appendix 9: Full content of HHFE emails

<<EMAIL 1>>

Welcome to your first Healthy Happy Family Eating email.

You'll receive eight more emails over the next month. Each one will include bright ideas to help you and your family on your way to healthier, happier family eating, as well as quick tips to help make meal planning easier.

All the ideas and tips will be based on these five principles:

- Togetherness
- Balance
- Variety
- Planning
- Simplicity

<<xhead>>Bright ideas

<<subhead>>*Take notes*

Either on paper or in the notes area on your phone, find a place where you can take notes on the programme, jot down shopping lists and save ideas you might want to try later.

Don't worry if you can't try the right ideas right away - save them for another time that suits you – or if the idea isn't right for you - this programme is all about finding what works for you and your family.

<<subhead>>*Get cooking with your kids*

Choose one recipe that you'd like to make with your children sometime this week.

It can be anything at all, sweet or savoury. It can even be a recipe that you don't cook, you just prepare. But whatever recipe you decide on, it must be something tasty that you're all looking forward to making and eating.

For inspo on how to cook with kids, go to the Netmums cooking with kids pages [LINK] where you can find recipes like these:

FRUIT KEBABS	(gluten free)	CHEESY HAM PASTA BAKE
EGG IN A HOLE	PIZZA PIES	ICE LOLLIES
WRAPS	THAI GREEN CURRY	TUNA MEATBALLS
CHICKEN/ FISH ON SKEWERS	TODDLER VEGETABLE CAKES	POTATO SALAD
LAMB BURGERS		

EASY
OATY
BISCUITS

CHEESE
PARCELS

<<xhead>>TOP TIPS... for getting the family eating together

- Get older children involved in planning meals – they may be more likely to eat them if they chose what was on the menu
- Let everyone serve themselves. It doesn't have to be fancy – even just serving themselves from pans at the stove (with supervision!) can encourage children to feel involved, as well as help with portion size control.

For more tips on involving all the family in mealtimes click here. [LINK]. And don't forget to check in our forum for ideas from other mums [LINK].

<<EMAIL 2>>

<<xhead>>Planning and budgeting

Planning and budgeting go hand in hand. If you can be organised about your family's meals, you'll probably waste less food, make fewer impulse buys and save money!

If you write down your plans, you're also more likely to follow them through, so if you're thinking about trying out some of our recipes [LINK] then write down the ingredients on this week's shopping list. There's also heaps of ideas for those planning meals on a budget [LINK].

<<subhead>>Bright ideas

- Try and find a quiet 5 minutes to think about some main meal ideas that suit your family. Use your notes to remind you of the meals that are your family favourites ie ones that everyone likes.
- If you need some help, take a look at some of our recipe ideas [LINK] or download one of our meal planners [LINK] – we have a few 4 and 6 week plans with a variety of meal ideas, including a planner for cooking on a budget [LINK].

If you already know what you'd like to cook, simply download a blank planner and fill in the gaps. [LINK]

- Each time you prepare a meal over the coming week, try to find one job the kids can do – even if it's spreading their own toast in the morning or helping to set the table – every little bit of involvement helps.

<<subhead>>Top tips... for getting organised and staying on budget

-Batch cook: if you can cook something up that will last for more than one meal, this will save you time and money in the long run.

-Clear out your freezer: are there things in there that you know you'll never eat? Or is there a way to move things around to make it more organised. If you free up some space, then you can freeze some of that batch cooking!

-Invest in a bag of frozen mixed vegetables: this can work out cheaper than buying all of your vegetables fresh and separately, and means you can try a few different things out with your kids without worrying as much about the waste.

-Pack up leftovers and use them for lunches, either for the kids or for yourself: if you know you need to save some food for later, this can help you to control portion sizes, too.

<<EMAIL 3>>

<<xhead>>Five a day

We all know that fruits and vegetables are an important part of a healthy diet, but how many of us – and our children are actually managing to eat our five a day?

The good news is that nearly all fruits and vegetables count towards our five a day. They can be fresh, dried, frozen or tinned (although watch out for extra sugar in tinned fruit!). Even a glass of fruit juice or a smoothie can count towards the total (be careful of sugar in juice though) and of course you can count the fruit and veg within your meals and sauces, too.

