

**Investigating offering of vegetables by caregivers of preschool age children**

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## Abstract

**Background:** Research into the methods which caregivers use to encourage children to eat vegetables is limited, with minimal evidence about what the barriers are to offering these foods. Vegetable consumption in children is typically low and so gaining information on these factors is vital in order to develop further caregiver-centred interventions to increase children's vegetable consumption. This study aimed to investigate the methods caregivers use to offer vegetables to preschool aged children, as well as the factors which influence whether and how caregivers present vegetables to their children.

**Method:** Seventeen caregivers with a preschool aged child participated in focus groups to assess these questions.

**Results:** Thematic analysis indicated that caregivers use a range of methods to offer their children vegetables, with these methods falling into three broad categories: behavioural/active methods, passive methods, and food manipulations. Influences on caregiver offering which emerged from the focus groups formed four categories: information, cost, parent factors, and child factors.

**Conclusions:** Together with large scale quantitative data, this information can be used to shape future interventions aiming to increase children's vegetable intake as well as to tailor advice given to caregivers striving to achieve a healthful diet for their children.

**Key words:** Caregiver offering, vegetable, barriers, feeding, consumption, child

## Investigating offering of vegetables by caregivers of preschool age children

Vegetables are important for health (e.g., Maynard, Gunnell, Emmett, Frankel, & Davey Smith, 2003) but are under eaten by children (Lennox, Olson, & Gay, 2011), particularly preschool children (Lennox et al., 2011). It is known that simply providing foods for children does not guarantee that they will be eaten. As such, investigating the methods which caregivers use to offer vegetables to their children and the factors that can influence caregiver offering is imperative in order to tailor advice on achieving healthful diets in young children.

Previous quantitative research (e.g., Musher-Eizenman & Holub, 2007) has revealed that caregivers use a range of methods to encourage children's food consumption. Some feeding practices, such as modelling and use of rewards, have been shown to be successful for increasing children's consumption of vegetables (e.g., Holley, Haycraft, & Farrow, 2014; Remington, Anez, Croker, Wardle, & Cooke, 2012; Wardle et al., 2003), as well as for encouraging acceptance when introducing novel fruits (Blissett, Bennett, & Donohoe, 2012). However, other more controlling feeding practices, such as use of pressure to eat, seem to be counterproductive (e.g., Galloway, Fiorito, Lee, & Birch, 2005; Galloway, Fiorito, Francis, & Birch, 2006). Research using measures such as the Comprehensive Feeding Practices Questionnaire (CFPQ; Musher-Eizenman & Holub, 2007) provides invaluable information on the range of feeding practices used by caregivers. However, such measures have been developed by researchers and clinicians, with minimal input from caregivers. Furthermore, the nature of such questionnaire research prevents the identification of other practices, that aren't assessed in these measures but that are potentially used by caregivers. For these reasons, research involving caregivers to explore the practices which they use to feed children is of interest.

Researchers have begun to use qualitative methods to examine a wider variety of the methods caregivers use to get their children to eat. This has included exploring the use of parental mealtime practices to encourage children's eating (Koivisto & Sjöden, 1996), parental strategies for managing their children's intake of snack foods (Corsini, Wilson, Kettler, & Danthiir, 2010), feeding practices used to influence children's food likes and dislikes (Casey & Rozin, 1989; Russell, Worsley, & Campbell, 2015), and the barriers which caregivers perceive to establishing healthy child eating behaviours as well as the strategies they use to promote healthy eating (Nepper & Chai, 2016). In a study by Moore, Tapper and Murphy (2007), mothers of 3 to 5 year old children reported using modelling to encourage consumption of familiar foods and introduce novel foods. Mothers also reported using pressure in the form of assertiveness and contingent rewards (such as dessert or television watching) to encourage consumption, but not to introduce novel foods. In a similar study by Russell et al. (2015) it was found that parents of 2 to 5 year olds reported using a diverse range of behaviours to alter children's food preferences; behaviours which differed in their effectiveness. Although potentially applicable to vegetable consumption, parents were not specifically interviewed on the strategies they employ in relation to encouraging their child's consumption of vegetables in Russell et al.'s study. Given that eating habits established early in childhood track through childhood and into adulthood (e.g., Farrow & Blissett, 2012; Mikkilä, Räsänen, Raitakari, Pietinen, & Viikari, 2007), increasing our understanding of how best to promote offerings of vegetables early in childhood is a logical step to help increase vegetable intake during early childhood. By increasing vegetable consumption among this age group, life-long benefits of a healthful diet including vegetables can be maximised.

