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Research Report

Ambiguity of ‘snack’ in British usage

Aïnhua Chamontin, Gabriele Pretzer, David A. Booth*

Food Quality and Nutritional Psychology Research Group, School of Psychology, University of Birmingham, Edgbaston, Birmingham B15 2TT, UK

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Abstract

Research into least fattening eating patterns indicates that in England ‘a snack’ is a term that refers to different eating habits from ‘snacking’ and that neither pattern of behaviour necessarily involves ‘snack food’. These hypotheses were tested by randomised mailings to a convenience sample of university campus addressees with the subject heading of the message and the topic of questions in it being one of the terms, a snack, snacking or snack food. Responses to all three terms much more often referred to eating between mealtimes than eating at mealtimes but this contrast was less for a snack, especially at lunchtime. Previous and subsequent eating occasions therefore tended to be at mealtimes, but again less so for a snack. A snack also differed from snacking or eating snack food in eliciting more reports by women of eating in the home than out, and more eating alone than in company. However, reports by men contributed most to differences between snack terms in the foods reported: more men ate bread in a snack than when snacking but more ate sweet items when snacking than in a snack. More men reported savoury items (e.g. potato crisps) as snack food than in response to the other two terms; however, when savouries were combined with bread-containing items, the women were unlike the men in that more of them referred to such items when snacking. Thus, for these people in England, having a snack is not the same thing as snacking or eating snack food. Because of these ambiguities in use of the root word snack, it may be best to avoid all its derivatives in questions to research participants, discussion among investigators and educational messages.

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Keywords: Snacking; Having a snack; Eating snackfood; Light meals; Bread; Potato crisps

Introduction

The mechanisms by which eating satiates appetite for food in human beings were sufficiently elucidated in principle by the mid-1970s for it to have become feasible to calculate the temporal pattern of consumption from a familiar diet in the absence of environmental influences (Booth, Toates, & Platt, 1976). A simulated 70 kg individual (in bed from 11:30 p.m. to 7:30 a.m.) ate only at around 8 a.m., 1 p.m. and 6 p.m., in meals of about 4 MJ. From the similarity to the concepts of mealtimes common among sedentary workers in temperate climates, it was suggested that the social conventions in such societies are adapted to average physiological needs (Booth & Mather, 1978).

The success of this quantitative modelling depended on the fact that the physiological after-effects of eating on hunger are dominated by the decelerating rate at which

the stomach passes ordinary food down the digestive tract to the rest of the body (Booth, 1978; Booth & Mather, 1978). The rapid onset of considerable distension in the stomach, the initial rush of nutrients to stimulate receptors in the wall of the small intestine, and metabolism of the very first substrates absorbed, can all contribute to the loss of attractiveness of available foods that constitutes the spontaneous ending of a meal. If the meal is too brief for the postgastric effects to terminate eating, then direct control of the amount eaten can be vested in a learnt conjunction of moderate distension with cues from the foods in the meal that are predictive of aversively reinforcing nutritional after-effects (Booth & Davis, 1973; Booth, Gibson, Toase, & Freeman, 1994; Booth & Grinker, 1993; Booth, Lee, & McAlevey, 1976; Booth, Mather, & Fuller, 1982; cp. Cecil, Francis, & Read, 1998; Gibson & Booth, 2000). Then later, after most of the meal has left the stomach, the rate of gastric emptying decreases and so intestinal stimulation declines and the support of metabolism from absorption also becomes attenuated. Thus all the internal signals again act in concert, but this time to cue a rise in hunger, i.e. an

* Corresponding author.

E-mail address: d.a.booth@bham.ac.uk (D.A. Booth).

increasing probability of a search for another meal. According to this theoretical model, these redundancies among sensory, digestive and metabolic stimulation normally enable some automatic control of the amount eaten at a meal whenever it occurs.

It was noted at an early stage in the development of this general theory of hunger and its satiation that the consumption of a small amount of food during the rapid emptying phase is unlikely to have an appreciable impact on the amount left in the stomach and the strength of intestinal and metabolic signals at the next mealtime (Booth, 1976, 1978, 1980). Therefore a small amount of energy consumed more than about an hour before a meal is unlikely to suppress intake at the next meal and so would add to positive energy balance. This hypothesis was formalised in the prediction that it is particularly fattening to consume even a small amount of energy—such as in or with a drink—between mealtimes or after the usual dessert (Booth, 1988a,b). This formulation was stated within the original use of compensation of intake to measure different types of satiating mechanism (Booth, 1972), contrary to the widespread misunderstanding of satiety as a ‘concept’ like a unitary effect of a nutrient in a meal on subsequent energy intake or appetite ratings (Porrini et al., 1997; Rolls et al., 1991). Recent experimental support for reduced satiating effects of food consumed between meals was obtained by Marmonnier, Chapelot, and Louis-Sylvestre (1999) and related to their view of the mechanisms of hunger at a more detailed metabolic level. The importance of low-calorie drink breaks (Booth, 1988b) in weight control is not predicted by the usual considerations of nutrient balances or energy flows between organs because they ignore the great changes in rate of absorption during the digestive phase.

One of the first tests of the hypothesis that energy intake between meals is particularly fattening was a retrospective interview study of professed dieters recruited on the shopping streets of four towns in the English Midlands (Booth, 1988c; Lewis & Booth, 1986). Respondents were asked if they had ‘cut down on snacks’ during their most recent episode of dieting to lose weight, or subsequently to the time of interview. They also reported current body weight and their weights at the start and finish of dieting last. Cutting down on ‘snacks’ was not related to weight loss maintained since the last episode of dieting. Yet this method was sensitive to a slimming effect of cutting down on fat-rich foods, which is predicted because adipose fat can be deposited from dietary fat without spending energy to synthesise fatty acids, unlike dietary carbohydrate. This failure to associate weight loss with ‘avoiding snacks’ was recently replicated in East Anglia by Conner and Norman (1996).