<<xhead>>Bright ideas

* Sit down with your children and list twenty different fruit and veg. Get each child to put them in order, with their favourite first and their least favourite last. Add their top five favourite fruit and veg to your shopping list and let your children find and add them to the trolley on the next trip to the supermarket.

- With smaller children, use these pictures [LINK] to see how many of the fruits and vegetables they're able to name, and remember to give lots of praise when they get them right!
- See if you've got some spare fruits and vegetables around the kitchen with your children, and throw them into the blender to produce a smoothie. You may be surprised at some of the things the kids will accept in a smoothie that they don't always like to have with their main meals!

<<xhead>>Top tips... for getting everyone to eat their five a day

-Keep carrots, celery and cucumber washed and cut into pieces in a box in the fridge - ideal for a quick snack.

-Keep trying a new fruit or veg with children. It can sometimes take as many as 10 times before they like it, so keep offering rejected foods every few weeks. Offering new foods, in very small quantities, alongside old favourites can really help.

-Don't say, 'No dessert until you've eaten your veg'. This will not only make them think that veggies = punishment; it will also give children the idea that pudding is more desirable than the vegetables.

<<xhead>>Top tips... for fussy eaters

Most parents have had to deal with a fussy eater at some point, and it can be hugely frustrating. Our top tips for dealing with fussy eaters include:

-If your child doesn't like something the first time you give it to them, don't give up! Keep putting it on their plate but try not to pressure them to eat it. They might be happy to try it once it's a bit more familiar.

-Try and get your child involved in food choices when choosing new foods. They might be more tempted to try things if they played a part in deciding to eat them.

-To encourage your child to eat new foods, try eating those foods in front of them; they may become more interested and want to try some of yours.

There are loads more tips on how to deal with picky eaters on Netmums [LINK] as well as advice from experts on what you can do to help [LINK].

<<EMAIL 4>>

<<xhead>>Healthy happy breakfasts

There are lots of health benefits to getting the day off to a good start with a healthy breakfast and if you can find the time to sit down with your family to have breakfast together, it will also give you the chance to chat before everyone starts their day.

<<xhead>>Bright ideas

- * Why not plan a family breakfast for tomorrow morning. If your family already have breakfast then well done – you're already off to a flying start!
- * Adding fruit to your family's breakfast can be a great way of squeezing in one or two of everyone's five a day before the day's even begun. For more ideas on ways to make breakfast more varied and healthy, click here [LINK].
- * At the weekend make porridge and let everyone in the family choose their own toppings [LINK].

<<xhead>>Top tips... for healthy breakfasts

-Try to make sure that breakfasts aren't too full of sugar by checking labels before you buy (avoid cereals with any added sugar – 5g sugar per 100g is a good level).

-Check the label on your breakfast cereal box to see if it is a good source of fibre, too: you're looking for at least 3g per 100g under the 'fibre' heading; a high-fibre cereal will have 6g per 100g or more.

-Choose a wholemeal or granary bread for your toast - or, if you or your family really don't like these, switch to a 50:50 wholemeal and white variety..

-Try to include something that's rich in calcium for breakfast - the easiest way is a glass of milk, or milk with cereal.

-If you're having a cooked breakfast, try and grill the ingredients rather than frying them.

-Use breakfast as an easy way to get one of your five a day: add a small handful of chopped or dried fruit to breakfast cereal, slice a banana on toast or have a glass of fruit juice or a smoothie. Or with a cooked breakfast, add grilled mushrooms, tomatoes or baked beans – all of which count as one of your five a day.

<<EMAIL 5>>

<<xhead>>Portion control

When larger portion sizes are served up, we tend to eat more than if we give ourselves smaller servings, and this can be true for our children, too.

Portion sizes in shops and restaurants have grown over the years, which doesn't help! For example, a report by the British Heart Foundation recently found that some restaurant portion sizes have more than doubled in the last twenty years, while shop bought items such as packets of crisps have also increased dramatically in size.

Look at the portion sizes that your family eats - do all your family need the same amount? Try varying the portions you dish out depending on the need of each person in your family - you may find you get more clean plates and less food wasted.

<<xhead>>Bright ideas

* Take a look at the Eatwell plate with your family [LINK]. See how much of your food should come from each food group. You don't need to get the balance right at every meal, but by balancing food groups over a day or week, including snacks, you can really make a difference to your family's diet.