Previous research in this field has been conducted with older children by Kirby, Baranowski, Reynolds, Taylor, and Binkley (1995), with a particular focus on how influences on vegetable consumption differ according to socio-economic status (SES). In contrast to higher SES families, families in the lower SES groups had very few fresh fruits and vegetables available in the home, with these parents rarely providing their children with fruits and vegetables in

their pre-cut form. Children across all SES groups reported thinking of vegetables as “grown-up” foods, which taste “nasty” (Kirby et al., 1995). Although of interest, the findings of this research are not necessarily transferable to caregivers of younger children, who are likely to be less autonomous and whose caregivers have a much greater impact on their eating behaviour at this age (Birch, Savage, & Ventura, 2007). Furthermore, this research does not delineate between fruits and vegetables, for which there may be distinct influences on consumption. Here, detailed further examination of the methods caregivers of preschool age children use specifically in relation to their child’s vegetable consumption is warranted.

To be useful, advice given to caregivers on increasing vegetable consumption must be in line with the current feeding practices used by the general population, or address recommendations that are not widely used currently. With this in mind, the present study aims were to build on previous research by using a qualitative approach to investigate the particular methods caregivers use to present their preschool children with vegetables, as well as the perceived barriers to offering their child vegetables.

## Method

### *Participants*

Seventeen primary caregivers with a preschool age child participated in the study, none of whom had children which had been hospitalised for feeding problems. Two caregivers were fathers, 14 were mothers and one was a grandmother. Mean child age was 34.9 months (SD 12.23, range 21 to 59) and mean caregiver age was 37.5 years (SD 5.81, range 24 to 51). Caregivers were predominantly of White/Caucasian ethnicity (n=14), with two caregivers identifying as mixed race and one as of Chinese ethnicity. Half of the caregivers in this study were educated to university level or higher (n=9) while the other half were non-university graduates (n=8).

132 *Procedure*

133 Full ethical clearance for this study was obtained from Loughborough University Research  
134 Ethics Committee.

135

136 *Recruitment*

137 Participants were recruited from the East Midlands area of the UK using posters which were  
138 placed at toddler groups in Leicestershire as well as on online University noticeboards and in  
139 University staff common areas. The study was also advertised in two local Leicestershire  
140 newspapers; the Leicester Mercury and Loughborough Echo.

141

142 *Focus groups*

143 Written informed consent was obtained from all participants before the onset of the study,  
144 with participants fully advised of their right to withdraw at any point. The focus groups were  
145 conducted at Loughborough University. Focus groups were run until data saturation was  
146 reached (i.e. until no new material was being generated). Five focus groups were conducted.  
147 Although these groups comprised a small number of caregivers, all group members were  
148 active participants and discussion flowed freely throughout each of the sessions. Three of  
149 the groups comprised caregivers recruited using a poster with the tagline '*Do you have a*  
150 *child aged 2-4?*' with the description '*we'd love to hear about your experiences of getting*  
151 *your child to eat fruits and vegetables, both good and bad*', while two further groups  
152 comprised caregivers recruited via a poster with the tag line '*Do you have a 2-4 year old who*  
153 *doesn't like vegetables?*' and the description '*We'd love to hear about your experiences of*  
154 *trying to get your child to eat vegetables*'. This second set of focus groups was run to ensure  
155 that the methods of offering vegetables used by caregivers of a child who refuses/avoids  
156 eating vegetables were adequately covered, as recent government statistics suggests that  
157 UK children's consumption of vegetables is half that of fruit (Public Health England & Food  
158 Standards Agency, 2014).

159

All focus groups were facilitated by one moderator (CH) and the sessions were digitally recorded. The moderator used a set of open ended and closed questions written by the research team, which were derived from a thorough review of the relevant literature. These questions aimed to address two main research questions: (1) What methods do caregivers use to encourage their children to eat vegetables?; (2) What factors influence how and whether caregivers present vegetables to their child? Each of these research questions was addressed via a number of questions within the focus groups (see Table 1). After the full set of questions had been covered, caregivers were asked to complete a short demographic questionnaire, including questions about parent and child age, ethnicity, and whether the child had been hospitalised for feeding problems.

