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# “Wrap healthy snacks with cool packaging” - A qualitative study of mothers’ portion size strategies for their children.

Tang Tang[1]*, Wenmeng Wang[1,], Fiona Croden[2], Marjan Vazirian[1], Marion M. Hetherington[2]

[1] School of Design, University of Leeds, Leeds, UK LE2 9JT; t.x.tang@leeds.ac.uk (T.T.); wangwenmeng321@hotmail.com (W.W.); m.vazirian@leeds.ac.uk (M.V.)

[2] School of Psychology, University of Leeds, Leeds, UK LS2 9JT; f.c.croden@leeds.ac.uk (F.C.); m.hetherington@leeds.ac.uk (M.H.)

* Correspondence: t.x.tang@leeds.ac.uk; +44 (0) 01133433793

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[1] Wenmeng Wang was a visiting PhD student at the School of Design, University of Leeds.

# Abstract

Offering large portions of high energy dense (HED) foods increases overall energy intake in children, a potentially important contributing factor to childhood overweight and obesity. Packaging offers a simple heuristic to encourage healthy eating for nutrient dense foods and to downsize portions of HED foods. However, it is not clear how parents use packaging for portion control, nor how packaging might be used as a solution to offset large portions. Therefore, the aim of the present study was to investigate mothers’ portion strategies and how they use packaging to facilitate portion control for children. 21 mothers of 25 children aged 1-5 years participated in semi-structured interviews to identify strategies used by mothers for portioning snack and meal items. Mothers reported feeling confident in amounts offered to their children, and were unaware of, or did not apply, recommendations for age-appropriate portions of meal items and snacks. Mothers portioned according to child appetite, needs and characteristics, not necessarily age. They reported that their child was able to determine for themselves how much to consume. However, mothers also applied restrictions to some foods. No differences in considerations and strategies were found between different ethnic groups of British and Chinese mothers. Mothers reported that packaging was an important determinant of preferences and a useful, convenient means of portion control. To promote appropriate consumption norms in children, a packaging design

concept is described to aid downsizing for a highly liked HED food. Future studies should examine how creative packaging solutions influence parents' feeding practices and how this might influence dietary quality through user testing.


## Keywords

Food intake, Children, Parent perceptions, Packaging design; Portion size strategies, Downsizing


# 1. Introduction

There is consensus within national and international policies that solutions to prevent obesity must involve reductions in portion size of food products (NICE, 2015; EU platform for action on Diet, Physical Activity and Health, 2015; WHO, 2014). In part this has been suggested as a result of robust and reliable evidence demonstrating that large portion sizes offered increase food intake (Rolls et al., 2000, 2006, 2007; Fisher et al., 2003; Hetherington et al., 2018; Hetherington, 2019) and may increase the risk of weight gain (Livingstone and Pourshahidi, 2014). WHO (2015) and SACN (2015) recommend that free sugar intake should be limited to less than 5% of total daily energy intake (TDEI). However, UK data show that all age groups consume more than double this amount (Tedstone et al., 2015). In 2018, Public Health England (PHE) initiated a campaign to "look for 100 calorie snacks, two a day max" advising caregivers to limit the frequency and energy content of children's snacks to twice a day, with a maximum of 100 kcal per snack. The introduction of the campaign has made the reduction of portion sizes and the sugar content of food products a more pressing issue for many food and beverage companies, at least in the UK.

Explanations for the portion size effect PSE are diverse (Steenhuis and Poelman, 2017; Zuraikat et al 2019). However, consumption norms for what is deemed an appropriate amount to eat are shaped by food portions people routinely encounter in everyday life, at home, in the marketplace or restaurants, and via advertisements. As exposure to large portions become normalised, people experience an upward shift in portion size expectations and food consumption correspondingly (Robinson et al., 2016). In children, since they are just beginning to learn about portion size and to establish eating habits, there is an opportunity to influence and shape expectations about appropriate portions (Hetherington and Blundell-Birtill, 2018)—namely 'me-size' amounts (DOH Change4Life, 2009). However,

previous studies reveal the limitations of merely using informational measures (Cavanagh et al., 2014) or guidance, such as labelling (Spanos et al., 2015; Versluis et al., 2015). Therefore, it is important to consider providing both information about downsizing portions and strategies to achieve this. This means that more effective interventions (Marteau et al., 2015) and more creative solutions to downsizing are needed to assist parents to adjust portions for and/or with children to suit their energy needs and appropriate to their size (Hetherington et al., 2018). To date, few studies have investigated the effects of downsizing snacks and meal items in children (e.g. Reale et al 2018; Carstairs et al 2018) yet there is considerable potential for children to learn to "downsize" through repeated exposure and experience.