* Make a quick list of your usual family staple meals. Get your children to take it in turns, calling out the meals. How many meals have you got on your list? Can you think of a new idea to add? Write down the ingredients and add them to this week's shopping list.

* If you haven't managed to cook a recipe with your children yet, try to do it this weekend. Read through the recipe before you start so that you know what you're doing and think about tasks that the children can do to help.

<<xhead>>Top tips... for managing portion sizes

-Look at each family member's hand for a rough guide to how much their individual portion should be; each person's carbohydrate serving (pasta, potato, rice etc.) should be about the size of their fist, while their protein should be around the size of their palm.

-Serving a salad before or with a meal cuts down on the risk of over-eating.

-Say no to supersizing in fast-food restaurants - or just buy one larger portion to share between two or three of you.

-Keep leftovers out of sight, not on the table in front of you: better to re-use them in tomorrow's meal than offer extra food today.

-Don't insist the kids clear their plates: children are much better at eating to meet their needs than we are, so if your kids consistently leave food on their plates, start giving them smaller servings.

-Avoid eating in front of the TV or while doing other activities: eating without distraction means you can pay attention to the amount you're eating and enjoy your food more.

<<EMAIL 6>>

<<xhead>>Sugar

Across the UK, children are consuming three times more than the recommended daily allowance of sugar.

Too much sugar can lead to tooth decay and weight gain and eventually many more long-term, serious health problems.

It's a good idea to try and avoid 'added sugar' wherever possible. Examples of added sugar can include sugar added by the manufacturer, by a restaurant chef, or by you in your cooking.

<<xhead>>Bright ideas

* See if you can do a sugar swap for all the family – examples could include switching your normal cereal to a plain whole-wheat cereal, switching fizzy or juice drinks to no-added sugar drinks or water, or giving the kids a less sugary afterschool snack like fruit, plain rice cakes or toast.

* Get the whole family to try and come up with some low sugar alternatives to pudding. Ideas could include cheese and biscuits, baked fruit, homemade ice-llollies from sugar-free squash. Or perhaps try baking with sweet spice like cinnamon instead of sugar.

* Get everyone in the family to think up their perfect sandwich. Encourage children to be experimental and to include as many food groups as possible (remember the Eatwell plate) – so, for example, a wholemeal roll with soft cheese, ham, lettuce and tomato would tick all the boxes.

<<xhead>>Top tips... for reducing your family's sugar intake

-Cook more food from scratch. You'll avoid some of the hidden sugars in processed food.

-Remove temptation. If it's not in the house, you can't eat it!

-Know your labels: sucrose, glucose, fructose, dextrose, lactose, maltose and corn syrup all refer to sugar content on your food labels.

-Remember that ketchup and other bought sauces often contain lots of sugar.

-Learn to enjoy food with less sugar – you could start by reducing how much sugar you put in your tea or coffee, or diluting your children's juice.

-Try not to use sugary treats as rewards for your children, or to cheer them up. This sends mixed messages if you're trying to get the family healthy.

<<EMAIL 7>>

<<xhead>>Salt

It's important for our health not to eat too much salt, but there's salt hiding in lots of everyday foods – from cured meats, such as bacon, ham etc., to cheese and nuts. Some other foods vary in salt content so it's good to check labels before you buy (examples include bread, ready meals, ketchup and cereals).

Current guidelines suggest the following daily guidelines for salt intake (sometimes you'll see it as sodium on the labels and sometimes as salt):

1 – 3 years: 2g salt a day (0.8g sodium)

4 – 6 years: 3g salt a day (1.2g sodium)

7 – 10 years: 5g salt a day (2g sodium)

11 and over (and adults): 6g salt a day (2.4g sodium)

Remember these are upper limits. It's fine to eat less but don't exceed them. And try to avoid adding salt to your cooking.

<<xhead>>Bright ideas

* Choose one of your cupboards and give it a good clear out. Throw away anything that is out of date. Look at the foods you use that need replacing, and see if you can swap any of them for a less salty option. Add the replacements to your shopping list.

* Try a family taste test: lay out some ingredients on a tray - you can use anything that you have in your kitchen; mashed banana, a slither of pear, honey or drinking chocolate powder all work well with small children. For older children, you could try cinnamon, mild korma curry powder, lemon, instant coffee, or even fennel seeds if you have them. Taking it in turns, use a scarf to blindfold your children (and any adults that are around, too) and see if they can identify the foods as you put tiny samples onto their tongues. Have water ready for them to sip at in between tastes. It's a great way to turn trying new tastes into something fun.