171 Table 1: List of main questions (and **research questions**) answered within the focus groups

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***What methods do caregivers use to encourage their children to eat vegetables?***


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- Do you give your child vegetables – either within meals or as a snack?
- How do you go about this?
- Do you offer the same vegetable another time/again if it is rejected?
- If your child rejects a vegetable, what do you do next time?
- If you are offering a vegetable again, after it has been rejected, does the way you offer the vegetable change or stay the same?
- Do you offer your child vegetables that you don't like yourself?
- Do you think these methods that you use to encourage vegetable consumption work?
- Which methods don't work?

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***What factors influence how and whether caregivers offer vegetables?***


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- Are the methods you use to encourage your child to eat vegetables methods which you have planned to use?
- Have the methods you use changed since you first became a parent?
- (If yes) Why did the methods you use change?
- What makes you choose a method?
- What would stop you from (re)offering a vegetable?
- When do you stop offering a vegetable?
- Why do you stop offering a vegetable?
- How long or how many times do you keep offering a rejected vegetable for?
- If you have more than one child, do you use the same methods of offering with all of your children?
- (If not) Why not?
- Does/has the way your child reacts shape(d) the methods you use?
- 

172

173



174 *Analysis*

175 All focus group recordings were transcribed verbatim by the researcher (CH). Although data  
176 were collected in relation to fruit and vegetables, only responses relating to vegetable  
177 consumption are analysed and reported on here, in line with the study aims. Transcribed  
178 data were initially analysed as two separate groups; group one comprised those caregivers  
179 recruited purely on the premise of talking about their experiences with their child and  
180 vegetables, and group two comprised the focus groups involving caregivers who were  
181 recruited on the basis of having a child who didn't like vegetables. However, as no  
182 differences were identified in terms of caregivers' responses, results are presented for the  
183 whole sample.

184

185 Data were analysed using thematic analysis and following the steps outlined by Braun and  
186 Clarke (2006). Initially, after checking the transcripts against the original recordings, all  
187 transcripts were read and re-read to fully immerse the researcher (CH) in the data. During  
188 this phase, primary thoughts and concepts for later coding were noted. Once the researcher  
189 was fully familiar with the data, the process of coding themes and subthemes was  
190 undertaken. Initially, interesting features within the data were assigned codes which  
191 meaningfully described something of the subject. Next, the full list of codes for the transcripts  
192 was collated and sorted into groups representing potential themes. These groups of codes  
193 were then collated, through a recursive process of combining and separating groups. This  
194 resulted in an organised set of themes; all of which were distinct from each other whilst  
195 sitting together in a meaningful way. Both inductive and deductive methods were adopted,  
196 allowing themes to be applied from the questions asked as well as new themes to be  
197 identified within the transcripts. Themes were assessed using a semantic approach, where  
198 themes are identified within the explicit meaning of the data, and not by examining the latent  
199 underlying features of these themes, resulting in a rich description of the data set (Braun &  
200 Clarke, 2006). To facilitate reflection and reconciliation of the themes identified, discussion of  
201 the coded items was held within the research team. The other members of this team had not

been involved in the focus groups, nor had they read the full transcripts of the groups. These discussions were used to qualify the trustworthiness of the analysis, in combination with a second researcher (CF) performing an analysis on 20% of the transcripts. This method of assessing trustworthiness of the analysis has been widely used and is acknowledged as appropriate for such a thematic analysis (Yardley, 2008).