The research tactic was then changed from using questions formulated by the investigators to using words elicited from people like those to be studied. A list of practices of eating and physical activity was composed from these qualitative data. Several hundred volunteers from

the community were asked to state how often they performed each sort of behaviour, in amongst questions about attitudes including a report of current body weight. These questions were repeated 12–14 months later. The individuals’ habit frequencies were correlated with changes in their reported weight, either relative to personal target weight (Blair, Booth, Lewis, & Wainwright, 1989) or in kilogrammes (Booth, 1996). Cutting down on ‘calories between meals’ or on ‘sweet extras’ was associated with maintenance of loss in weight for 1 year more strongly than any other practice, including cutting back on common categories of foods that are rich in fat.

Such a striking disparity between asking about snacks using that term and asking about energy intake between meals in the respondents’ own words indicates that the term snack may be used ambiguously, at least in England. For example, it is feasible for ‘having a snack’ to refer either to eating some food between meals or to a light meal, as pointed out by Gatenby, Anderson, Walker, Southon, and Mela (1995).

Yet a retrospective comparison of successful and unsuccessful maintenance of lost body weight within the USA showed that avoidance of ‘snacking’ was the one practice that reliably discriminated weight loss from regain (Kayman, Bruvold, & Stern, 1990). Thus, at that time at least, snacking may have referred more exclusively to between-meals eating in the USA than it did in the UK.

Furthermore, the frequencies with which individuals declared that they consumed ‘calories between meals’ and ate ‘sweet extras’ both loaded on the largest factor in principal components analysis (Note 1). This indicates that what is crucial is not only the timing of the intake but also its perceived role in the individual’s hunger management strategy (Dibsdall, Wainwright, Read, & Booth, 1996). To snack may mean to eat something extra in California more consistently than it does in England.

Despite the tests reported by Blair et al. (1989), Booth (1996), and Kayman et al. (1990), Gatenby (1997) claimed that the proposal that “there may be poor compensation for the insertion of additional eating occasions” has “not been empirically tested”. Such assertions are based on a paradoxical disregard for any data not based on so-called quantitative food records — a method that requires the highly invasive and notoriously fallible procedure of the eater weighing each item to be eaten and, even more arbitrarily, the data analyst imposing a definition of a snack as a bout of intake amounting to less than a certain amount of energy, e.g. 375 kJ. On the basis of such chemically conceptualised approaches to dietary assessment (Booth & Platts, 2000), it was originally claimed that higher frequency of eating is associated with lower body weight; however, subsequent studies of considerable size have produced no consistent picture (Bellisle, McDevitt, & Prentice, 1997; Drummond, 1996). Nevertheless, a recent example of supportive data in men — not women — was published

from Scotland (Drummond, Crombie, Cursister, & Kirk, 1998). In any case, measures like frequency of intake ignore differences between times of day and intervals from small to larger amounts of eating and also the eaters' own conceptions of the behaviour at the eating episode.

To gain some direct evidence on the current English usage of terms relating to a snack, the present study combined controlled experimental manipulation with the recording of open-ended non-numerical responses. One of the three topics, 'a snack', 'snacking' and 'snack food', was randomly assigned to each addressee of an unsolicited email message. The same questions were asked about each term, concerning the foods and drinks consumed at the most recent occasion of snack(ing)/food consumption (or at a usual example), its location, whether alone or accompanied, and the times of day of that eating event and of the immediately preceding and following episodes of eating. After assignment of the elicited responses to adequately large conceptual categories, further analysis was quantitative, based on the numbers of people using a word in a category. The sampling of respondents was however socially qualitative, i.e. the experiment was run on a convenience sample of volunteers at the investigators' place of work.

Method

Two sets of questionnaires were designed, one sent first unsolicited, the other sent afterwards only if the respondent agreed.

The first set dealt with 'having a snack', 'snacking' or 'eating snack food(s)', each topic sent to a different person, asking the same questions about the snack term. Respondents were asked to describe the last occasion when they 'had a snack', were 'snacking' or 'ate snack food(s)'. Respondents who professed never to eat in that manner were asked to answer in terms of what they considered to be a typical example. The questions were about what they ate or/and drank, where, with whom, at what time of day, how long after the last eating occasion, how long before the next expected eating occasion and if it was usual; if not, they were asked to give a more usual example, answering those questions again.

The second set of questionnaires asked what the respondents thought about the two snack terms that their first questionnaire had not been about. This questionnaire started with a request to name another eating/drinking occasion which was not of the type that they had been asked about in their first questionnaire. Then they were asked if there was a difference between the snack term that they had first been asked about and a second snack term, and then to answer the same detailed questions for this second term. Finally, the third snack term was elucidated in the same way. The second questionnaire asked about the other two snack terms one way round in half the addressees, while the other half were asked in the opposite sequence.

The answers were all open-ended, in order to avoid influencing the respondents' choice of replies other than by the key term 'having a snack', snacking or 'eating snack food(s)'.

The questionnaires were sent by email to individuals on the campus of the University of Birmingham in August–September 1999 and (to others) in June–July 2001. The email addresses were for members of staff, postgraduate research students and Level 2 undergraduate students of the School of Psychology, and staff of a few other departments of the University. From 761 who received the first questionnaire, a total of 121 people sent answers. They were 62 members of staff and 59 students; 44 of them were male and 77 female; almost all of them were under 35 years old. A total of 86 answered the second questionnaire as well, 41 members of staff and 45 students; 31 were male and 55 female. It was noted that there was a considerable minority of surnames that are more characteristic of continental Europe or southern Asia.