<<xhead>>Top tips... for reading food labels

-Food labels might give you the figure for sodium, instead of salt. If it's too confusing, check the 'traffic light' labels and go for the green or, less often, amber ones.

-Check the recommended serving size – sometimes what looks like it's meant for one person may actually be designed for two, or even the whole family.

-Be clear between the terms 'reduced' and 'low'. 'Reduced-sugar' might mean there is less than there was before, but the level might still be very high. Instead, look for 'sugar-free' or 'no added sugar'.

-Compare the portion content to the recommended amount for one person (often referred on the label either as 'GDA' or 'RI' – Recommended Daily Allowance, or Reference Intake). If the recommended amount is close to the GDA/RI, try and think about whether you can realistically avoid eating any more of that nutrient in a day.

<<EMAIL 8>>

<<head>>Happy mealtimes

Research shows that if you eat together more as a family you might also be happier in the long run.

If you are relaxed about mealtimes, your children are more likely to remain stress-free as well, and you might even find that a relaxed attitude encourages fussy eaters to try new things with no pressure.

If you don't feel you can all sit down together as a family for meals, is there another way that you could you change your routine just a little bit? Some people find that sitting down for breakfast as a family is a good solution if one parent works too late to join for dinner.

<<xhead>>Bright ideas

Try and find fifteen minutes today just for yourself. Sit down with a cup of tea or coffee, or perhaps your lunch if you're on your own.

Take a moment to really taste the food and savour the flavours. In our hectic world, it can be very easy to forget to think about what we're eating so try and be mindful of what you're eating, and whether you're enjoying it.

Get the family together for a meal and set some ground rules so that you can really focus on each other. That might mean no TV, and leaving phones away from the table. Ask one another about your days... and make sure you listen to your family's answers!

<<xhead>>Top tips... for a mindful and happy mealtime

- Slow down your chewing; try not to shovel the food in!
- When you have a family meal, make sure you focus on each other and on the food – not screens, work, homework or other distractions.
- If you think you're eating too fast, try and think about what you're eating. If you're children are, ask them what they're enjoying about their food.

<<EMAIL 9>>

You've come to the end of the Healthy Happy Family Eating emails.

We hope you've enjoyed it and have found some quick and easy ways to improve your family's eating.

A list of all the Netmums food pages that were included in the course is below. You can use them as a reference and check back now and again for fresh recipe inspiration.

<<xhead>>Bright ideas

To celebrate all you've learned, why not plan a special meal with a new recipe [LINK]?

Make it extra special by getting your children to make an imaginative (and inexpensive) centre piece for your table - using floating tea lights or flowers from the garden. Lay out kitchen roll as napkins and put out wine glasses for everyone, even if they're just filled with water for the kids!

While you're eating, ask your family what they've enjoyed about the course, and which ideas or tips they'd like to continue with going forward.

USEFUL PAGES (all hyperlinks)

5 a day

Brilliant breakfasts

Drinking more water

Eatwell plate

Fussy eaters

Fussy eaters - top tips

Happy family meals

Labelling

Lunch box ideas

Meal planner

Portion distortion

Saturated fat food swaps

Reducing your sugar

Snack swaps

Tips for happy meal times

We hope that you and your whole family have enjoyed Healthy, Happy Family Eating and you've started some new eating habits that you can stick to.

Please do save these emails to dip in and out of when you're looking for inspiration and ideas, and don't forget to chat about what you've learnt – or what you're planning to cook for tea tonight – in our Coffeehouse.

Appendix 10: Full content of Kids' Wellbeing emails

<<EMAIL 1>>

Welcome to your first Kids' Wellbeing email.

You'll receive 8 more emails over the next month. Each one will focus on a wellbeing topic for your kids and contain some tips on how to improve their lifestyles. In this email, we're focussing on your kids' screen time.

<<xhead>>Screen time

Most children these days have access to all sorts of screens; TV, tablets, smartphones. These devices have some great benefits. But how much screen time is too much? And how can we ensure that our children spend some time away from the gadgets?