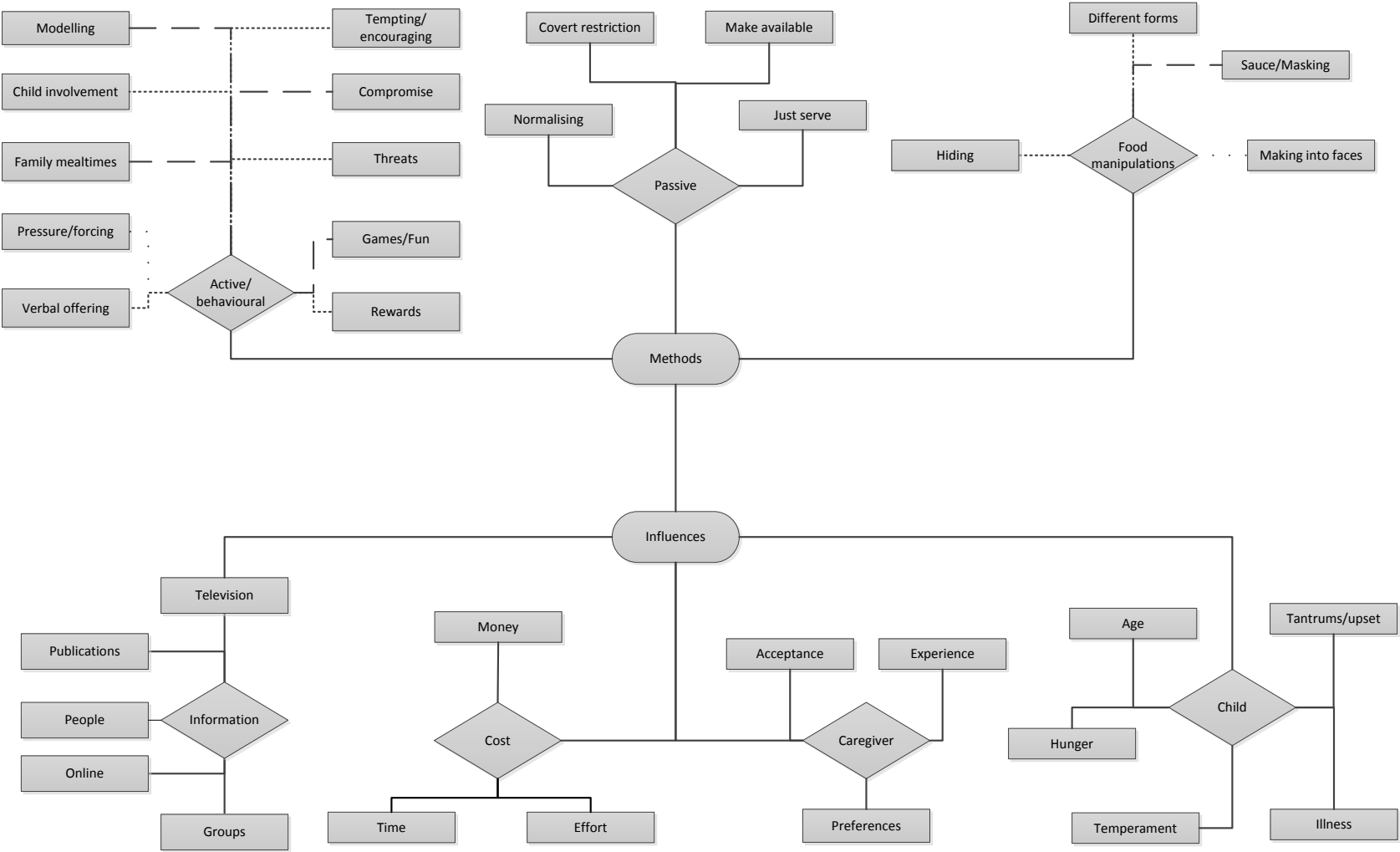
## Results

### *Descriptive statistics*

A total of five focus groups were conducted, with a mean duration of 38:42 (minutes:seconds) (SD 13:09, range 20:10 to 53:18).

### *Thematic analysis*

It was expected that the two different recruitment posters would result in recruiting two distinct groups of caregivers, for which two separate thematic analyses would be conducted allowing for examination of convergence and divergence. However, after analyses indicated a lack of divergence between the two groups of transcribed data, and following consultation with an experienced qualitative researcher, the two groups were collapsed and analyses are reported as one group. Thematic analysis revealed three main themes surrounding methods of offering vegetables to children, and four main themes around the influences on caregiver offering of vegetables. These are presented in Figure 1.



223

224 Figure 1. Map of themes surrounding parental methods of presenting vegetables to their child as well as the influences on vegetable exposure.

225 successful — — — sometimes successful - - - - - unsuccessful . . . . . success not described —————

## 226 *Methods of presenting vegetables*

227 Three major themes reflecting ways of offering emerged from the focus groups, indicating  
 228 that caregivers use three primary types of methods when presenting vegetables to their  
 229 children; behavioural/active methods, passive methods, and food manipulations.

