

How can toddlers' food consumption be realistically recorded?

From a weighed dietary record to a photo-supported estimate of portions consumed

Annett Hilbig, Ute Alexy, Helga Stelzner, Mathilde Kersting, Dortmund

Summary

Feasible dietary recommendations should rely on accurate consumption data, particularly during the transition from an infant diet to the family diet.

To determine the consumption habits within the GRETA Study (German Representative Study of Toddler Alimentation) an estimated 7-day consecutive food record was used. It was based on median, age-dependent portion sizes of the foods most frequently consumed by toddlers from the DONALD Study (Dortmund Nutritional and Anthropometric Longitudinally Designed). During the field study, a photo booklet was most accepted by the participants. Furthermore, the validation study confirmed that the newly developed estimation food record was a valid assessment tool for estimating toddlers' food intakes. The validated pictures were compiled in a final photo booklet, which is intended to facilitate nutrition anamnesis and counselling and also to be used in the research and development of dietary recommendations for toddlers.

Keywords: toddlers, estimated food record, photo booklet, portion size

pometric Longitudinally Designed) study, the average food quantities per day, e. g. for two-year-old children, fall between 600 g (10th percentile) and 1,200 g (90th percentile) [2].

In terms of energy needs, toddlers eat (g/day) less overall than older children and adults, but relative to kilogram body weight they eat more. Standardised adult portion sizes or so-called "hand portions" are therefore not inherently suited to recording the food consumption of toddlers.

Precisely-recorded consumption quantities were therefore used for 10- to 36-month-old children, to develop a simple and realistic tool for determining and evaluating food consumption in toddlerhood. The result would help substantiate and facilitate nutrition anamnesis and counselling, e. g. from paediatricians, nutritionists and dieticians.

Introduction

During the transition from an infant diet to the family diet it is often difficult for parents, as well as specialists, to estimate children's food consumption. There are various reasons for this. There is wide individual variability in the development of eating skills among infants [1]. Whereas some children are still taking bottles of milk, others are already eating at family mealtimes. Daily food quantities differ significantly from child to child. As demonstrated by the DONALD (Dortmund Nutritional and Anthro-

Methodology and Results

Accurate recording of food consumption with food weighed dietary records: the DONALD study

In the DONALD study, the food consumption of infants, children and young people has been recorded since ►

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1985 by means of 3-day weighed dietary records for toddlers aged 12, 18, 24 and 36 months [3]. The consumption quantities of food and meals are determined at every meal-time using electronic scales (reading: 1 g); uneaten remains are taken into account. This accurate consumption record continues with documentation in the food and nutrient database LEBTAB, where there is a specific entry for each recorded food, as well as for prepared meals and infant and toddler products.

In order to develop a much simpler tool for recording consumption among toddlers, 736 records were collected from 238 children aged from 10 to 36 months from the study period 2004 to 2008 within the DONALD study. Firstly, the 194 most frequently consumed foods

(from approx. 25,000 recorded foods) were identified and their average (median) consumption quantities or portion sizes were determined, partially adapted to household measurements and photographed. These foods were assigned to 17 different food groups. Overall, the data provides an image of toddlers' current eating habits.

From weighed dietary records to photo-supported estimate records: the GRETA study

The German Representative Study of Toddler Alimentation (GRETA) of 2008 aimed to record the food consumption and intake of nutrients from a sample of 500 children aged 10 to 36 months and to evaluate results in the light of food- and nutrient-related recommendations [4].

In order to be able to employ an accurate and easy-to-use survey tool, a semi-quantitative, photo-supported 7-day estimate record was conceived and adapted to toddlers' eating habits. To that end, portion photos generated by the DONALD data of the most consumed food (groups) were listed in a user-friendly record book. The parents recorded their children's food consumption for a period of seven consecutive days using a tally system (1 line = 1 portion; $\frac{1}{2}$ = $\frac{1}{2}$ a portion). This tool proved successful in practice among all social groups.