Parents have a central role in shaping their children's eating habits (Savage et al., 2007; Hart, et al., 2010). As the "gatekeepers" of child nutrition, caregivers, especially mothers, decide the type, quantity and quality of food they make available in the household (Cullen et al., 2003). Parents influence their children's micro-environments by their own dietary patterns and use of food parenting practices (Larson and Story, 2013). However, it has been reported that parents struggle with quantifying portions they serve their children and describe adjusting portions as effortful and inconvenient (Curtis et al., 2017). Parents may not think about the portion size of snacks and few use recommendations or actual measurements (Croker et al., 2009). However, parents do apply a number of different strategies to determine the portion size for their children (Fisher et al., 2015). For example Blake et al. (2015) reported that in parents of preschool children from low-income households, portioning snacks involved using small containers, measuring cups and scales; subdividing large adult or family portions, purchasing small pre-packaged snacks, using hand measurements to gauge child size portions and letting children determine their own portion size. Typically, decisions about portion size are made based on the perceived healthfulness of the food (Blake et al., 2015), child specific characteristics such as the child's appetite (Croker et al., 2009) and contextual factors such as location, time of day, proximity to last eating occasion, package sizes (Blake et al., 2015) and may be based on the amounts adults serve themselves (Johnson et al., 2014). Whilst recommended serving sizes are typically given for adults on pre-packaged foods, these are not adjusted to reflect a child's energy needs, age or stage of development. Serving suggestions vary across brands leaving customers confused about appropriate portion sizes (British Heart Foundation, 2013). Serving adult sized portions may be especially problematic for energy balance and risk of

obesity (Livingstone and Pourshahidi, 2014). An important observation made by Johnson et al. (2014) was that parents who serve themselves a large portion at meal times also serve a large portion for their child. In this study, serving size by mothers accounted for 73% of the variance in the amount children then consumed.

An obvious solution to portion control concerns for individual families is through the design of food packaging. Food packaging is known as an environmental cue to influence purchase decisions, buying behaviour (Ogba and Johnson, 2010; Fuente et al., 2015) and serving size (Neyens et al., 2015). Given that consumers rely on package size, information, and habitual use to determine serving sizes (Chandon, 2013), packaging could be used to better inform parents about portion sizes offered to young children. Past attempts have been made to promote appropriate serving sizes through packaging design, such as smaller packaging and use of food labels. However, recommended amounts remain unadjusted for children. Therefore, it is not clear how parents decide how much of a food to offer to children of different ages but what is known is that portion sizes have increased (Nielsen and Popkin, 2003; Smiciklas-Wright et al., 2003; Wrieden et al., 2008) and that larger amounts have become normalised for some foods which are high in energy density (HED i.e. >4 kcal/g, BNF https://www.nutrition.org.uk/healthyliving/fuller/what-is-energy-density.html). More research is needed to understand the effect of packaging on portion control and healthy eating (Twine, 2015), particularly in children.

The aim of the present study was to investigate how mothers use packaging to facilitate portion control for children in the home environment using a qualitative approach and in particular, to assess whether packaging might facilitate portion control to suit the age and stage of the child. Drawing on the understanding of the strategies used by mothers to support healthy behaviour in children, a packaging design concept is suggested here as a means of supporting parents to offer energy dense, highly liked foods which are within recommendations and promote appropriate consumption norms in children.

# 2. Methods

The reported study was part of a larger, observational study involving filming family meals at home. Only the interviews with mothers are reported here and the larger study received ethical approval from the School of Design, University of Leeds, UK (PVAR 15-096).

## 2.1 Participants

A convenience sample of 21 mothers of children aged 1 – 5 years were recruited from Leeds, Manchester and Chester. Recruitment involved placing advertisements around the university, by email distribution lists and using posters in children's centres, community centres, supermarkets, internet based infant forums, and a snowball sampling strategy through the researchers' personal contacts from February to August 2017.

Inclusion criteria included being the biological parent of a child without a chronic medical condition affecting growth or eating (e.g., food allergies or intolerances, developmental disorders, or birth defects); having primary responsibility for feeding their child most of the time; and parental age of at least 18 years or older.

In total, 21 mothers aged 24-51 years; BMI 17.5-29.3 kg/$m^2$) of 25 children aged 1-5 years (17 males) participated in the study. The sample was skewed towards high income, well-educated and therefore high SES families, with 62% of families earning above the average household income for 2018 (ONS, 2018). Most of the sample were white British, Chinese, and other white and mixed (95%), from two-parent/caregiver families and most were within a healthy weight range (self-reported). Approximately 90% of parents had a higher national certificate or diploma and 66% of them reported higher education such as an undergraduate degree or postgraduate qualification (Masters/PhD). Participant characteristics are presented in Table 1.

Table 1. Participant characteristics

| | Attribute | Number | Percentage |
|---|---|---|---|
| **Mother** | | | |
| Age (years) | 21-30 | 3 | 14% |
| | 31-40 | 16 | 76% |
| | 41-50 | 1 | 5% |
| | 51-60 | 1 | 5% |
| BMI (kg/$m^2$)** | Underweight | 2 | 10% |
| | Normal weight | 15 | 71% |
| | Overweight | 4 | 19% |
| Ethnicity | White British | 11 | 52% |
| | African | 1 | 5% |

| | | | |
|---|---|---|---|
| | Other white/white Irish | 1 | 5% |
| | Chinese | 8 | 38% |
| Highest Education | Vocational qualification (GNVQ or BTEC) | 2 | 10% |
| | Higher national certificate or Diploma | 5 | 24% |
| | Undergraduate degree | 6 | 28% |
| | Postgraduate qualification (master/PhD) | 8 | 38% |
| Employment Status | Full time | 5 | 24% |
| | Part-time | 8 | 38% |
| | Not working | 8 | 38% |
| Marital Status | Two-parent/caregiver family | 20 | 95% |
| | Single parent | 1 | 5% |
| Income | £10–20,000 | 4 | 19% |
| | £20–30,000 | 4 | 19% |
| | £30–40,000 | 7 | 33% |
| | £40,000+ | 6 | 29% |
| **Child** | | | |
| Sex | Female | 8 | 32% |
| | Male | 17 | 68% |
| Age (months) | 12-24 | 4 | 16% |
| | 25-36 | 10 | 40% |
| | 37-48 | 1 | 4% |
| | 49-60 | 10 | 40% |
| BMI Centile* | Overweight | 5 | 20% |
| | Normal weight | 18 | 78% |
| | Underweight | 2 | 8% |

*BMI centile based on Boys & Girls UK-WHO Growth Chart 0-4years, Boys & Girls UK body mass index 2-20 and child's height and weight reported by parents. Overweight is defined as >91st centile and underweight < 2nd centile.

