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ELDERLY PEOPLES' MEALS. A COMPARATIVE STUDY BETWEEN ELDERLY LIVING IN A NURSING HOME AND FRAIL, SELF-MANAGING ELDERLY

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Abstract: Background: Sweden is one of few countries that have specific recommendations regarding mealtime habits. The importance of mealtime habits for health outcome is inadequately studied in elderly subjects. Objective: The aim of this study was to investigate the distribution of the daily meals/energy intake; the number of eating episodes per day and subjectively estimated meal-dependent variables (appetite, motivation to eat, sense of taste and sense of smell) and compare the results of elderly living in a nursing home with frail, self-managing elderly living at home. Design: Explorative study. All analyses of energy intake were based on food records; weighed in the nursing home and estimated in the frail, self-managing elderly. Participants or contact persons estimated the subjective variables using a 10-point VAS scale. Results: On average there were 4-5 daily eating episodes in both groups. The eating episodes were much more widespread over the day in the self-managing elderly, and their length of fasting at night was significantly shorter. The subjects´ estimated appetite and sense of smell was reduced in about 30-40% in both groups. Sense of taste was reduced in 40 % of the males and 10-20 % of the females. Energy intake was similar in both groups, 25 kcal/kg body weight/day, with more than a three-fold variation among individual subjects. Energy intake/kg body weight correlated with a shorter length of fasting at night in the nursing home residents, however, did not correlate with ADL, number of eating episodes per day, appetite, motivation to eat, or senses of taste or smell. Conclusion: The self-managing elderly had more widespread eating episodes than the elderly in the nursing home, indicating that self-managing elderly exhibit larger variations in food intake preferences, however, without affecting mean energy intake. The lack of correlation between energy intake and estimated appetite, taste and smell is in line with previous findings in elderly.

Key words: Elderly, nursing home, self-managing elderly, meal frequency, mealtime habits, eating episodes, visual analogue scale, appetite, motivation to eat, sense of taste, sense of smell, energy intake.

Introduction

Sweden is one of few countries that have specific national recommendations regarding mealtime habits. In a recent study a questionnaire was sent to 21 countries, and only five reported that they had some recommendations regarding mealtime habits: Germany, Greece, Poland, the USA, and Japan (1), but none as specific as in Sweden. The Swedish Nutrition Recommendations, SNR, (2) recommend that the intake of energy and nutrients should be spread over the day for all ages, i.e. with breakfast (20-25 percent of total daily energy intake, E%), lunch (25-35 E%) and dinner (25-35 E%) with additional two or three in-between meals. Furthermore, SNR emphasizes that it is desirable that mealtime habits are regular and enough time should be allowed to eat in peace and quiet. For the elderly, the Swedish National Food Administration recommends that the length of fasting at night should not be longer than 10-11 hours (3).

The number of daily meals has been shown to increase when elderly subjects living alone are hospitalised (4). An increased number of daily meals have been shown to increase the energy intake (5) as well as not influence the energy intake (6). The three traditional meals (breakfast, lunch and dinner) contain the bulk of daily energy intake in the elderly (7, 8). Snacks and in-between meals may enhance energy intake (9), but these must be of a good nutritional quality in order to increase nutrient intake (10, 11), as many served in-between meal beverages are high in sugar and low in nutrients (12).

Good mealtime habits have been correlated with good health (1, 13). For most people the mealtime habits and meal patterns are stable and serve to structure the day. In spite of this, the impact of elderly people´s mealtime habits is inadequately studied. It has been hypothesised that mealtime habits may influence food choices (6), energy intake, body fat content and body weight (14). How meals are distributed over the day may also affect nutrient induced thermogenesis as well the metabolism of fats and carbohydrates by e.g., circadian rhythms of hormone release (15). Although chronobiology and food intake have not been studied in the elderly, it is likely that circadian rhythms are also of importance in this age group.

Currently there is no accepted standardized classification of meals. Several meal classifications have been proposed including time of consumption (5, 6, 11), self reported classification (5, 11, 13, 14), amount of food intake (16), amount of energy/nutrients/water-intake (17) and quality of food/provisions (4, 6, 18). In this study we chose to use a variant of the time-of-consumption classification method counting eating episodes on an hourly basis, to avoid subjective terms such as 'meal' or 'snack', because such terms may have different implications in different individuals.

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Both senses of taste and smell decrease with ageing (19), but as age increases, smell deficits may present a more serious problem than do taste deficits (20). de Jong et al. (19) found that energy intake and body mass index (BMI) did not correlate with any sensory outcome in either independently living elderly or elders living in a senior home.

In Sweden there is a strong relation between on the one hand type of living for elderly people (e.g. institution versus independent living) and on the other hand various combinations of comorbidity and/or injuries with accompanying functional impairments. Such factors are well known to influence various meal and food-intake related variables and therefore consitute a high nutritional risk situation. Thus, there are reasons to hypothesize differences in such food-intake related variables between elderly in various types of living.