Too much child and teen screen time has been linked to sleep disturbance and other health issues such as high blood pressure and obesity. Exactly how much time you let your child spend in front of a screen will depend on lots of factors, and is up to you. We have some suggestions below about ways that you can limit your child's screen time to an amount of time that you feel is OK.

<<xhead>>TOP TIPS... for reducing screen time

- Set limited viewing times. Let them know that they can choose, say, one programme after school and one after their homework.
- Keep screens away from the bedroom. Screen time can have a huge effect on sleep and it's really important to keep kids' sleeping environment calm.
- Monitor your children's screen time – make sure you know what (and when) they're watching.

For more information on how screen time can affect your child's sleep (and how to create a good bedtime routine) click here. [LINK]

<<EMAIL 2>>

<<xhead>>Bullying

It is devastating for any parent to find out that their child is being bullied and it can be difficult to know what to do or how to help them. The most important thing you can do is think before you react. Netmums has loads of helpful resources on what to do if your child is being bullied [LINK] such as advice on how to practice role playing with them [LINK] or what to do if your child has been accused of bullying someone else. [LINK]

<<xhead>>TOP TIPS... spotting the signs of bullying

- Look out for changes in mood. Typical changes might include becoming more withdrawn, or being upset more easily than normal. They may also report feeling sick and not wanting to go to school.
- Changes in behaviour might also indicate that there's a problem. If your child is normally outgoing and becomes introverted, for example. Changes in eating habits may also be a sign of bullying.

- Signs of physical bullying might include torn clothing, or your child might try and cover up to hide bruises.
- Damaged or missing items can also be a warning sign – especially if there is more than one episode.

Of course, none of these signs in isolation mean that your child is being bullied but they are things you can look out for if you're worried. Make sure you are able to reassure your child, and above all listen to them.

<<EMAIL 3>>

<<xhead>>Getting Active

We all know it's important to exercise, but it's often easier said than done. People who have exercised in the past are more likely to take up exercise again, which is why it's really important that we get our children active as early as possible.

<<xhead>>TOP TIPS... *Get kids exercising*

- If you don't already, encourage them to walk or cycle to school. Or if that's not realistic, maybe get off the bus one stop early to walk the last bit.
- Sign your kids up to an afterschool or weekend activity. It could be a traditional sport, like football or tennis, or if that doesn't excite them how about something new, like trampolining or street-dance. Use our Local Area pages [LINK] to find out what's on in your area.
- Limit screen time: We've talked previously about how important it is to limit screen time, and if they're not in front of the TV they're more likely to be doing something active! Perhaps you could try negotiating half an hour of exercise in exchange for half an hour of screentime.
- Encourage them to invite a friend to join them for their activity. They could go ice-skating, swimming or simply playing in the park.

<<EMAIL 4>>

<<xhead>>Medicine cabinet essentials

The vast array of over the counter medication and medical equipment available for children can be confusing and overwhelming. In this email, we let you know about the basic – and essential – tools we think you need for a well-stocked medicine cabinet.

- Child/infant paracetamol (e.g. Calpol): how much to give your child varies according to age so always check the label. For more advice on when you can use it – and when not to – go to the Netmums site [LINK]
- Sun cream: In this country, we just never know when the sun might come out so it's good to have some in stock. Make sure you check the use by dates carefully.
- Calamine: traditionally used for chicken pox but can be great for other rashes and stings as well.

- Cough mixture: coughs often creep up on little ones in the middle of the night so it's a good idea to have some in the cupboard.
- Antiseptic cream: for all those little cuts, and it can be helpful for bites and stings too.
- Plasters: to protect the cuts after the antiseptic!
- Cotton wool, plasters, scissors and tweezers
- Thermometer – there are many different kinds, and it's down to personal choice which one works for you. For small children who won't sit still for long, it can be good to buy a thermometer that doesn't take long (e.g. a digital one used on ears) to ensure an accurate reading.

Take a look at our suggestions to fill the medicine cabinet. [LINK]

<<EMAIL 5>>

<<xhead>>Internet Safety

The Internet can be a brilliant source of information and fun for kids, but it can be difficult to know what's safe and what's not online. It's a good idea to make sure you know what sites and apps your kids are using. Take a look at our social networking information page [LINK] to find out about more about sites like Facebook, ClubPenguin, Poptropica and many more. You can find more information about implementing parental controls onto computers and tablets here [LINK].

