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

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Running head: Investigating offering of fruits and vegetables

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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

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

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

58

59 Previous quantitative research (e.g., Musher-Eizenman & Holub, 2007) has revealed that  
60 caregivers use a range of methods to encourage children's food consumption. Some feeding  
61 practices, such as modelling and use of rewards, have been shown to be successful for  
62 increasing children's consumption of vegetables (e.g., Holley, Haycraft, & Farrow, 2014;  
63 Remington, Anez, Croker, Wardle, & Cooke, 2012; Wardle et al., 2003), **as well as for**  
64 **encouraging acceptance when introducing novel fruits (Blissett, Bennett, & Donohoe, 2012).**

65 However, other more controlling feeding practices, such as use of pressure to eat, seem to  
66 be counterproductive (e.g., Galloway, Fiorito, Lee, & Birch, 2005; Galloway, Fiorito, Francis,  
67 & Birch, 2006). Research using measures such as the Comprehensive Feeding Practices  
68 Questionnaire (CFPQ; Musher-Eizenman & Holub, 2007) provides invaluable information on  
69 the range of feeding practices used by caregivers. However, such measures have been  
70 developed by researchers and clinicians, with minimal input from caregivers. Furthermore,  
71 the nature of such questionnaire research prevents the identification of other practices, that  
72 aren't assessed in these measures but that are potentially used by caregivers. For these  
73 reasons, research involving caregivers to explore the practices which they use to feed  
74 children is of interest.

75

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

98

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

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

112

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

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120

## Method

### *Participants*

122 Seventeen primary caregivers with a preschool age child participated in the study, none of  
123 whom had children which had been hospitalised for feeding problems. Two caregivers were  
124 fathers, 14 were mothers and one was a grandmother. Mean child age was 34.9 months (SD  
125 12.23, range 21 to 59) and mean caregiver age was 37.5 years (SD 5.81, range 24 to 51).  
126 Caregivers were predominantly of White/Caucasian ethnicity (n=14), with two caregivers  
127 identifying as mixed race and one as of Chinese ethnicity. Half of the caregivers in this study  
128 were educated to university level or higher (n=9) while the other half were non-university  
129 graduates (n=8).

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131

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

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

170

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?
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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

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

207

208

## Results

209 *Descriptive statistics*

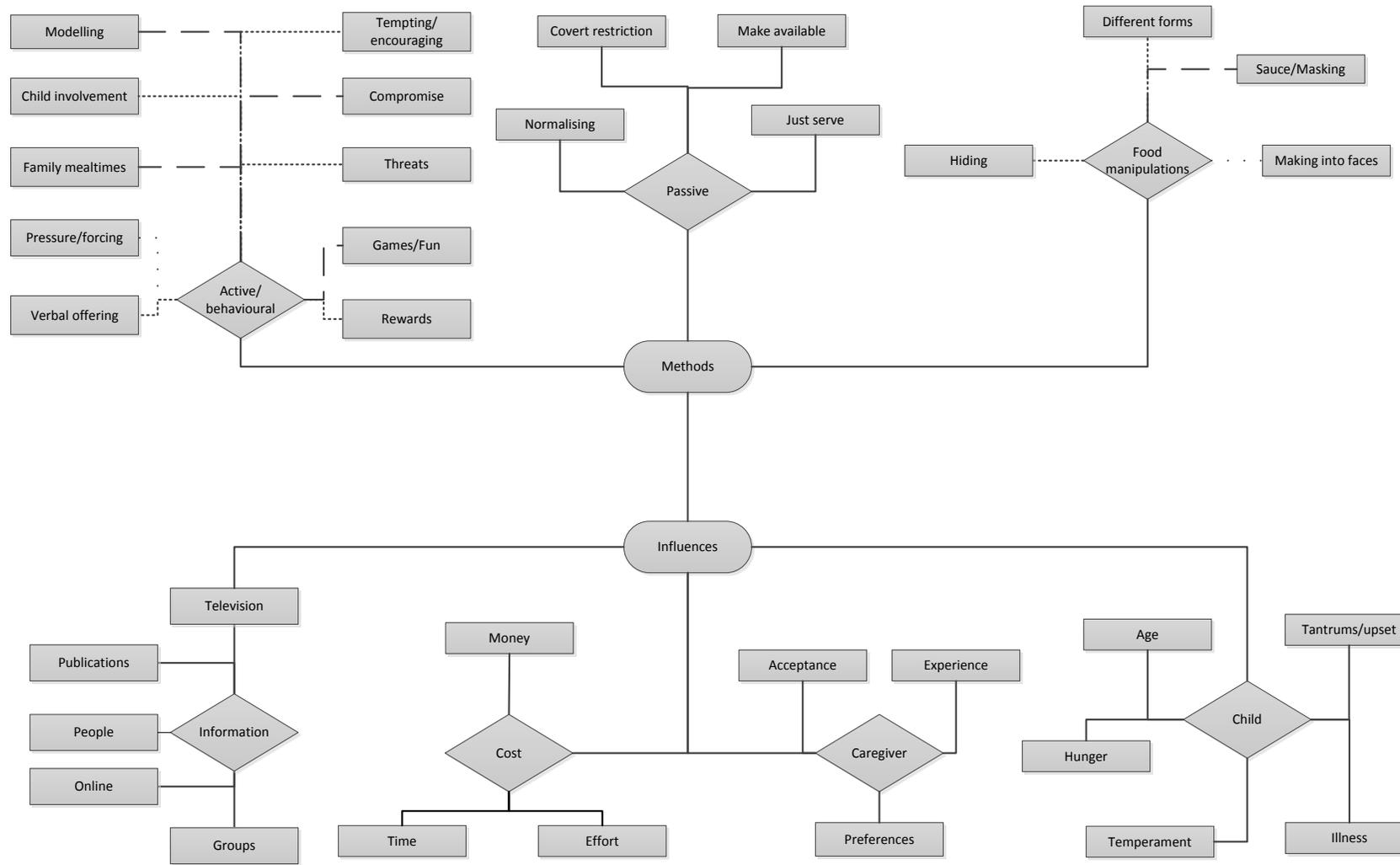
210 A total of five focus groups were conducted, with a mean duration of 38:42 (minutes:seconds)  
211 (SD 13:09, range 20:10 to 53:18).