In a validation study of a sub-sample of the GRETA collective, the photo-supported estimate record, measured against a weighed dietary record over a period of three days, proved to be a relatively valid means for recording the intake of energy and nutrients among groups of toddlers. In this study, the intake of energy and 14 nutrients determined by both methods were compared in a group of 67 toddlers aged 10 to 36 months by means of different statistical procedures (mean differences, SPEARMAN correlation coefficients, cross-classification, BLAND-ALTMAN-plots). All procedures resulted in satisfactory to good accordances, e. g. significant correlations between $r = 0.35$ and $r = 0.80$ and a minor proportion of misclassifications ($< 9\%$) [5].

From estimated food records to the estimation of food consumption in diet consultations

In order to utilise the findings from the studies in practice, a selection of 170 photos of typical toddler portions (♦ Figure 1) was compiled from the GRETA 7-day estimate record, and divided into 18 food groups [6]. Alongside standard foods, e. g. bread ($\frac{1}{2}$ a slice) and apple ($\frac{1}{2}$ a piece), these also included convenience meals, e. g. goulash (3 dessert

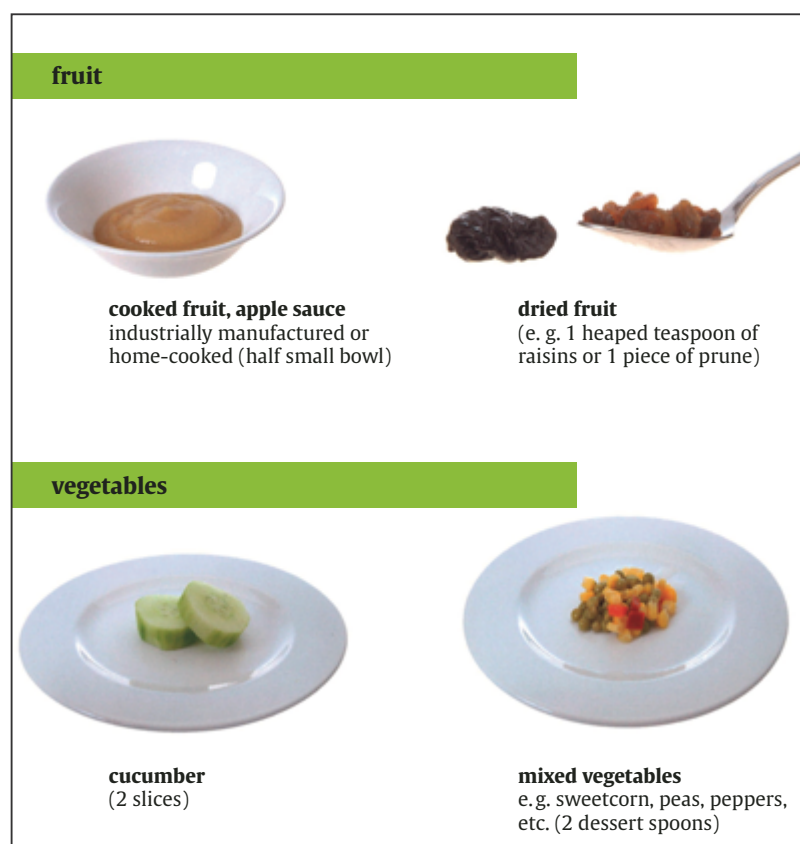


Fig. 1: Photos of average portion sizes for toddlers, demonstrated by various foods from the food groups "fruits" and "vegetables"

spoons) and snacks, e.g. potato crisps (6 pieces). In contrast to the GRETA record booklet, the average weights per portion were also provided (♦ Figure 2), in order to allow direct logging, e.g. in consultations, without the intermediation of a scientific institute.