230

## 231 *Behavioural/active methods*

232 These were methods which relied on specific caregiver-child interactions or behaviours in  
 233 relation to the caregiver's presentation of vegetables (see Figure 1). Caregivers reported  
 234 several behavioural/active methods as being successful for getting their child to eat  
 235 vegetables; the first of these was modelling. Examples of modelling ranged from caregivers  
 236 eating in front of their children and putting vegetables on their own plates, to caregivers  
 237 stating how yummy foods were while they ate, encouraging partners to eat vegetables in  
 238 front of the child, as well as using the child's siblings as role models. Games were also  
 239 described by caregivers as successful for offering vegetables: *"I was like 'let's pretend we're  
 240 eating trees with our broccoli' and she loves it"*. Caregivers also reported successfully using  
 241 family mealtimes to encourage their child to eat vegetables, which likely represents another  
 242 method of modelling: *"I find if we eat as a family it is better, because if I'm doing something  
 243 and give [child] something to eat she sort of, you know, wonders what I'm doing or will mess  
 244 about"*. Finally, caregivers reported that using compromise within the meal setting was  
 245 successful for getting their child to eat vegetables. Typically this was including additional  
 246 requested items or compromising on the order in which courses of a meal were eaten.

247

248 A number of behavioural/active methods were reported by some caregivers as being  
 249 successful and by others as not, or as working on some occasions but not others. One of  
 250 these methods was verbal offering of vegetables to their child *"do you want to try one of  
 251 these peas?"*. Some caregivers also acknowledged trying to tempt or encourage their child  
 252 to try and eat vegetables. Caregivers identified sometimes taking this one step further, by  
 253 offering their child rewards for eating vegetables: *"you can have some pudding if you finish*

off your X, Y or Z". Rewards took several forms, such as play time, sticker charts or dessert. Child involvement was used by some caregivers, for example letting children choose vegetables in the supermarket or choosing what is served at mealtimes, to growing them at home, as well as helping to prepare and cook them: *"we've been growing our own vegetables as well which has helped. Sort of help pick the veg and then help prepare it"*. Some caregivers reported using pressure or coercion in an attempt to get their child to eat vegetables, but all of these parents agreed that this method does not work: *"I've tried 'sit there 'til you've finished' and he can sit there for 3 hours and not eat it, so I don't do that"*. Finally, some caregivers reported using threats such as not being able to have dessert or having to go to bed if their child didn't eat their vegetables.

#### *Passive methods*

Caregivers identified a number of passive methods of presenting their children with vegetables (see Figure 1). These included just serving vegetables so that they were put on the child's plate without discussion, and normalising offering through this continued presentation: *"but I always make a point of putting it there, because...it's got to be normal hasn't it?"*. Caregivers also made vegetables available for their child to snack on, whilst removing alternative, more favoured food from the environment in order to encourage the child to eat vegetables as part of their meals: *"there's times when he's had some of these-is it Goodies? Those maize-type crispy things, and there's not really anything to them. But if he has those, I've only ever let him have a couple like about a third or a half of a pack in a little bowl, but that will affect how much he eats and how fussy he is later on in the day"*.

#### *Food manipulations*

Caregivers reported manipulating vegetables in a variety of ways in order to get their child to eat them (see Figure 1). Several caregivers reported using sauces as well as masking vegetables with flavours to get their child to eat them and most caregivers agreed that this was a successful method. Caregivers also reported hiding vegetables within other foods: *"I*

put carrot in mashed potato and mash it up so it's like mashed potato, and swede so that it's the same consistency as potato", although they were less certain of whether this was a successful method. Presenting the same vegetable in different forms over a period of time was also a method used by caregivers, but they were also uncertain as to whether this was a consistently successful method, with some caregivers commenting that they will "do it a different way if not roast it, or I'll mash it or put it in a cottage pie topping or something. That always goes down well!". Finally, caregivers acknowledged making vegetables into faces, but all caregivers who reported trying this method agreed that it did not work to get their child to eat vegetables: "faces don't work, really. Like you say I do it for my entertainment I think 'ooh that'd make a brilliant eye!' (all laugh) I could lay it like this on the plate that looks amazing and it's like...no".

#### *Influences on how/when parents present vegetables*

Multiple influences on how and when caregivers present their children with vegetables emerged from the focus groups. These were broadly clustered around four main themes: information, cost, parent factors, and child factors.

##### *Information*

Caregivers talked about obtaining information on how to get their children to eat vegetables from a number of sources (see Figure 1). These sources included: books, television and online, support groups, people and social support (e.g., from family members or other parents). Caregivers also commented that the general provision of information for caregivers around getting children to eat vegetables is poor and can be conflicting, for example "I was at a bit of a loss because you don't get much advice from anywhere, I felt, from where I live".