Some respondents gave several examples in some answers or described their usual habits in addition to the last occasion. So the total number of answers was sometimes larger than the number of respondents.

The questionnaires in 1999 and 2001 were virtually identical except for one item concerning the term snack food: a question was added in 2001 about what else the respondents ate or drank with the snack food. For this reason, the answers about drinks were analysed in each year separately.

Foods reported were assigned to one of five categories: Fruit and Vegetables, Bread (including toast, sandwiches, rolls and all savoury things based on flour), Savoury items, Sweet items (like biscuits, cakes, pastries, flapjacks, ice creams, yoghurts) and Chocolate items (Table 1).

Location and Company were divided into two categories: At home and Not at home, and Alone and Not alone. Times of the snack were divided into six periods of the day: Breakfast (from 6 to 10 h); Mid-morning (10–12); Lunch (12–14); Mid-afternoon (14–18); Dinner (18–20); Evening and overnight (20–6).

When respondents answered in words instead of numbers for the timing of the eating, the times were coded as 'x.9'. Thus, the code 7.9 was used when the answer was 'breakfast', 9.9 for 'morning', 10.9 for 'mid-morning', 11.9 for 'late morning', 12.9 for 'lunch time', 13.9 for 'after lunch', 14.9 for 'early afternoon', 15.9 for 'tea time', 'afternoon' or 'mid-afternoon', 16.9 for 'late afternoon', 17.9 for 'early evening', 18.9 for 'dinner time', 19.9 for 'evening', 21.9 for 'late evening', 22.9 for 'late at night' and 23.9 for 'at night' or 'before bed'. For the present analyses, the occasions coded 'x.9' were included with other 'x' times, not with the 'x + 1' times, because the patterning seemed more consistent this way.

A few answers were difficult to code. For example, one respondent wrote that he ate bread and soup 'alone (rest of family had a cup of tea and biscuit)': this was coded as

Table 1
Food and drink items included in conceptual categories

Fruit and vegetables		Bread-containing items		Savoury items		Sweet items		Chocolate items		Drinks	
Type	N	Type	N	Type	N	Type	N	Type	N	Type	N
Banana	12	Toast	13	Crisps	30	Biscuits	16	Chocolate bar	14	Tea	18
Apple	3	Bread	11	Cheese	11	Flapjack	8	Chocolate	10	Coffee	14
Fruit	2	Sandwiches	8	Chips	6	Sweets	7	Kit Kat	7	Cola	12
Nectarine	2	Cereal	3	Crackers	3	Jam	6	Twix	7	Water	10
Orange	2	Sausage rolls	2	Pasta	2	Yoghurt	6	Choc. biscuit	5	Soft drink	3
Clementine	1	Beanburger	1	Pork pie	2	Ice-cream	5	Mars Bar	4	Diet cola	2
Dried apricots	1	Cheese baguette	1	Samosas	2	Cake	3	Choc. Ice	2	Fruit juice	2
Dried fruit	1	Pitta bread	1	Soup	2	Muffin	3	Choc. Minstrels	2	Lucozade	2
Raisins	1	Wholemeal rolls	1	Tortilla dips	2	Pastries	3	Cookie	2	Milkshake	2
Raw vegetables	1			Nuts	1	Honey	2	Cold Nesquik	1	Orange juice	2
				Cheese biscuit	1	Ice lollies	2	Snickers bar	1	Wine	2
				Popadoms & dip	1	Candy bar	1			[Other alcohol]	4
				Fish	1	Cereal bar	1			[Fruit drinks]	4
				Meat filling	1	Crunchie	1			[Carbonated]	4
				Onion rings	1	Cryst'd ginger	1			[Fruit/herb inf'n]	3
				Prawns	1	Butter cookie	1				
				Roast veg plait	1	Doughnut	1				
				Taramasalata	1	Fig bar	1				
				Bhaji	1	Fruit Opal	1				
				Cheese & veg pastry	1	Hula hoops	1				
						Milk ice lolly	1				
						Muesli bar	1				
						Oatcakes	1				
						Scone	1				
						Shortbread	1				
						Sweet biscuit	1				

eating alone. One person gave two different times of the day for snack food: the time first mentioned was recorded. Another said 'throughout the day' for snacking and this was coded as a missing datum, since only one person made any such literal reference to 'grazing'.

Data from just the first questionnaire were used in primary analysis. Only the first example given was entered into analysis, even if it was called unusual. Thus, each respondent appears only once in the main analyses.

Some subsidiary analyses were conducted on data from both the first and second questionnaires (i.e. including one person's answers concerning all three snack terms), but using only those respondents who gave a different answer for each term. It should be noted that these data are not all strictly independent, i.e. each datum from a different person.

Frequencies were compared using the χ^2 test in SPSS 10.0 for Windows; $p < 0.05$ was considered to be statistically significant. Sets of answers were tested between years, among the snack terms and between the genders, in order to see if it was possible to merge data to analyse greater numbers. The only noticeable differences were between 1999 and 2001 but data from the two years were always merged because the differences were not significant ($p > 0.05$).

Results

Never snacking

No respondent in either year denied eating snack food or having a snack. However, in 1999 only, one woman and two men denied ever snacking, $\chi^2(2) = 5.1$, $p = 0.105$ among the three snack terms.