212

213 *Thematic analysis*

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

222



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*

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

264

#### 265 *Passive methods*

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

276

#### 277 *Food manipulations*

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

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

293

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

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

298

#### 299 *Information*

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

306

#### 307 *Cost*

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

317

### 318 Caregiver factors

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

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

338

339 *Child factors*

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

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## 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).

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

393

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

403

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

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

425

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

432

433 Another barrier to offering was the cost of offering vegetables, whether financial, time, or  
434 effort; although some caregivers stated that this would not stop them from reoffering these  
435 foods to their children. Research suggests that a diet higher in fruits and vegetables does  
436 cost more financially than a diet higher in fats and sweets (Drewnowski, Darmon, & Briend,  
437 2004). For caregivers who have a smaller budget for feeding their children, the repeated  
438 food waste resulting from rejection of vegetables would present a bigger barrier to future  
439 offering than for caregivers in this study. Providing information to parents on the success of  
440 repeated offering of foods, and reassuring them that waste (and the associated cost) need  
441 not be long term, may encourage parents to reoffer vegetables in the short term until their  
442 child accepts these foods. Parents could also be educated on ways to offer vegetables more  
443 cheaply, such as preparing food in bulk (Kilcast et al., 1996), as well as ways in which to  
444 reuse refused vegetables for themselves or other children. Although research into time as a  
445 barrier to caregivers offering vegetables is limited, previous studies have revealed time to be

446 a barrier to parents' preparation of meals (Fulkerson et al., 2011; Nepper & Chai, 2016). One  
447 possible solution to time as a barrier to offering may be to educate caregivers on the easiest  
448 methods of preparing vegetables, particularly preparing in bulk and in advance of mealtimes,  
449 which are methods previously demonstrated by high vegetable consumers (Kilcast et al.,  
450 1996).

451

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

459

460 A number of child factors which influence how and when caregivers offer their child  
461 vegetables were also discussed, such as child age, hunger and children getting upset. It  
462 emerged that some caregivers would not offer vegetables which their child dislikes if their  
463 child became upset when presented with the vegetable for fear of creating greater feeding  
464 difficulties. To minimise this fear, advice to caregivers should be tailored to reassure them  
465 about the appropriate level of persistence to use when feeding a child, with it known that  
466 repeated exposures to disliked foods are necessary for children to accept them (Cooke,  
467 2007) and that pressure to eat can result in lowered preference for pressured foods (e.g.,  
468 Galloway et al., 2005; Galloway et al., 2006). Child age influenced the behavioural method of  
469 offering which caregivers' employed. With this in mind, advice given to caregivers about  
470 possible methods to encourage consumption of vegetables should include information about  
471 which particular methods are the most appropriate for children of different ages. More  
472 research in this area seems necessary in order to develop specific advice tailored to child  
473 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.

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**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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