**Body mass index (BMI) calculated from self-reported height and weight and classified as underweight <18.5 kg/$m^2$; normal weight 18.5–24.9 kg/$m^2$; overweight 25–29.9 kg/$m^2$; obese >30 kg/$m^2$.

## 2.2 Procedure

Prior to the start of the main data collection, potential participants completed a family

profile questionnaire as a screening tool that contained general demographic questions (number of children, child age, gender, parental age, self-reported heights and weights to calculate body mass index (BMI), income, education, employment, ethnicity). Parents gave written informed consent to participate. Next the interview was scheduled to suit family commitments and was conducted with a guide lasting between 60 and 90 minutes (see Supplementary material 1). The interview guide consisted of six sections covering parents' perceptions of portion size, the child-parent purchase relationship, feeding practices and portion size strategies, intention and confidence (self-efficacy beliefs) to serve age appropriate portions of meals and snacks, and parents' perceptions and needs of packaging solutions for portion control.

Participants were compensated for their participation with £10 supermarket gift vouchers. Data collection took place over a 12-month period between March 2017 and February 2018.

### 2.3 Data analysis

All interviews were recorded, transcribed, and then analysed. The transcripts from the interviews were analysed using thematic analysis (Braun and Clarke, 2006). Transcripts were checked against audio-recordings for accuracy, and initial notes and potential codes were discussed between two of the researchers (TT and WW). Data were coded both to extract individual behaviours and collective practices. The related codes were collated into potential themes and all relevant data were clustered within each potential theme. Themes and detailed sub-themes were identified, given tentative labels and plotted in word documents. Inductive reasoning was applied to ensure that themes were evident in the raw data. These were reviewed and adapted to fit better the data through an iterative process of close examination of the transcripts, comparison between participants, and considering the entire data corpus guided by Braun and Clarke (2006). Following the identification of codes and themes in the data, the two researchers (TT and WW) brought both sets of data together to compare and validate the emergent themes. Discrepancies were discussed at project meetings with MH until consensus was achieved (Ryan and Bernard, 2000).

## 3. Results

Interview data are presented below according to thematic analysis, quotations from mothers are provided to give examples supporting the themes. Mother IDs are given and then this ID is linked to a child ID giving sex (daughter = F, son = M) and age. The

supplementary material 2 shows each mother ID with each ID for the child.

## 3.1 Portion size: mothers' perceptions, confidence and awareness

Mothers reported feeling unconcerned about amounts of food served to, and consumed by, their child. Lack of concern may be attributable to parental perceptions that children were of a healthy weight (Table 2). Mothers related the portion sizes of foods to their child's weight and health status, knowing how much their child could eat, being in control of what was offered and applying restrictions for treat foods.

Table 2: Reasons given for reported confidence in adjusting portion sizes served to children aged 1-5 years at home.

| **Reasons** | **Quotations** |
|---|---|
| (1) Their child was a healthy weight and happy | "*Confident - They've never complained to me… I can clearly see that they have got enough energy and healthy. They are in a good mood. So these are confirming that the portion is appropriate*." [ID 1]<br>"*… he is fine weight wise*." [ID 10] |
| (2) Mothers knew how much their child could finish | "…. *I know how much they'd eat*." [ID 16]<br>"*It's easy for me to know, 'cause I know what they can eat and what they can finish, I basically know how much to give them - just a regular portion*" [ID 18] |
| (3) Feeling in control of their child's eating | "…. *I am in control of what is bought*." [ID 14]<br>"... *I bought the right food for them and they look healthier*." [ID 17]<br>"*I have made a timetable or wrote what we need to have, so if I am not at home if it is the Dad or someone else, I just make sure to give them the idea what I should give them*." [ID 18] |
| (4) The idea of small being appropriate as a portion for a treat food | "*I actually use sweets as a reward* (ID 5M: 58m), *but I have a mini and tiny lollipop, not the big ones*." [ID 5]<br>"*After swimming classes, he* (ID 12M2:54m) *gets the juice. We eat Coco Pops as snacks without milk. It's just like a treat when their behaviour is good… For my older son, I know he likes chocolates, ice cream and yoghurt; I give him one yoghurt every day if the size is too small, ...I will give him two… For sweets, chocolates and ice cream just as treats… just one chocolate, a small amount, not every day, one to three times a week, probably 20 grams each time*." [ID 12] |

| | |
|---|---|
| | "*I don't believe in giving them so much savoury or junk food. It's really a treat*…" [ID 18] |
| (5) Appling rules compared to other parents/caregivers or other children | "*.... I think compared with other parents, we don't give them snacks and sweets often*." [ID 10]<br>"*She started asking for desserts after meals at home in the first few weeks in reception. I told her, 'we are not eating desserts after meals at home'. After many many times, she understands and stops asking for it now*." [ID 17] |

A lack of awareness was expressed regarding age-appropriate portions of meal items and snacks advocated by labels, recommendations or campaigns.