Unusual examples

For each example that respondents gave of a snack, snack food or snacking, they were asked if it was usual for them. Nobody gave an example of snack food that s/he regarded as unusual. Only small numbers of the examples of a snack and snacking were stated to be unusual. So these data were merged, not only across years and genders but also between savouries or bread-based items and between sweet or chocolate-containing items.

The greatest variation among the three snack terms in what was regarded as unusual was found for the broad category of bread and savoury items, although there was only an approach to statistical significance in this size of sample, $\chi^2(2) = 5.7$, $p = 0.07$: bread or savoury items — a category dominated by packets of potato crisps (Table 1) — were

regarded as unusual least often for snack food (0%, i.e. never) and most often for a snack (25%).

A subsidiary analysis including the same people's responses to the second questionnaire gave results consistent with the above. The greater amount of data brought one effect virtually to a significant level: savouries were reported by more people to be eaten at home as snackfoods than as a snack or in snacking, $\chi^2(4) = 9.7, p = 0.051$.

Non-snack eating/drinking occasion

Respondents were asked to name an eating and/or drinking occasion which was not 'having a snack', snacking or 'eating snack food' (which 'snack' term they had been asked about). Nearly everybody wrote 'meal' or 'a meal'.

Foods eaten

The variation among the three snack terms in the frequencies of reports by both genders of all categories of food in the first questionnaire in both years did not approach significance, $\chi^2(8) = 10.3, p > 0.27$. Nevertheless, the across-genders uses of some particular categories of foods did seem to vary among the terms.

Sweet items were reportedly eaten by the greatest number of people when snacking (Fig. 1), overall $\chi^2(2) = 8.4, p < 0.02$. The largest such difference was between snacking and snack food, $\chi^2(1) = 5.8, p < 0.015$: this may be because a packet of potato crisps is a common snack food (Table 1). Yet a pack of crisps is not so commonly consumed when snacking in this culture, $\chi^2(1) = 2.8, p = 0.093$.

Bread may be eaten more often as a snack. Although this effect was not reliable in replies to the first set of questions, significance was approached by including answers from the same people's second questionnaire, $\chi^2(2) = 3.1, p = 0.062$.

The genders appear to differ in the patterns of foods eaten (Fig. 1); however, these differences were seldom reliable in this sample, even when data from all three snack terms were combined. Perhaps surprisingly, men and women showed similar habits for sweet items, $\chi^2(2) = 1.8, p = 0.53$, and for snacking on the widely craved food, chocolate (Hetherington & MacDiarmid, 1993). No gender difference appeared either when sweet and chocolate items were combined.

The usage of fruit and vegetables reported under these snack terms was too low for reliable analysis. For usage of bread, differences with gender across the three snack terms were very marginal, $\chi^2(2) = 4.0, p < 0.15$.

However, the gender difference across snack terms was statistically significant for the savoury category of foods, $\chi^2(2) = 8.2, p < 0.02$. This effect was largely attributable to men giving savoury items more often as examples of snack food than of what was eaten in a snack, whereas the frequencies in women were the other way around (Fig. 1), $\chi^2(1) = 7.2, p < 0.02$. This gender difference replicated among the three terms overall when the categories of savouries and of bread-containing items were combined, $\chi^2(2) = 6.6, p < 0.05$, with the biggest difference being more men eating savouries or bread as snack foods, though this time compared to those snacking, with women doing the opposite, $\chi^2(1) = 5.8, p < 0.03$.

When responses to the first set of questions by each gender were considered separately, only the men showed reliable overall variation among the three snack terms in their usage of foods in the five categories, $\chi^2(8) = 21.2, p < 0.01$. Thus the gender difference in food narratives elicited by the snack terms arose largely from the men in this sample. More detailed inspection of the data from women exposed very few tendencies to vary among the snack terms. The clearest example was that fruit and vegetables may be

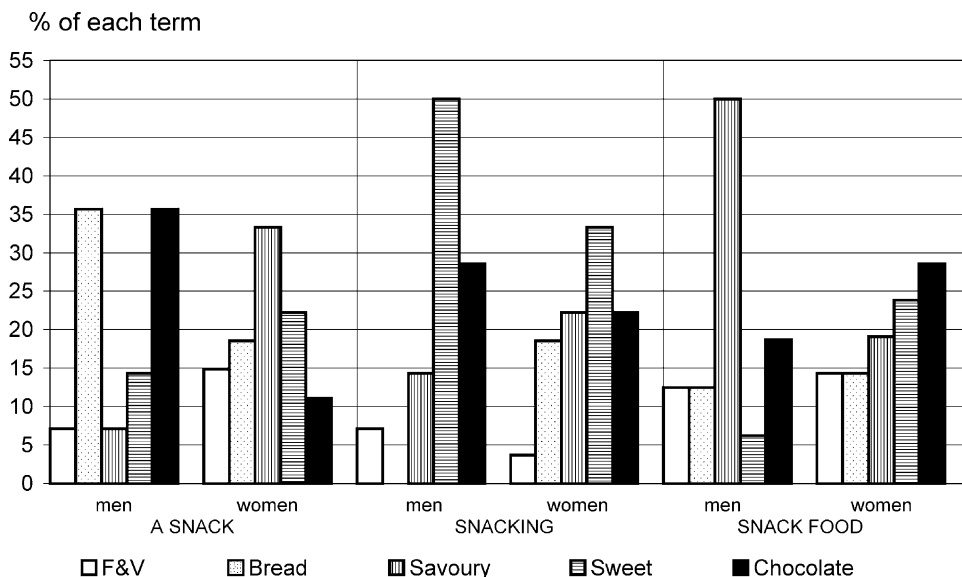


Fig. 1. Frequencies of food categories elicited from each gender by a snack term in the first questionnaire.

eaten less when snacking, $\chi^2(4) = 7.7$, $p < 0.05$. Further work might show that, for these women in England, savoury items were more characteristic of a snack, while chocolate items served more as snack foods (Fig. 1).