##### *Cost*

Cost was a recurring influence on caregiver offering of vegetables to their children (see Figure 1). This theme can be broken down into three types of cost, the first of which is financial (including food waste). Caregivers also talked about the time taken to prepare and cook vegetables for their children, as well as the effort involved in cooking and coming up with inventive ways of offering vegetables. Although acknowledged by several caregivers as a barrier to repeated presentation, costs did not always lessen or stop caregivers from presenting their children with vegetables which they may not eat: “[child] gets carrots and green beans and broccoli on his plate two or three times a week, and they get thrown in the bin. But they’re always on his plate”.

#### Caregiver factors

A few caregiver factors which influence whether caregivers present their children with vegetables emerged from the focus groups (see Figure 1). One of these was caregivers’ own preferences for vegetables. Here, it varied between caregivers as to whether they would offer their children vegetables which they do not eat themselves: “[Husband] doesn’t like cabbage, so I don’t buy cabbage just for me or [child]. So, yeah, I suppose [child]’s diet is restricted to what we like really”. Caregivers’ experiences of feeding vegetables to other children also influenced how and whether they presented their 2 to 4 year old with vegetables: “it changes, I think, from one child to the next because you learn from your first and then try and do it different with the next”. This experience altered the methods which caregivers used, as well as caregivers’ attitudes towards offering. For example, caregivers with older children reported feeling more relaxed about getting their younger child to eat vegetables: “with [the] first or second child I can imagine it’d be quite stressful, but now I’ve got to...five, my attitude is well they’re not going to die if they don’t eat this plate of food”. Finally, some caregivers reported developing acceptance to the vegetables their child would and wouldn’t eat, or their child’s general dislike of these foods: “I’m not sure if we’d persevered with it, it would’ve had the desired result because I think that ultimately the child’s resistance is greater than any amount of coercion of your part”. Mindsets such as this

one prevented caregivers from offering their child (other) vegetables, or lessened their attempts at offering.

### *Child factors*

There were several child factors identified in the focus groups which influenced caregivers' presentation of vegetables (see Figure 1). One of these was the age of the child, which impacted on the methods which caregivers said they adopted, such as whether they used rewards or disguised vegetables: *"a two year old you can do it [hide vegetables] more with say than a four year old"*. Another child factor was hunger level. Several caregivers explained that they tried to ensure their child was hungry before offering vegetables in an attempt to increase acceptance of them: *"I do find that if it's something that they don't particularly want, they can then refuse it if they're not really that hungry...if he's hungry he'll eat the lot, and there's no messing around and it's gone"*. Caregivers also identified that child tantrums and upset can influence how/when they present vegetables: *"normally once they've said no...you're going to have a tantrum on your hands and sometimes it's easier to not deal with it"*. This seemed to influence caregivers in one of two ways: 1) that if their child became upset that they would stop the episode of presenting a vegetable; or 2) that they would not present vegetables if they thought it may upset their child, as they were concerned about creating greater feeding difficulties for their child: *"as much as you're told to try and give your child a balanced diet you're also warned about the dangers of making food a major issue. So you're kind of caught between both"*. Child temperament was also identified as having an influence on caregivers' offering of vegetables and children's food refusal: *"she's very stubborn"*. Finally, some caregivers reported that they would not reoffer a vegetable if it had made their child unwell, or if their child was already unwell.



## Discussion

The aim of this study was to investigate caregivers' methods of presenting vegetables to their children and the perceived barriers to offering their child vegetables. It was found that caregivers' methods of offering vegetables can be broadly categorised into active/behavioural methods, passive methods, and methods which are based on manipulating the foods being offered. A number of influences on caregiver offering also emerged from the focus groups. These fell into four categories: information, cost, parent factors, and child factors.