> "*I rarely read the portion. I don't know*." [ID 18]
> "*Not sure about appropriate portion sizes. Just using the small plates for them and the right portion as it is in the menu* (label)." [ID 4]
> "*I am not sure what the size they should be having. It's difficult because everyone has different portion sizes*." [ID 8]

Five out of 21 mothers had heard about the Public Health England campaign - Change4Life and the specific"Me size meals" advice.

> "*I did hear about it. But the only time I heard about it when I was going through the University Research Open Day*." [ID 5]
> "*Yes. 'Me size meals' from the flyer my daughter brought from school*." [ID 8]

Of those who were aware of "Me size meals" four mothers did not use this approach for determining the portion size of foods offered to their children at home.

> "*I'm undecided about doing this. I heard about it but I am not really looking into it. I saw a program about sugar. I tried to do it but I don't actually follow it*." [ID 10]
> "*No. I use the child's plate for him, just to make sure he is getting to know what is the right amount of food for him. But I haven't seen any packaging in the store that says this is the right (size). Like these crisps that is smaller or the cookies pack are*

*smaller, they are the right sizes to give to kids. So I haven't used things like that*." [ID 5]

There was broad consensus among mothers that their considerations for determining the portion size of a child's meal and snack foods were guided by past experience, rather than external advice. Parents estimated their child's eating over the course of the day and tested the quantities or portions through trial and error.

"*If I think something is too big, then I would like to give them (children)* (ID 8M: 27m and ID 8F: 5y9m) *half*. *I just give them what I think the normal portion is. If they want more, they can have more. They have their own bowls. They eat porridge a lot. I don't measure the portions*." [ID 8]

Table 3: considerations that drive the portion size for children

| **Considerations** | **Quotations** |
|---|---|
| (1) Responding to child's needs | "*I work on what looks the right amount of food. As my son gets older and more active, I increase his portions*." [ID 20]<br>"*After he has been playing for an hour on trampolines, or it has been 3-4 hours since the last time he eats something, I tend to give him a bit more, starting with the healthy stuff, fruits, dry fruits, then biscuits or rice cakes… until he won't ask for any more. I try to limit the bad, but it is hard to know how much is appropriate*..." [ID 3] |
| (2) Perceived healthfulness | "*If it's healthy, breakfast cereals without added sugar, (I'll give them) as much as they want. They keep asking for more and more… sugar-sweetened drinks - never, savoury snacks - once a day, confectionery and cakes – I give them Kid size… I would not let them have the same size as me... just being logical*." [ID 2]<br>"*I guess if it is healthy, I will give him a good portion, for example, roasted hazelnuts, raisins. For the packaged snacks, I tend to buy snacks for babies. It says on the packaging "no nasties". It must be healthier and contain less artificial sugar than other cookies... He won't stop until it is finished. I guess eating a whole bag of biscotti* must be better than eating a whole pack of Oreo cookies*." [ID 3] |
| (3) Eating | "*Unhealthy food is only for snack time. I just give them one pack of crisps* |

| | |
|---|---|
| outside the home | *or one chocolate bar. Then that's all for the whole day. But if they are at a party, they will eat whatever they want*." [ID 17]<br>"*It is so difficult especially eating out in the pub. Not sure about correct portion sizes, just try to use the right portion as it is in the menus. They do eat less veg and fruit somehow… It is easier to give them toast or anything easy on the go*." [ID 2] |
| (4) Rules and Restrictions | "*We have a rule that she (ID 6F: 56m) can have three glasses of sugar sweetened drinks, two packs of savoury snacks, confectionery and cakes once a day*". [ID 6]<br>"*I limited sweet drinks for her* (ID 18F:27m) *to once or twice daily*". [ID18] |

* This is a type of baby biscuit with 22g of sugar per 100g, considered high in energy density WHO (2015). Maximum recommended sugar intake per day for 4-6 years is 19g.

Considerations which framed decisions about portion sizes of foods included child needs, perceived healthfulness, context and limitations for certain foods/beverages. Interestingly if mothers perceived a food as healthful then they encouraged more intake, whereas restrictions were in place for foods or beverages considered less healthful. Eating outside the home was construed as more problematic than at home.

## 3.2 Strategies to portion child's foods and drinks

Mothers described strategies they used for portioning child's foods and drinks; and referred to self-regulation as a means for the child themselves to apply when deciding how much to eat.

(1) Using portioning aids

Mothers reported use of portioning tools including using small containers, e.g. child-sized bowls (IDs 6, 8, 10, 13, 17, 18), plates (IDs 1, 4, 5, 9) and spoons (IDs 3 and 10), hand measurements (ID 5, ID13), and serving spoons and scale (ID 10).

> "*Yes, (I'm) using the scale, serving spoons. Caring too much about the portion sizes*". [ID 10]

(2) Pre-packaged individual snacks

Mothers relied on the size of pre-packaged foods as a guide to appropriate portion sizes, offering half of pre-packaged foods to their children.