<<xhead>>TOP TIPS... *keeping kids safe online*

- Sign up to one or two of the social networking sites yourself so you can see what they're about.
- Check out the privacy information and safety tips provided on the sites your kids are using.
- Show an interest and talk to your kids about their experiences on the Internet.
- Think about setting a limit on how much time they spend on the Internet – and remember the tips from our screen time email a few days ago!
- It can help if your children are somewhere you can see them when they're on the internet.
- Encourage kids to think about safety for themselves. Talk to them about the important issues and agree some rules:

Always keep personal details secret

Never meet someone you've met on the internet, especially not on your own

Do not open emails from someone you don't know

Remember someone online might be lying

Tell your parents or carer if anything doesn't feel quite right

<<EMAIL 6>>

<<xhead>>Child benefit

Child Benefit is a tax-free payment available to anyone who is responsible for a child, as long as either you or your partner doesn't individually earn over the

maximum threshold. Claiming Child Benefit can give a big boost to your family budget. If you've just had a baby, make sure you claim before it's three months old. And if your circumstances change, it's always worth checking if your entitlements have changed too. Even if you think you won't be entitled to anything, you should still claim so you don't miss out on other entitlements.

Use the links provided below to see if you're entitled to Child Benefit and if so how to claim it.

Who can claim Child Benefit? [LINK]

How much is Child Benefit [LINK]

Child Benefit if you earn more than £50,000 [LINK]

How to apply for Child Benefit [LINK]

Why it's important to claim Child Benefit [LINK]

<<xhead>>TOP TIPS... around Child Benefit

- Claim your Child Benefit as soon as your child is born even if you don't think you're entitled to anything. By claiming Child Benefit, you can get credits towards your State Pension if you're not making national insurance contributions because you're looking after your child.
- You can claim Child Benefit until your child is 16, or until they are 20 if they remain in full time education.
- You can claim Child Benefit for each child you are responsible for, regardless of whether you are their parent.

For more information about Child Benefit and links to the forms and information you need to apply, click here. [LINK]

<<EMAIL 7>>

<<xhead>>SunSense

Although we all hanker for a bit more sunshine, sunny weather does have its own problems. Sun rays cause burning and getting sunburnt can increase the risk of developing skin cancer, so it's important to take it seriously and protect your children's skin.

Sunscreen products contain filters that act as a barrier, protecting the skin from these rays. All sunscreens have an SPF (Sun Protection Factor) which indicates how long you can stay in the sun without burning. The lower the factor, the shorter time this will be. So for example, SPF 10 means you can stay in the sun 10 times longer (than without any lotion) before you will burn. SPF 50 means 50 times, etc. So sunscreen doesn't completely protect the skin, even if it's a really high factor. See below for some tips on other ways to stay safe in the sun.

<<xhead>>TOP TIPS... Sun Safety

- Avoid the strongest rays of the day - from 11am to 3pm – either go inside or find some shade during these periods. And remember to keep applying sunscreen even if you're in the shade.

- Once you think your kids are old enough to apply their own sunscreen, supervise them the first few times and make sure they are covering all their skin.
- Keep them covered up. Wet clothing can lose half its UV protection, so always put a new, dry t-shirt on when the kids come out of the water.
- Beware of cloudy days: the sun can get through the clouds, and you might be less aware of it because it's cooler. This applies to windy days too.
- Wear sunglasses. If you can find wraparound ones, these can be good for little ones to make sure they wear them for longer.
- Buy a hat! The ones with a long piece of material hanging from the back of the hat to cover the neck are particularly good for kids.

And don't forget that if you're travelling somewhere for some winter sun, the rules still apply! Even if you're skiing and it's cold, where there is sun, there are UV rays.

<<EMAIL 8>>

<<xhead>>Winning the bathroom brushing battle

Getting your children to brush their teeth properly and for long enough can be a struggle. We've got some tips in this email to help you with it. And if you'd like more advice, take a look at some of our webpages, or make a fun trip to the dentist; NHS dental care is free for children and the earlier you take them, the quicker they will become familiar with the environment. If they seem apprehensive, instead of telling them not to worry (sure to make them worry!), just let them sit and watch you have your teeth checked to show them it's not scary.