Consistently with the gender differences above, the three snack terms varied significantly in the numbers of men from whom they elicited reports of eating three of the five categories of food: bread-containing items, savoury items, and sweet items (overall $p < 0.03$ in each case). Reliably more men reported eating bread in a snack than those snacking, $\chi^2(1) = 5.0$, $p < 0.03$. In contrast, more men reported eating savoury items as snack food than in a snack, $\chi^2(1) = 7.5$, $p < 0.005$, and than when snacking, $\chi^2(1) = 5.2$, $p < 0.02$. More men reported snacking on sweet items than those using them for snack foods, $\chi^2(1) = 5.2$, $p = 0.02$.

This variation among the terms in what they meant to men may be attributable to a difference between the two wider categories of bread or savouries and chocolate or sweet items, $\chi^2(2) = 8.6$, $p < 0.02$. However, the actual effects lay within each of these broad categories of food, as described above.

Location of eating

There may have been fewer people who ate snack food at home (44%) than out of the home (56%), i.e. at work, travelling or out-of-doors, relative to a more even split for having a snack and snacking (both 51% at home and 49% out). However, overall analyses among the three categories of locations showed no significant variation among snack terms.

Across the snack terms, there may have been fewer people eating out-of-doors than at home and at work taken together. A snack may be taken indifferently indoors or out-of-doors, whereas snacking may be done more indoors. This was marginally so for women, taking together at home and at work, $\chi^2(1) = 2.1$, $p = 0.10$. Indeed, the difference in numbers of women between home and out-of-doors for a snack was numerically smaller than that for snacking, $\chi^2(1) = 3.5$, $p < 0.09$, as also between work and out-of-doors, $\chi^2(1) = 2.9$, $p < 0.12$.

Inspection of the home/out difference for specific food categories (Fig. 2) indicates that there were some differences in behaviour between the locations, especially in men, as there were significant effects both in overall analysis, $\chi^2(4) = 11.2$, $p < 0.03$, and also for men, $\chi^2(4) = 16.8$, $p < 0.001$. The major contrast was that more people reported eating bread-containing items at home as a snack and fewer as snack food, whereas these terms had the opposite effect for bread eaten outside, $\chi^2(2) = 7.3$, $p < 0.02$.

Categories of food elicited for locations differed significantly between snack food and the two other terms combined, $\chi^2(1) = 3.6$, $p < 0.05$. The categories of snack food that more respondents ate away from home were chocolate items, fruit and vegetables, and bread-containing items, whereas snack food eaten at home was mainly

savouries, $\chi^2(1) = 6.2$, $p < 0.01$. This was not an intensification of a general pattern in the case of snack food because, when responses to the three snack terms were combined, the only significant effect was more reports of bread than chocolate at home, with the opposite out of the home, $\chi^2(1) = 7.0$, $p < 0.01$.

Eating in company

In this sample of responses to snack terms, more people reported eating alone than in company, $\chi^2(1) = 4.0$, $p < 0.05$. No significant variations were found among terms, foods, timings or locations, in interaction with gender or within either gender. The three snack terms may however vary in the proportion of women reporting eating alone, $\chi^2(2) = 4.4$, $p = 0.1$: the nearest approach to statistical significance in the responses from women was a greater number of those responding to having a snack alone than among those responding to snacking, $\chi^2(1) = 3.1$, $p < 0.06$.

Timing of a snack, snacking and eating snack food

For each snack term in each gender, there were far fewer people reporting eating at conventional mealtimes than between mealtimes (Fig. 3), $p < 0.002$ for each of the six comparisons.

These contrasts between mealtimes and periods between meals are weakest between supper and the later evening (Fig. 3). This is presumably because the timing of the evening meal varied considerably in this population—and indeed whether the evening had one or two eating occasions. Because of this, it was difficult to decide on a period that included all teas, dinners and suppers and still left a substantial part of the evening afterwards. Considering only the snacks taken before 18:00 h, the contrast with the later evening was greatest for snacking than for having a snack, $\chi^2(1) = 4.1$, $p < 0.03$, or eating snack food, $\chi^2(1) = 4.0$, $p < 0.02$, as might be predicted.

The numbers of people reporting having a snack varied significantly among the three mealtimes, $\chi^2(2) = 5.4$, $p < 0.05$, with the greatest number of people reporting a snack at lunchtime (noon to 14:00). In addition, marginally more respondents reported having a snack at lunch than snacking then, $\chi^2(1) = 3.3$, $p = 0.055$. When data were included from respondents to the second email, this contrast became significant, $\chi^2(1) = 5.1$, $p < 0.02$.