> "*For me, I just usually eat what the package size is. For them* (ID 5M: 58m; ID 5F: 7y5m) *I split it up, but that is not very technical*." [ID 5]

Pre-packaged individual snack foods were also used by mothers to avoid negotiation and prevent children from asking for more. In cases where mothers viewed the child's requests for snacks to be motivated by want rather than actual hunger, they found the packaging with individual serving portions to be a quick and easy way to set a limit on snack number or portion size with their children.

> "*I will buy individually pre-packaged snacks for my children. I can control the portion they eat. Like individually pre-packaged crisps and biscuits, I just give them one portion*." [ID 10]

> "*Like the crisps, cookies… I buy the small bags for convenience when being out of the house, in the park or when playing golf. So when it's finished, he doesn't ask for more. If it is a big bag, he might see and keep asking for more*…" [ID 9]

(3) Subdividing large adult or family portions by sight or prior experience

Mothers adjusted portions of HED snacks in an effort to provide 'something small' for their children, but the interviews suggested some confusion about how much to serve. This is in contrast to the confidence shown for small, pre-packaged snacks relative to the need to subdivide from a larger package.

> "*If they are having nuggets or something like that, try to count them. No more than five. Counting to control it*." [ID 1]

> "*If it is a large portion, they will ask for more when they finish. It is quite hard to stop them from constantly asking for more and more... It depends on them, for me, it is quite hard to decide how much*." [ID 10]

(4) Child self-regulation

The child's ability to self-regulate was considered important. Mothers trusted their children to stop eating in response to internal cues of hunger and fullness, therefore, they did not need measuring aids nor did they need to be concerned about amounts offered to their child.

> "*I usually give him a normal bag, he usually eats about a half and leaves… he just stops*." [ID 8]

> "*They don't eat too much of every food or every portion. I know my kids very well, even though you give the portion that doesn't suit them, they won't finish it*." [ID 18]

> "*I don't calculate. She* (ID 19F1: 44m) *knows how much she needs. Very confident. I don't think it is about parents. Children know how much their bodies' need. We prepare the 'right' food, and they choose how much they eat*." [ID 19]

> "*My daughter* (ID 17F: 56m) *eats more than my son* (6y9m). *It's hard to decide how much they can eat. I normally give them as much as they want. I rarely control them*." [ID 17]

Different strategies, rules and tools (Table 4) were reported by the mothers to determine the portion size of HED cereals, confectionery (cakes, ice-cream, cookies), savoury snacks and sugary drinks offered to their child.

Table 4: Portion size considerations and strategies used for HED food items

| **Considerations** | **Quotations** |
|---|---|
| Cereals | |
| (1) Using portioning aids | "*I serve breakfast cereals according to the kid size bowl, half of the adult's bowl*". [ID 9] |
| (2) Subdividing large adult or family portions by sight or learned responses | "*I just give them what I think the normal portion. If they want more, they can have more. They have their own bowls. They eat porridge a lot. I don't measure the portions*." [ID 8] |
| (3) Responding to child appetite | "*They keep asking for more... as much as they want*…" [ID 2]<br>"*I probably don't look at the package to see what the portion size* |

| | |
|---|---|
| | *is. ...I don't know what the portion size is for cereal. I don't measure breakfast cereal, because cereal sizes are so small, and he is really hungry at breakfast time, so I just let them have as much as they want*." [ID 5] |
| Confectionery | |
| (1) Subdividing large adult or family portions by sight or learned responses | "*Per day, a quite small portion of confectionery and cakes for them. I do not measure them often. So if my son (ID 8M:27m) wants snacks… or something as a treat, like a chocolate bar, he will have a kid's one, a little bar, in small size*." [ID 8]<br>"*One slice of the cake. I cut it, only a small piece of the cake*." [ID 17] |
| (2) Halving pre-packaged adult's snacks | "*I buy the chocolate bar in the small bag and split it in half for my elder son* (ID 12M2: 54m)." [ID 12] |
| (3) Responding to child appetite | "*During the day, when they feel hungry, they will eat the cake*." [ID 17] |
| (4) As small treats to reward the child | "*There is a rule that would allow you to eat dessert if you eat a proper healthy meal. For example, an ice-cream cone, but not always… I give him ice cream but he would not eat an entire cone*." [ID 1] |
| Savoury snacks | |
| (1) Pre-packaged individual snacks | "*Savoury snacks, regularly, one portion per day* (ID 15F:31m)". [ID 15]<br>"*Whenever they* (ID 4M1:49m; ID 4M2:19m) *ask, I give one bag of crisps*" [ID 4].<br>"*I give him* (ID 18M: 48m) *one pack maybe after breakfast and one pack before dinner. Normally, two packs per day*." [ID 18] |
| Sugary drinks | |
| (1) Use situational cues such as time of day/volume | "*Sugar sweetened drinks at breakfast and during daytime, 3 glasses per day* (ID 6:56m)" [ID 6]<br>"*One bottle, 200ml or 250ml of sugary drinks per time* (ID 17F:56m)." [ID 17]<br>"*… mealtime and between meals, I will provide squash instead, my daughter* (ID 13F:35m) *will drink soybean milk*." [ID 13] |
| Meals | |

| | |
|---|---|
| (1) Portion decisions e.g. logic, child-sized tableware, hand measurements | "*Tried to be logical not give too much*." [ID 2]<br>"*Using the plate to measure the portion. Child sized plates for the kids to measure the right size. Sometimes by sight. Cooking for five then split them between five*." [ID 4]<br>"*I normally serve a little bigger portion if she is very hungry. My daughter is 8. The normal portion is like my hand size, includes everything. Carbohydrate would be my palm size. For my son* (ID 13M:35m*), I just give him a Chinese bowl, full portion, about 100 to 200 grams*." [ID 13] |