<<xhead>>TOP TIPS... *for children's dental health*

- Brush young children's teeth for them – every time!
- You should either brush their teeth or supervise them doing so until they're around 7 or 8 years old.
- Brush their teeth for at least two minutes. You can make this fun by using an egg timer or an app on your phone.
- Make them spit! But they don't need to rinse – that just washes away the good fluoride.
- Once they're brushing their own teeth, you can help them by using a mirror to show them where to brush.
- Encourage your child to choose their own toothbrush at the shops – they might be more keen to use it when they get home if they picked one they liked.

Click here [LINK] for more expert tips on tooth brushing for kids, and here [LINK] for more information on babies' teeth.

<<EMAIL 9>>

You've come to the end of our Wellbeing emails.

We hope you've enjoyed it and have picked up a few ideas around your kids' lifestyles and wellbeing. Below is a list of all the links we've sent you which you might find useful to file for future use.

DENTAL HEALTH

INTERNET SAFETY

MEDICINE CABINET ESSENTIALS

SUNSENSE

SCREENTIME

CHILD BENEFIT

BULLYING

GETTING ACTIVE

Appendix 11: CONSORT checklist for RCT paper



CONSORT 2010 checklist of information to include when reporting a randomised trial*

Section/Topic	Item No	Checklist item	Reported on page No
Title and abstract	1a	Identification as a randomised trial in the title	1
	1b	Structured summary of trial design, methods, results, and conclusions (for specific guidance see CONSORT for abstracts)	1
Introduction	2a	Scientific background and explanation of rationale	2-5
Background and objectives	2b	Specific objectives or hypotheses	5
Methods	3a	Description of trial design (such as parallel, factorial) including allocation ratio	5
Trial design	3b	Important changes to methods after trial commencement (such as eligibility criteria), with reasons	9
Participants	4a	Eligibility criteria for participants	9
	4b	Settings and locations where the data were collected	13
Interventions	5	The interventions for each group with sufficient details to allow replication, including how and when they were actually administered	6-8
Outcomes	6a	Completely defined pre-specified primary and secondary outcome measures, including how and when they were assessed	13-15
	6b	Any changes to trial outcomes after the trial commenced, with reasons	n/a
Sample size	7a	How sample size was determined	9 (pragmatic)
	7b	When applicable, explanation of any interim analyses and stopping guidelines	n/a
Randomisation:	8a	Method used to generate the random allocation sequence	13
Sequence generation	8b	Type of randomisation; details of any restriction (such as blocking and block size)	13
Allocation concealment mechanism	9	Mechanism used to implement the random allocation sequence (such as sequentially numbered containers), describing any steps taken to conceal the sequence until interventions were assigned	13
Implementation	10	Who generated the random allocation sequence, who enrolled participants, and who assigned participants to interventions	13 (electronic)

Blinding	11a	If done, who was blinded after assignment to interventions (for example, participants, care providers, those assessing outcomes) and how	n/a
	11b	If relevant, description of the similarity of interventions	6-8
Statistical methods	12a	Statistical methods used to compare groups for primary and secondary outcomes	16-20
	12b	Methods for additional analyses, such as subgroup analyses and adjusted analyses	20
Results			
Participant flow (a diagram is strongly recommended)	13a	For each group, the numbers of participants who were randomly assigned, received intended treatment, and were analysed for the primary outcome	10
Recruitment	13b	For each group, losses and exclusions after randomisation, together with reasons	10
	14a	Dates defining the periods of recruitment and follow-up	9
	14b	Why the trial ended or was stopped	9
Baseline data	15	A table showing baseline demographic and clinical characteristics for each group	11-12
Numbers analysed	16	For each group, number of participants (denominator) included in each analysis and whether the analysis was by original assigned groups	16-19
Outcomes and estimation	17a	For each primary and secondary outcome, results for each group, and the estimated effect size and its precision (such as 95% confidence interval)	16-20
	17b	For binary outcomes, presentation of both absolute and relative effect sizes is recommended	n/a
Ancillary analyses	18	Results of any other analyses performed, including subgroup analyses and adjusted analyses, distinguishing pre-specified from exploratory	19
Harms	19	All important harms or unintended effects in each group (for specific guidance see CONSORT for harms)	n/a
Discussion			
Limitations	20	Trial limitations, addressing sources of potential bias, imprecision, and, if relevant, multiplicity of analyses	23-24
Generalisability	21	Generalisability (external validity, applicability) of the trial findings	20-25
Interpretation	22	Interpretation consistent with results, balancing benefits and harms, and considering other relevant evidence	20-25
Other information			
Registration	23	Registration number and name of trial registry	1-2
Protocol	24	Where the full trial protocol can be accessed, if available	n/a
Funding	25	Sources of funding and other support (such as supply of drugs), role of funders	25