Timing of previous and subsequent eating occasions

More of the reports of eating occasions preceding or following the eating thought of under a snack term may have been at mealtimes than between meals. However, this contrast—at least for the next eating occasion—was less for a snack, $\chi^2(1) = 2.3$, $p < 0.13$, than for snacking, $\chi^2(1) = 15.8$, $p < 0.001$, or snack food, $\chi^2(1) = 5.1$, $p < 0.02$. This

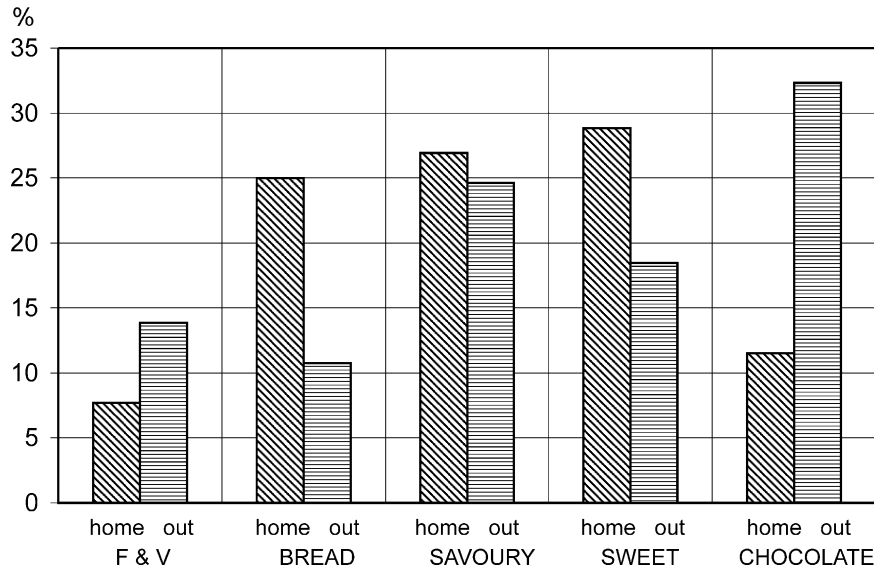


Fig. 2. Locations of eating: /// at home; = = out of the home (at work, travelling, out-of-doors).

is to be expected if a snack is more likely to be eaten at a mealtime.

This pattern replicated in female respondents for just the previous eating occasion: a snack, $\chi^2(1) = 5.8, p < 0.02$; snacking, $\chi^2(1) = 22.2, p < 0.001$; snack food, $\chi^2(1) = 9.9, p < 0.001$. The focus on mealtimes was reliable for the subsequent eating occasion in men after eating snack food, $\chi^2(1) = 4.8, p < 0.03$, and in women after snacking, $\chi^2(1) = 10.7, p \leq 0.001$.

Also as to be expected if snacking is between meals, more of the occasions preceding snack food than snacking may have been during the previous evening, $\chi^2(1) = 1.5, p < 0.15$. The evening meal was reported to precede snacking by marginally more respondents than those reporting other times of day, $\chi^2(2) = 5.5, p < 0.07$.

Drinks

A question explicitly about drinks was added to the snack food condition in 2001. The total number of respondents who

reported drinks was greater in 2001 than in 1999, $\chi^2(1) = 5.9, p < 0.01$. However, such a difference could have arisen from changes in behaviour since 1999, rather than from the change in question about snack food. So 1999 was compared with 2001 for the relative numbers reporting drinks in response to questions on a snack, snacking and snack food. There was no numerical difference in women or after merging the genders but more men reported drinks with snack food in 2001 than in 1999, $\chi^2(1) = 7.1, p < 0.005$.

Neither men nor women mentioning a drink in 1999 reported a type of food that was not also reported by those in 2001 who reported a drink in answer to the explicit questioning. Additional types of food were reported by the greater number in 2001, as was a wider variety of times of eating.

The ranges of foods and times of eating were similar among those who reported a drink to those who did not, except for a snack, in which men included chocolate when they did not drink but not when they did drink, $\chi^2(4) = 9.1, p < 0.05$.

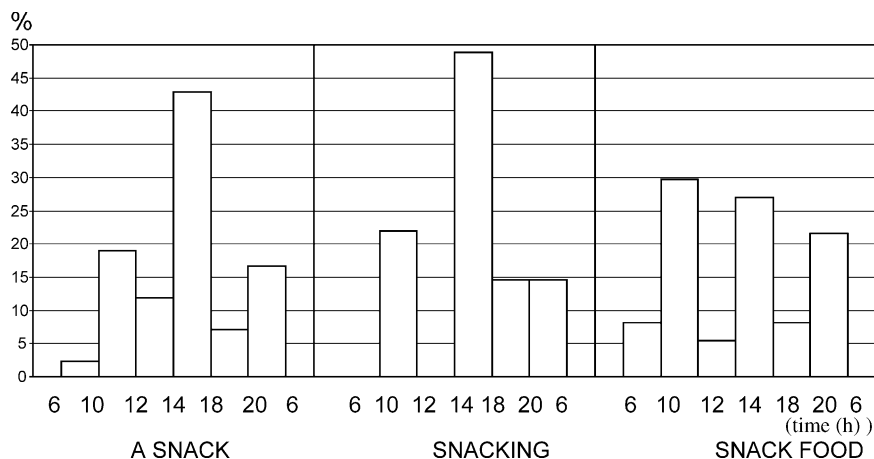


Fig. 3. Timings (on 24 h clock) of the eating characterised by each snack term.

There was no significant difference in category of eating location or eating alone vs. in company between people who reported a drink and people who did not. The greatest difference was for location in snacking for women, who may have snacked more out when they did not drink, $\chi^2(2) = 4.3, p = 0.097$. For eating alone vs. in company, all p -values were greater than 0.21.

Discussion

There were conceptually consistent differences in usage among the three terms, a snack, snacking and snackfood, although the variations were not generally very large. The association with eating away from mealtimes was least strong for a snack. Eating around lunchtime was particularly liable to be called a snack. This supports the suspicion that, in England at least, a snack may be a light meal at a conventional eating time. Of course, no generalisation is possible on the basis of results from such a biased sample of addressees—mainly graduate students of psychology from a single department. Nevertheless the findings clearly illustrate verbal behaviour consistent with the hypotheses and so justify greater caution in use of the idea of a snack in research in the UK and indeed elsewhere.