Most portion size considerations and strategies were common and shared across the ethnic groups. However, more mothers of Chinese origin described peer influence at nurseries and reception class which shaped their children's preferences and consumption of sugary snacks and drinks. Carlson et al. (1984) found that most culture-based dietary habits tended to persist amongst Chinese immigrants even as time spent living in the UK increases. For example, Chinese families tend not to have dessert after dinner or eat fresh fruit as dessert.

Among the present sample mothers reported that their children ate dessert as part of school meals for the first time (e.g. ID 13, ID 17), and were given beverages other than water (e.g. ID 21). More Chinese mothers talked about limiting portion sizes of sweet snacks (ID 17) and limiting access to sugar-sweetened beverages (ID 21). One mother reported that an increased exposure to foods high in sugar was unavoidable in the UK (ID 12).

> *"My son has just started nursery in the primary school and he gets sweet desserts after having meals or for snacks. I always give him fruit at home. Having dessert after a meal is not a traditional thing in Chinese culture. "* [ID 13]

> *"We do not allow our children to have sugary drinks until they start to go to school… Before four years old, they just drank water. Since he went to nursery, he saw other kids drinking squash, since then he asked for it too. We try to avoid giving him sugary drinks, but he knows others (in his class) drinking it … there is peer influence, you know, we try to limit it to a minimum amount..."* [ID 21]

*"My older son (*ID 12*M1: 54m) is in … the reception, desserts are served with school meals. It is part of the culture here. Staying away from sweets or foods high in sugar is really hard as dessert is customary after meals in the UK."* [ID 12]

## 3.3 Mothers' perception of the effects of packaging on their children

Interviews revealed that nearly two-thirds of the mothers mentioned that food packaging influenced their child's purchase requests and product preferences. At the moment of purchase, children often reach for products with the packaging that is directed at their age and some mothers (e.g. ID 11; ID 17 see their quotes in Table 5, ID 10) reported that their children were completely unconcerned about foods.

"*He* (ID 21M1:25m) *doesn't always eat the food. He liked the packaging only. He wanted the packaging*…" [ID 10]

Packaging with cartoon characters was considered a particular favourite of the children, packaging with bright colours, and interesting shapes were also identified as important. Examples from the interview to illustrate these attributes are presented in Table 5.

Table 5: Packaging attributes influencing their child's product preferences discussed by the mothers

| Packaging attributes | Quotations |
|---|---|
| Cartoon characters influence purchase | "*If there are some cartoon characters on the top, they are more likely to want to buy them. Even if they've never touched, never tried or never had them before (ID 17F: 56m; ID 17M: 6y9m). As long as the cartoon characters are nice, cute and pretty, they want them*." [ID 17]<br>"*Some cartoon characters will influence him (ID 21M1:25m). For example, he watched the Peppa Pig cartoon, he didn't know what's inside, but he recognised Peppa Pig. Since he was attracted by the package, he wanted to buy it*." [ID 10]<br>"*Before she* (ID 11F: 25m) *didn't like cheese biscuits, but once, she picked up one by herself because of its packaging. There was a bear on the packaging. Then she starts to eat cheese biscuits*." [ID |

| | |
|---|---|
| | 11] |
| Attracted by bright colours | "*They were attracted by the bright colour, like yellow or red, they can easily see the box or packaging with these kinds of colours*." [ID 10]<br>"*My son likes red. He will prefer to pick up things that are in red*." [ID 12]<br>"*Usually like red or orange. He likes the bright ones*." [ID 5] |
| Unusual shapes(e.g. a ball, an egg or a star): encourage curiosity. | "*Like egg or star. Probably not as much by the shape, just by the picture on it*." [ID 5]<br>"*If there is something that's got like nice packaging form, they might want to see what it is and point to it… I would say they might be curious, but not influenced by. They're just curious what is inside and what it is like*." [ID 18] |
| Free gifts | "*She* (ID 11F: 25m) *likes chocolate eggs because inside the eggs there are toys. She doesn't eat the chocolate; she likes the toys inside. That's why he* (ID 11's husband) *always buys her that kind of chocolate egg*." [ID 11] |

## 3.4 Mothers' needs for packaging solutions for downsizing

Most mothers considered packaging as an appropriate downsizing solution for their children aged 1-5 years. However, mothers also raised disadvantages of packaging associated with environmental concerns, what is practical with different needs of different children; and the ways in which cartoon characters draw children towards foods which are high in energy density and considered less healthful. Four main recommendations (Table 6) were made by mothers that packaging could aid the portion control for their children.