*We strongly recommend reading this statement in conjunction with the CONSORT 2010 Explanation and Elaboration for important clarifications on all the items. If relevant, we also recommend reading CONSORT extensions for cluster randomised trials, non-inferiority and equivalence trials, non-pharmacological treatments, herbal interventions, and pragmatic trials. Additional extensions are forthcoming: for those and for up to date references relevant to this checklist, see www.consort-statement.org.

Appendix 12: TIDieR checklist for RCT paper



The TIDieR (Template for Intervention Description and Replication) Checklist*:

Information to include when describing an intervention and the location of the information

Item number	Item	Where located **	
		Primary paper (page or appendix number)	Other † (details)
1.	BRIEF NAME Provide the name or a phrase that describes the intervention.	1	
2.	WHY Describe any rationale, theory, or goal of the elements essential to the intervention.	4-6	
3.	WHAT Materials: Describe any physical or informational materials used in the intervention, including those provided to participants or used in intervention delivery or in training of intervention providers. Provide information on where the materials can be accessed (e.g. online appendix, URL). Procedures: Describe each of the procedures, activities, and/or processes used in the intervention, including any enabling or support activities.	6-7	
4.	WHO PROVIDED For each category of intervention provider (e.g. psychologist, nursing assistant), describe their expertise, background and any specific training given.	6-7	
5.	HOW Describe the modes of delivery (e.g. face-to-face or by some other mechanism, such as internet or telephone) of the intervention and whether it was provided individually or in a group.	6	
6.	WHERE Describe the type(s) of location(s) where the intervention occurred, including any necessary infrastructure or relevant features.	6	

<p>WHEN and HOW MUCH</p>	
<p>8. Describe the number of times the intervention was delivered and over what period of time including the number of sessions, their schedule, and their duration, intensity or dose.</p>	<p>6-7 _____</p>
<p>TAILORING</p> <p>9. If the intervention was planned to be personalised, titrated or adapted, then describe what, why, when, and how.</p>	<p>n/a _____</p>
<p>MODIFICATIONS</p> <p>10.† If the intervention was modified during the course of the study, describe the changes (what, why, when, and how).</p>	<p>n/a _____</p>
<p>HOW WELL</p> <p>11. Planned: If intervention adherence or fidelity was assessed, describe how and by whom, and if any strategies were used to maintain or improve fidelity, describe them.</p>	<p>n/a _____</p>
<p>12.‡ Actual: If intervention adherence or fidelity was assessed, describe the extent to which the intervention was delivered as planned.</p>	<p>n/a _____</p>

** **Authors** - use N/A if an item is not applicable for the intervention being described. **Reviewers** – use ‘?’ if information about the element is not reported/not sufficiently reported.

† If the information is not provided in the primary paper, give details of where this information is available. This may include locations such as a published protocol or other published papers (provide citation details) or a website (provide the URL).

‡ If completing the TIDieR checklist for a protocol, these items are not relevant to the protocol and cannot be described until the study is complete.

* We strongly recommend using this checklist in conjunction with the TIDieR guide (see *BMJ* 2014;348:g1687) which contains an explanation and elaboration for each item.

* The focus of TIDieR is on reporting details of the intervention elements (and where relevant, comparison elements) of a study. Other elements and methodological features of studies are covered by other reporting statements and checklists and have not been duplicated as part of the TIDieR checklist. When a **randomised trial** is being reported, the TIDieR checklist should be used in conjunction with the CONSORT statement (see www.consort-statement.org) as an extension of **Item 5 of the CONSORT 2010 Statement**. When a **clinical trial protocol** is being reported, the TIDieR checklist should be used in conjunction with the SPIRIT statement as an extension of **Item 11 of the SPIRIT 2013 Statement** (see www.spirit-statement.org). For alternate study designs, TIDieR can be used in conjunction with the appropriate checklist for that study design (see www.equator-network.org).