Additional descriptions of the recommended daily food consumption quantities in the “optimised mixed diet” and example meals for two and three-year-old children were intended to facilitate the interpretation e.g. of parental data on their children’s food consumption [7]. The “optimised mixed diet” was developed and evaluated at FKE as a scientifically-based food and meal-related prevention programme for the diets of children and young people aged 1 to 18 [8].

Discussion and conclusions

In recent times, toddler nutrition has become a common subject not only in nutrition research and the public health sector, but also in product development within the food industry and in nutrition education [9–12]. Hence, questions are being asked on child nutrition in parental diet consultations, as well as by institutions, e.g. nurseries and daycare centres. Realistic consumption data are indispensable for determining and evaluating the actual diet in the transition phase from infant diet to family diet.

The traditional weighed dietary record method still appears to be better than other methods for producing a valid and realistic record of individual food consumption of toddlers [13]. Less effort is required when estimates of consumption quantities are permitted, like in the VELs study (*Verzehrsstudie zur Ermittlung der Lebensmittelaufnahme von Säuglingen und Kleinkindern* [Consumption Study to Determine

Described foodstuffs and portion sizes			
Drinks (page 4)			
mineral water		(quarter glass)	50 g
juice	fruit/vegetable juice	(half glass)	100 g
juice drinks	fruit/vegetable tea + juice	(half glass)	100 g
milk	1.5 % or 3.5 % fat	(half glass)	100 g
soya drink		(half glass)	100 g
drinking powder		(1 teaspoon)	3 g
Fruit (pages 5–7)			
pear, apple		(half an apple or third of a pear)	56 g
banana		(half a banana)	50 g
grapes		(5 pieces)	40 g
berries		(1 dessert spoon)	20 g
kiwi		(half a Kiwi)	44 g

Fig. 2: List of average portion sizes (g/portion) among toddlers, demonstrated by various foods from the food groups “drinks” and “fruits”

Food Intake of Infants and Toddlers]) in Germany [9] and the large epidemiological study with toddlers in Finland [11]. The American FITS study (Feeding Infants and Toddlers Study) used a specially-developed booklet with sizes of actual foods for its telephone 24-hr recalls [12]. More realistic photos proved to be helpful for quantifying consumption portions among adults [14]. The use of new electronic media to simplify consumption surveys still requires further testing [15, 16].

The new survey tool described here, in the form of a photobook tailored to toddlers’ eating habits, is taken from a tested and validated 7-day estimate record by the German-wide GRETA study. The unavoidable use of standard portions is admittedly linked to a loss of individual variation and a potential influence over response behaviour by means of guidelines. However, the advantage is that the standards were measured directly from the corresponding age groups. Individual variability can also be taken into account, with the option of indicating partial portions, e.g. ½ a portion.

The new photobook is more flexible than the 7-day estimate record. It can be used, detached from specific survey provisions, in its entirety or with selected foods, e.g. accompanied by records, recalls or FFQs (Food Frequency Questionnaires) as part of studies or for (medical) nutrition anamnesis and counselling for toddlers.

Outlook

The development work described here – from detailed output data from the DONALD study, via the public health approach in GRETA, to the photobook for estimating toddlers’ food consumption – is an example of translational research in the field of preventative child nutrition. If in future the question “what and how much do toddlers eat?” can be answered more simply and reliably with the new survey tool, not only might nutrition anamnesis and counselling be facilitated in the consulting field, but research and development in the field of toddler nutrition might also benefit.

Dr. Annett Hilbig¹
 Dr. Ute Alexy^{1,2}
 Dipl. oec. troph. Helga Stelzner¹
 Prof. Dr. Mathilde Kersting¹

¹Forschungsinstitut für Kinderernährung
 Dortmund (FKE)
 Heinstück 11, 44225 Dortmund
 E-Mail: hilbig@fke-do.de

²DONALD Studie
 Rheinische Wilhelms-Universität Bonn
 Heinstück 11, 44225 Dortmund

Conflict of Interest

Prof. Dr. Mathilde Kersting is Scientific
 Director of FKE GmbH.

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