Table 6. Four types of packaging solutions for downsizing proposed by the mothers

| Packaging types | Quotations |
|---|---|
| (1) Informative packaging | "*Never seen any age specification on the packaging. It has an adult's guideline but not a child's guideline*." [ID 6]<br>"*I like to have clear information on the recommended portion sizes for different ages on the packaging*." [ID 3] |
| Front of pack guidance | "*It must be shown all in one place and not found all around the boxes. It must be clear to see in front of the package. The easiest place to see. All* |

| | |
|---|---|
| | *the time searching for the information. Informational as well as the visual. Tables are good*." [ID 1]<br>"*Somewhere in big letters, so I can see it straight away. Not something on the back. Or at least say how many servings there are per package*." [ID 5] |
| (2) Colour-coded graphics | "*Visuals. Same kind of motifs for everyone. Which will be easy to recognise. Having the lines to measure the amount is really helpful … I do think that the packaging design helps if it has got the measuring scales like the lines to specify the amount. It could be helpful for the changes*." [ID 2]<br>"*Colour coding sugar, fat etc. is quite helpful*." [ID 19] |
| (3) Affordances aiding portioning during the consumption | "*Structural, too much information on the packaging. I haven't noticed the traffic lights on the package*." [ID 17]<br>"*I rarely read the portion, but I am trying to say, for the first time, something I really don't know, I will take time to read*." [ID 18]<br>"*I prefer one pack for one portion. It's easier. When we are looking after children, we need to keep an eye on them, so saving time is very important for me*." [ID 11]<br>"*I am very pleased that these snacks have got little bags; this is a very good idea ... Portion size would be good in this packaging size*." [ID 1] |
| Re-sealable packaging | "*Some packaging can be resealed. I prefer that kind of packaging because sometimes kids cannot eat the whole thing*." [ID 12]<br>"*Structural is always easier, cause we divided in two, so you know that you just give a half. It does need to be written on*." [ID 5] |
| (4) child-oriented packaging cues | "*Making the yucky food look cooler (through the packaging)… we just brought out some crisps made from like parsnips that they don't expect from you. One of the packs has a maze on the back of it, and my daughter ate all the crisps… because she was doing the maze on the back. It was interesting to her*." [ID 5]<br>"*Wrap healthy snacks with cool packaging, like Yollies! …He* (ID 16M:36M) *remembered the packaging, he always picked it up from the delivery I ordered*." [ID 3]<br>"*Vegetables and fruits need to be improved… Healthy yoghurt is simple, but the sugary ones have got designs... Make healthy appealing to* |

*children. You would never ever see characters on healthy foods packaging*!" [ID 6]

# 4. Discussion

Mothers of children aged 1-5 years felt confident about the portion sizes they served to their children, responding to their child's age, appetite, activity levels, time since they last ate and how hungry their child was. They did this in preference to using guidance from outside agencies. Mothers reported that individual characteristics of their child determined portion size not simply their age. However, mothers reported a conflict between efforts to control portion sizes at home and what happens outside the home, where children may have to decide for themselves what is appropriate to eat. Nevertheless, mothers reported that their children know how much to eat and what is right for them. Yet they described applying rules about consuming some foods and beverages, including applying restriction, in particular to amounts of sugar sweetened beverages and sweet foods. They reported adjusting amounts to ensure this was "small" and not "too much" and that they subdivided or halved larger, adult size portions to match their child's needs. Parents also reported using dishware, spoons, and their hands to divide foods and at other times relied on previous experience, visual estimation and trial and error to decide on amounts to offer. Finally, mothers reported that packaging was an important influence on their child's intake. They mentioned features such as colours or structure of the package and that single pre-portioned snacks were useful and saved time for busy schedules. This study reveals the complexity of the food choice environment which mothers navigate to feed their children adding to and extending the existing qualitative literature on portion size decisions.

## 4.1 Conflicting accounts of confidence and not knowing

Mothers' confidence in portion sizes offered to children aged 1 - 5 years was set against a lack of knowledge and application of official guidelines. This confirms qualitative research by Croker et al. (2009) with mothers of children aged 8 - 11 years, who did not follow recommendations for portions. In both cases mothers said that they adjusted amounts in accordance with child needs and context. Mothers offer amounts they believe are right for their child and this varied by child, food item and occasion. Confidence regarding portion sizes may be linked to mothers' perceptions of their child growing well, being happy and achieving a healthy weight.

There is evidence of Chinese-American parents applying pressure to eat in children they perceive as underweight (Chang et al 2017), and in a study of low-income, Latina mothers, Hidalgo-Mendez et al (2019) found those with healthy weight children were less likely to apply healthy eating guidance compared to those heavier children. Using perception of weight may be an unreliable guide to portion sizes for some foods and for some children, since numerous studies have shown that parents misjudge parental weight status (Etelson et al. (2003; Jones et al. (2011).

Parents reported responding to their child's appetite, and this knowledge had been acquired over time. These findings correspond with those of Sherry et al. (2004) whose participants said that they '... knew how much their children would or needed to eat'. This may mean that recommendations for standard amounts are considered irrelevant by parents. Indeed, Croker et al. (2009, p442) suggested that "exhortations to UK parents to limit portion sizes may fall on deaf ears". Almiron-Roig et al., (2013) have demonstrated that adults remain unaware of reference portion sizes and this, in turn, may facilitate overconsumption. Additionally, since some children may not recognise when they are full (Fisher et al., 2007) and are just learning about appropriate portions, repeated experience of adult size portions may become the expected norm (Robinson et al., 2016). It is therefore important for public health policy to recognise that parents prioritise perceived child needs above national recommendations.