Caregivers in this study suggested various behavioural/active methods of offering vegetables. Two of these (rewards and modelling) have been the crux of successful parent-led interventions aimed at increasing children's acceptance of a disliked vegetables (e.g., Holley et al., 2014; Remington et al., 2012; Wardle et al., 2003), as well as being observed in successful caregiver offering of novel fruits to their children (Blissett et al., 2012). This is a promising finding, suggesting that such interventions may have good feasibility for caregivers, where the required behavioural methods are in line with current practices used by caregivers. In line with previous literature on parental feeding practices, caregivers suggested using compromise during mealtimes, a demonstration of flexible, authoritative feeding practices (Baumrind, 1968), and unanimously agreed that using more rigid and authoritarian feeding practices, such as pressure, were counterproductive. Indeed, previous literature has found that authoritative feeding practices are associated with higher intake of vegetables (Patrick, Nicklas, Hughes, & Morales, 2005), so the current findings suggest that practices used by the caregivers in these focus groups to get their children to eat vegetables included some of the more favourable ones. Getting children involved in growing, choosing and preparing vegetables was also rated as a successful behavioural/active method by some caregivers in the current study, or as successful on some occasions, aligning with research demonstrating that involvement via a school gardening programme can increase children's willingness to try vegetables (Morris, Neustadter, & Zidenberg-Cherr, 2001).

However, involving children in these practices may prove difficult for caregivers who find time constraints to be a barrier to offering their children fruits and vegetables, a point which will be further discussed later on.

The passive methods (such as normalising the inclusion of vegetables) which caregivers in this study reported using to encourage their children to eat vegetables are likely to reduce neophobic responses in children. By ensuring that vegetables are normally present at meal/snack times, parents are increasing children's familiarity with these foods, where it is known that children's liking is significantly associated with their familiarity with a food (Cooke & Wardle, 2005). Some caregivers in the current study also covertly restricted other less healthy and more highly favoured alternative foods as a way to encourage children to eat meals which include vegetables. This is a practice which has been shown to promote children's fruit and vegetable consumption (Brown, Ogden, Gibson, & Vogeley, 2008).

In line with previous research, caregivers suggested manipulating food in a variety of ways as being potentially successful for increasing children's consumption of vegetables (Poelman & Delahunty, 2011; Reimer et al., 2004; Savage, Peterson, Marini, Bordi, & Birch, 2013). These manipulations included hiding vegetables to increase their child's consumption (such as mashing other vegetables in with potatoes), using sauces, and presenting vegetables in different forms. Although there is some research evidence that hiding vegetables within foods can increase children's consumption of the hidden vegetable (e.g., Spill, Birch, Roe, & Rolls, 2011), the use of this practice likely misses valuable opportunities for children to develop a liking or willingness to consume vegetables when they are "seen". Because children are unaware of the presence of the vegetables, it is unclear what impact hiding vegetables has on increasing consumption of vegetables when they can be seen (Pescud & Pettigrew, 2014). Previous research has suggested that preparation methods can influence acceptance of vegetables, particularly in children who like fewer vegetables, given that taste and texture can vary significantly as vegetables are cooked (Poelman & Delahunty, 2011).

With this in mind, exploring different methods of preparation and presenting vegetables in a variety of forms seems logical for increasing children's consumption. As one of a combination of methods, hiding vegetables may be useful for increasing children's consumption in the short term, while manipulations - such as offering vegetables in a variety of preparations - may promote children's tasting of these foods which, in turn, could potentially result in long-term increases in consumption. It would be of interest to explore caregivers' perceptions of these methods for achieving different outcomes.

A number of influences to offering vegetables were highlighted by caregivers in this study. One of these was information about offering vegetables to children. Although caregivers reported obtaining information from a number of sources, caregivers highlighted that information was not only limited but also conflicting, which aligns with previous research (e.g., Mitchell, Haycraft, & Farrow, 2013). This suggests that the provision of information to caregivers on the importance of offering and reoffering vegetables must be improved.

Another barrier to offering was the cost of offering vegetables, whether financial, time, or effort; although some caregivers stated that this would not stop them from reoffering these foods to their children. Research suggests that a diet higher in fruits and vegetables does cost more financially than a diet higher in fats and sweets (Drewnowski, Darmon, & Briend, 2004). For caregivers who have a smaller budget for feeding their children, the repeated food waste resulting from rejection of vegetables would present a bigger barrier to future offering than for caregivers in this study. Providing information to parents on the success of repeated offering of foods, and reassuring them that waste (and the associated cost) need not be long term, may encourage parents to reoffer vegetables in the short term until their child accepts these foods. Parents could also be educated on ways to offer vegetables more cheaply, such as preparing food in bulk (Kilcast et al., 1996), as well as ways in which to reuse refused vegetables for themselves or other children. Although research into time as a barrier to caregivers offering vegetables is limited, previous studies have revealed time to be

a barrier to parents' preparation of meals (Fulkerson et al., 2011; Nepper & Chai, 2016). One possible solution to time as a barrier to offering may be to educate caregivers on the easiest methods of preparing vegetables, particularly preparing in bulk and in advance of mealtimes, which are methods previously demonstrated by high vegetable consumers (Kilcast et al., 1996).