It should be noted that it may well be the portability and stability of snackfoods as packet foods that makes them more consistently eaten between mealtimes, rather than by an association with the idea of snacking as such. A further problem with the term snacking is that this verb form could carry a connotation of repetition, whereas a snack is a single event and eating a snackfood need not imply any other aspect of ingestive behaviour.

We suggest therefore that it is unwise to ask questions using the root word snack during research investigations in the UK. Ahead of investigating what respondents mean, the word might better be avoided in research in other countries too. Use of the verb form in 'How often do you snack?' might in itself evoke responses divergent with the replies to 'When did you last have a snack?'—let alone questions about 'eating snackfoods'. Then, even if the noun form, snacks, is studied entirely separately from the notion of snacking, different people even in one locality may refer to different amounts, types and timings of food choice as a Snack, or indeed as Snacking.

Furthermore, use of this term risks confusion in the research community. Indeed, it is quite arbitrary to define a Snack as an occasion of food consumption not at a conventional Mealtime, or as an occasion when the amount of food contains less than a certain amount of energy decided without any firm empirical or theoretical foundation. When food choices are to be characterised by timing or amount, tentatively labelled categories should be avoided.

No less importantly, these results illustrate potentially serious dangers in using the term snack in any of its forms

within advice to individual clients, educational messages broadcast to the public or the professional dissemination of information about dietary practices. In any case, such advice should be directed at eating patterns for which there is specific evidence of nutritional harm or benefit in specifiable circumstances. Attempts to define snacks independently of what people say about their eating patterns neglect this fundamental principle and have led to great confusion in the epidemiology of nutrition and obesity (Gatenby, 1997).

In this recent sample from the UK (dominated by graduate students), we did not replicate the earlier observation by Seligson, Krummel, and Aggar (1994) that chocolate was less often eaten at meals than at snacks. It is possible that in this country, or among the groups sampled, chocolate-coated starch wafers and sugar creams are commonly used as dessert items in light meals that are based on ready-to-eat items.

Since snackfoods are portable and the items reported for snacking are pleurably savoury or sweet, the present results may indicate an important way of increasing intake of fruit and vegetables. The infrequent reporting of these nutritious foods under snack terms might be improved by encouraging easily carried whole fruit or small packs of salad vegetables to be eaten more often between meals as well as at meals. A particular merit of this strategy is that the water content of fruit and salad vegetables may refresh the mouth more saliently than dry packet foods.

To conclude, these data are consistent with the view that the connections between food and health are not merely chemical but also include irreducibly cognitive-behavioural aspects (Booth, 1988c, 1999; Booth & Platts, 2000). If the eater's own characterisation of an episode as the consumption of a 'sweet extra' is of the essence of its threat to weight control (Blair et al., 1989, Note 1; Booth, 1996), then records of the weights of foods eaten can never by themselves be used to pick out the most fattening habits, e.g. by adjusting the criteria for energy content that distinguish a snack from a meal. Even invoking certain periods of the day as mealtimes for reduction of data from a timed record may not capture all of the eater's performance in discriminating the cutting of calories 'between meals' from cutting down on calories 'in meals' (Blair et al., 1989). Proper understanding of a culture's narratives of eating may be indispensable, not just to the implementation of dietary advice based on nutrient intake epidemiology but also to re-development of the scientific basis of food and nutrition policy in a nutritional epidemiology that incorporates knowledge derived from experimental and social psychology (Booth, 1988c, 2002).

References

- Bellisle, F., McDevitt, R., & Prentice, A. M. (1997). Meal frequency and energy balance. *British Journal of Nutrition*, 77(Supplement 1), S57–S70.