## 4.2 A gap between awareness and action

Meal items and snacks were portioned to be "small", but most mothers defined this in relation to subdividing from adult sizes e.g. giving a half of an adult portion. Some portioning methods were used such as containers, dishware, pre-packaged individual snack and hand measurements. Portion size judgments were made on the basis of child appetite supporting observations by Blake et al. (2015). Quantifying portions and adjusting portions for children involved "intuition and guesswork" (Croker et al., 2009, p442) and "trial and experience" (Blake et al., 2015, p19). It was evident in the present study that mothers maintained a certain degree of routine in offering certain foods and amounts. However, they could not explain why they did so. Indeed Blake et al (2015) revealed that more than half of the mothers interviewed could not articulate how they decided on how much to offer their child. Most attributed this to habit rather than to deliberate and conscious efforts. It is challenging to integrate public health messages about portion control into daily routines due to the habitual nature of food provision.

## 4.3 The consensus view on the packaging as a downsizing strategy

Mothers reported that packaging offered a convenient and useful way to provide children with appropriate portions, at least for some foods. Given the difficulty reported in subdividing large, adult or family portions (such as cereals, beverages, homemade dishes, meal items) for their children, packaging offers a solution to assist with portion control. Also, given the habitual nature of food provisioning, packaging offers a simple solution for some foods. Almost two-thirds of the mothers agreed that food packaging influenced their child's product preferences. The visual aspect of products influences decision making about the food not only at the point of purchase but also consumption. Interviews revealed that mothers found the use of packaging, e.g. the shape, the presence of cartoon and animal characters influenced children's opinions about taste and food choices. This supports findings by Enax et al. (2015) that a fun, child-directed packaging for yoghurt was rated as attractive and tasty by children aged 8-10 yr. Recent work with children aged 10-14 yr demonstrates that food packaging could influence the intention of children to choose healthy food (Pires and Agante, 2011). According to Lapierre et al. (2011), "children remember nonverbal representations more easily than verbal descriptions". Nonverbal representations, such as colourful, cartoon characters on packaging may encourage young children to make healthy choices (Cravener et al., 2009). Therefore, packaging may assist children in recognising and remembering healthy eating options as well as providing age-appropriate portion sizes for downsized HED options.

Packaging may perform better than traditional advertising and informational campaigns in terms of improving comprehension and changing the choice environment at both the critical moments of purchase and consumption (Chandon, 2012). There is widespread interest in packaging design interventions that are reliable and simple to perform due to the time-constraints faced in families with young children. Informative packaging can encourage reflection and achieving downsizing goals through heuristics, simple cues or cognitive signs. Simple, colour-coded, summary graphics informing mothers of how portions contribute to recommended daily intake should be easier to see, at a glance, on packaging than current labels provide.

Convenient packaging solutions are required to facilitate parent choices and aid adjustment for child-size portions. Structural design attributes can promote portion control through the

physical characteristics of the product. By using affordances (informing potential behaviour) and constraints (limiting potential behaviour) (Norman, 1998), structural design attributes, such as pre-packaged individual serving snack foods, re-sealable packaging, measuring cups or scoops, and plates with divisions can nudge user behaviour towards downsizing. Structural design attributes can help simplify the process of setting priorities when users have varying goals and time constraints.

There are a large number of innovative food packaging designs created for children, but few consider offering guidance or aids on portion sizes to promote appropriate consumption norms in children. More interactive and educational packaging designs could be useful for children to learn to accept small portions of HED items within a downsizing context.

## 4.4 Proposed design solution -Sleeping Bear biscuit packaging concept

The following design concept has been developed as a potential solution to mothers' expressed wish to limit intake of foods which are considered less healthful This example shows how portion control could be facilitated by creative packaging. The Sleeping Bear biscuit concept focuses on a cylindrical canister or tube with a sleeve that wraps around it. The sleeve would twist to reveal an opening where a set portion of biscuits would be dispensed (Figure 1), within the recommended daily sugar intake for a 3-5 yr old child (NHS Choices, 2017). Design elements help to support the message of downsizing (by offering a specific, small portion) and focus on the importance of portion control (by taking only one portion). The narrative of the sleeping bear reinforces the message of a small, child size portion by encouraging the child not to "disturb" the bear for a second portion.


@Katie Miller, School of Design, University of Leeds, 2018

Figure 1. Sleeping Bear for chocolate button biscuits

# 6. Conclusions

The present study revealed a gap between behaviours reported to support portion decisions and the knowledge and implementation of recommendations for age-appropriate portion sizes for children. Mothers responded to their child's needs, and portioned accordingly. This behaviour was driven by prior experience. Parents trusted that their child knew how much to eat, yet restrictions and limitations were placed on specific high energy dense items. Parents reported that packaging is influential food choices and portion size.. Therefore, more innovative solutions could take account of mothers' needs to respond to their child's appetite and at the same time support dietary guidelines to limit the amount and frequency of consuming HED items for children. Two limitations of the study were that the sample was biased towards higher social status (education, income) and the child sample was dominated by males (17/25). Clearly, this constrains findings to this particular cohort and no claim about generalisability can be made. Future studies will benefit by involving a wider group of participants. Furthermore, a study that explores the feasibility, acceptability, and efficacy of

innovative packaging solutions for downsizing HED foods for children is warranted, and this should involve parents as the gatekeepers of their child's food choices and nutrition.

## Competing interests

The authors declare that they have no competing interests.

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