Caregivers' attitude towards their child's vegetable consumption also appears to influence offering of vegetables. Some caregivers in this study stated that they had developed a level of acceptance towards their child's refusal of many vegetables and had resolved to accept the selection of foods their child would eat. With this in mind, caregivers who have come to accept their children's food refusal may benefit from better provision of information on the value of persistent offering of disliked foods to children (Cooke, 2007), and also of eating more vegetables in sight of their children (modelling; Palfreyman, Haycraft, & Meyer, 2014).

A number of child factors which influence how and when caregivers offer their child vegetables were also discussed, such as child age, hunger and children getting upset. It emerged that some caregivers would not offer vegetables which their child dislikes if their child became upset when presented with the vegetable for fear of creating greater feeding difficulties. To minimise this fear, advice to caregivers should be tailored to reassure them about the appropriate level of persistence to use when feeding a child, with it known that repeated exposures to disliked foods are necessary for children to accept them (Cooke, 2007) and that pressure to eat can result in lowered preference for pressured foods (e.g., Galloway et al., 2005; Galloway et al., 2006). Child age influenced the behavioural method of offering which caregivers' employed. With this in mind, advice given to caregivers about possible methods to encourage consumption of vegetables should include information about which particular methods are the most appropriate for children of different ages. More research in this area seems necessary in order to develop specific advice tailored to child age.

474

475 There are multiple strengths to the current study. First, it provides up to date information  
476 about the methods caregivers in the UK use to offer vegetables to young children. With it  
477 known that children's consumption of vegetables is particularly low, this area is a public  
478 health priority. Furthermore, these data are enriched by providing information on the  
479 perceived barriers to caregivers offering of vegetables, which could be translated into  
480 information for caregivers on how to overcome these barriers. Having said this, this study  
481 does have its limitations. First, the employment levels of the participants in this study  
482 suggest that this sample is of relatively high SES and, as caregiver methods and particularly  
483 barriers to offering may well be different amongst lower SES groups, future research should  
484 aim to recruit a more socio-economically diverse sample of caregivers. Moreover, the word  
485 'methods' was used throughout the focus group questions which might have prompted  
486 caregivers to discuss overt behavioural strategies which they use when offering vegetables,  
487 rather than more covert methods. This might explain the dominance of overt methods in the  
488 results of this study. Finally, the reflexivity of the caregiver-child interactions at feeding time  
489 is impossible to disentangle, and therefore discussion of caregiver and child influences on  
490 consumption of vegetables must bear this in mind.

491

492 This study makes a valuable contribution to research into increasing children's vegetable  
493 consumption by providing novel information about the methods used by caregivers, the  
494 barriers to offering vegetables and the strategies that caregivers believe are effective. Future  
495 research could explore possible differences in the methods used to achieve short term wins  
496 versus the methods used to achieve long-term changes in children's consumption of  
497 vegetables. It is likely that methods which caregivers employ to increase consumption on  
498 individual occasions are different to the methods which caregivers believe are suitable for  
499 achieving a longer-term healthful diet. Together, this information can be used to tailor future  
500 advice for caregivers who want to achieve a more healthful diet for their child, by taking into

- 501 consideration the barriers which caregivers experience to help ascertain the most
- 502 appropriate methods of offering vegetables for them.

**Key messages**

- Establishing healthy eating behaviours early in life is an important public health priority yet too many children eat too few vegetables.
- This study investigated caregiver methods of offering vegetables to young children as well as the barriers to caregiver offering, to try to understand more about ways to support caregivers with increasing children's vegetable consumption.
- Common methods which caregivers used to offer vegetables were grouped into three categories: active/behavioural, passive, and food manipulations.
- The main barriers to caregivers offering vegetables were: lack of information, cost, and various caregiver and child factors (e.g., temperament or preferences).
- These findings are useful for tailoring future interventions and advice for caregivers as part of public health and policy efforts to increase vegetable intake in children and promote healthier lifestyles.

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