- Blair, A. J., Booth, D. A., Lewis, V. J., & Wainwright, C. J. (1989). The relative success of official and informal weight reduction techniques. *Psychology and Health*, 3, 195–206.
- Booth, D. A. (1972). Satiety and behavioral caloric compensation following intragastric glucose loads in the rat. *Journal of Comparative and Physiological Psychology*, 78, 412–432.
- Booth, D. A. (1976). Approaches to feeding control. In T. Silverstone (Ed.), *Appetite and food intake* (pp. 417–478). West Berlin: Abakon Verlagsgesellschaft/Dahlem Konferenzen.
- Booth, D. A. (1978). Prediction of feeding behaviour from energy flows in the rat. In D. A. Booth (Ed.), *Hunger models: computable theory of feeding control* (pp. 227–278). London: Academic Press.
- Booth, D. A. (1980). Acquired behavior controlling energy intake and output. In A. J. Stunkard (Ed.), *Obesity* (pp. 101–143). Philadelphia, PA: W.B. Saunders.
- Booth, D. A. (1988a). A simulation model of psychobiosocial theory of human food-intake controls. *International Journal of Vitamin and Nutrition Research*, 58, 55–69.
- Booth, D. A. (1988b). Mechanisms from models – actual effects from real life: the zero-calorie drink-break option. *Appetite*, 11(Supplement), 94–102.
- Booth, D. A. (1988c). Relationships of diet to health: the behavioral research gaps. In C. H. Manley, & R. E. Morse (Eds.), *Healthy eating—a scientific perspective* (pp. 39–76). Wheaton, IL: Allured.
- Booth, D. A. (1996). Measurement of hunger and satiety for long-term weight control. In A. Angel, G. H. Anderson, C. Bouchard, D. Lau, L. Leiter, & R. Mendelson (Eds.), (vol. 7) (pp. 355–358). *Progress in obesity research*. London: John Libbey.
- Booth, D. A. (1999). Evidence-based reduction of obesity: identification of a subculture's least fattening eating patterns. *Appetite*, 32, 80–85.
- Booth, D. A. (2002). Nutrients epidemiology or healthy dietary practices? *Appetite*, 38, 69–70.
- Booth, D. A., & Davis, J. D. (1973). Gastrointestinal factors in the acquisition of oral sensory control of satiation. *Physiology and Behavior*, 11, 2329.
- Booth, D. A., Gibson, E. L., Toase, A.-M., & Freeman, R. P. J. (1994). Small objects of desire: the recognition of foods and drinks and its neural mechanisms. In C. R. Legg, & D. A. Booth (Eds.), *Appetite: neural and behavioural bases* (pp. 98–126). Oxford: Oxford University Press.
- Booth, D. A., & Grinker, J. A. (1993). Learned control of meal size in spontaneously obese and nonobese bonnet macaque monkeys. *Physiology and Behavior*, 53, 51–57.
- Booth, D. A., Lee, M., & McAlevey, C. (1976). Acquired sensory control of satiation in man. *British Journal of Psychology*, 67, 137–147.
- Booth, D. A., & Mather, P. (1978). Prototype model of human feeding, growth and obesity. In D. A. Booth (Ed.), *Hunger models: computable theory of feeding control* (pp. 279–322). London: Academic Press.
- Booth, D. A., Mather, P., & Fuller, J. (1982). Starch content of ordinary foods associatively conditions human appetite and satiation, indexed by intake and eating pleasantness of starchpaired flavours. *Appetite*, 3, 163–184.
- Booth, D. A., & Platts, R. G. (2000). Tool for assessing and reducing an individuals fat intake. *Appetite*, 34, 107–108.
- Booth, D. A., Toates, F. M., & Platt, S. V. (1976). Control system for hunger and its implications in animals and man. In D. Novin, W. Wyrwicka, & G. A. Bray (Eds.), *Hunger: basic mechanisms and clinical implications* (pp. 127–142). New York: Raven Press.
- Cecil, J. E., Francis, J., & Read, N. W. (1998). Relative contributions of intestinal, gastric and oro-sensory influences and information to changes in appetite induced by the same liquid meal. *Appetite*, 31, 377–390.
- Conner, M. T., & Norman, P. (1996). Body weight and shape control: examining component behaviours. *Appetite*, 27, 135–150.
- Dibsdall, L. A., Wainwright, C. J., Read, N. W., & Booth, D. A. (1996). How fats and carbohydrates in familiar foods contribute to everyday satiety by their sensory and physiological actions. *British Food Journal*, 99, 142–147.
- Drummond, S. E. (1996). A critique of the effects of snacking on body weight status. *European Journal of Clinical Nutrition*, 50, 779–783.
- Drummond, S. E., Crombie, S. E., Cursister, M. C., & Kirk, T. R. (1998). Evidence that eating frequency is inversely related to body weight status in male, but not female, non-obese adults reporting valid dietary intakes. *International Journal of Obesity*, 22, 105–112.
- Gatenby, S. J. (1997). Eating frequency: methodological and dietary aspects. *British Journal of Nutrition*, 77(Supplement 1), S7–S20.
- Gatenby, S. J., Anderson, A. O., Walker, A. D., Southon, S., & Mela, D. J. (1995). Meals and snacks: implications for eating patterns in adults. *Appetite*, 24, 292.
- Gibson, E. L., & Booth, D. A. (2000). Food-conditioned odour rejection in the late stages of the meal, mediating learnt control of meal volume by after-effects of food consumption. *Appetite*, 34, 295–303.
- Hetherington, M. M., & MacDiarmid, J. I. (1993). Chocolate addiction: a preliminary study of its description and its relationship to problem eating. *Appetite*, 21, 233–246.
- Kayman, S., Bruvold, W., & Stern, J. S. (1990). Maintenance and relapse after weight loss in women: behavioral aspects. *American Journal of Clinical Nutrition*, 52, 800–807.
- Lewis, V. J., & Booth, D. A. (1986). Causal influences within an individuals dieting thoughts, feelings and behaviour. In J. M. Diehl, & C. Leitzmann (Eds.), *Measurement and determinants of food habits and food preferences* (pp. 187–208). Wageningen: Department of Human Nutrition, Agricultural University.
- Marmonnier, C., Chapelot, D., & Louis-Sylvestre, J. (1999). Metabolic and behavioral consequences of a snack consumed in a satiety state. *American Journal of Clinical Nutrition*, 70, 854–866.
- Porrini, M., Santangelo, A., Crovetti, R., Riso, P., Treostolin, G., & Blundell, J. E. (1997). Weight, protein, fat, and timing of preloads affect food intake. *Physiology and Behavior*, 62, 563–570.
- Rolls, B. J., Kin, S., McNelis, A. L., Fischman, M. W., Foltin, R. W., & Moran, T. H. (1991). Time course of effects of preloads high in fat or carbohydrate on food intake and hunger in humans. *American Journal of Physiology*, 260, R756–R763.
- Seligson, F. H., Krummel, D. A., & Agpar, J. L. (1994). Patterns of chocolate consumption. *American Journal of Clinical Nutrition*, 60, 1060S–1064S.

Reference note

1. Blair, A. J., Lewis, V. J., Booth, D. A. (1990). *Self-help dieters behaviour that best maintains reduction in overweight*. Unpublished manuscript. School of Psychology, University of Birmingham, UK.