The aim of the present study was to investigate elderly people living in a nursing home as well as frail, self-managing elderly living at home regarding

- distribution of daily meals
- number of eating episodes per day including length of fasting at night
- four subjectively estimated meal-dependent variables (appetite, motivation to eat, sense of taste and sense of smell)
- energy intake

and analyze if there were any differences between the two groups.

Material

Elderly living in a nursing home

This group included all 76 elderly residents (15 men, 61 women) with multiple diagnoses living in a nursing home in Sundbyberg, a suburb of Stockholm, Sweden. Breakfast was served at 8 a.m., lunch at 11:45 a.m., coffee/tea with buns and cakes at 1:30 p.m., dinner at 4 p.m. and coffee/tea and sandwich at 5:30 p.m. Some of the residents also ate something later at night. On request the residents could be served in-between meals. All examinations took place at the nursing home.

Self-managing elderly

This group included 29 frail, elderly subjects (11 men, 18 women) participating in an ongoing treatment study regarding nutrition state and physical activity (work in progress). These participants were recruited from a questionnaire sent to all elderly persons (>75 years), in Solna, a suburb of Stockholm. Suitable candidates were then subjected to a standardized telephone interview for inclusion criteria of a) body mass index <20 kg/m2 and/or reduction of body weight >5% the last year and b) reduced physical activity (21). All subjects were living at home, with various degrees of home services. Examinations took place at our research centre completed by one home-visit by a dietician.

The reason for selecting these two groups is that we wanted to compare two frail elderly populations with different types of living (institution vs. independent), since both these groups consume much municipality-resources and are considered to be at high nutritional risk.

All individuals signed an informed consent to participate in the study. Ethical approval was obtained from the research ethics committee at the Karolinska Institute in Stockholm.

Methods

Body weight and height

The patients were weighed, dressed in underwear, to the nearest 0.1 kg on a digital chair scale (UMEDICO SV-600, Rosersberg, Sweden). For most residents, height was measured to the nearest 0.5 centimetre in the standing position using a stadiometer. For a few residents at the nursing home (unable to stand even with support due to e.g. contractures of muscles and joints in the extremities) height was approximated by adding the measurements of head-shoulder, shoulder-hip, hip-knee, and knee-heel.

Energy intake

In the nursing home, dietary intake was measured on five consecutive weekdays (excluding weekends) by a weighed food record, made by a nutritionist in collaboration with the staff as previously described (22). In the group of frail, self-managing elderly, a four-day estimated food record was used to collect dietary data from four consecutive weekdays including either Saturday or Sunday, according to instructions by a dietician. The amounts of food were estimated using household standards. A home-visit was made (by a dietician) to all self-managing elderly to assure that correct household standards were used and to discuss the food record in detail with each resident.

The data were coded in terms of the household standards and weights in “MATs den flexible” (Rudans Lättdata, Västerås, Sweden) and the database used was PC-kost (The Swedish National Food Administration), which contains about 50 different nutrients.

Eating episodes

In this study an “eating episode” was classified in the following way: every dietary intake, food and/or drink, which provided energy and that was eaten during the same hour. To show the distribution of daily energy intake in the two different groups of elderly, all individual eating episodes were analyzed as mean energy-intake during each hour. The length of fasting at night was defined as the time between the last eating episode in the evening and the first eating episode in the following morning.

Subjective variables

Four variables, i.e. appetite, motivation to eat, sense of taste and sense of smell, were estimated in each individual using a 10-point Visual Analogue Scale (VAS) from 1 (much reduced)

to 10 (normal). About 80% of the subjects were able to estimate the VAS-scores directly. If the elderly subjects were not able to score themselves, the examiner interpreted the comments from contact persons on the VAS, which was the case in about 10% of the participants. 10% were incapable in estimating the VAS-score. All VAS-estimates were then collected in three categories; "normal" (8-10), "slightly reduced" (4-7) and "much reduced" (1-3).

Activities of daily living (ADL)

ADL was measured by a physiotherapist according to the Katz Index (23, 24) and classified from A to G, where A indicated total independence and G total dependence.

Statistical analysis

Ranks were assigned to the ordered categorical subjective variables of appetite, motivation to eat, sense of smell and taste as well as ADL, and to the continuous variables of length of fasting at night, BMI and energy intake/kg body weight (BW). Spearman correlation coefficients based on ranks were calculated for the two groups separately. This resulted in a large number of ties when correlation coefficients and p-values were calculated by standard procedures; thus they may not be valid. To assure that the calculated p-values were correct under these circumstances a Monte Carlo simulation method was used to simulate a large number of possible outcomes. Comparing these possible outcomes with the observed outcomes gives exact p-values for the correlations presented. The variables of age, BMI, ADL, number of eating episodes, energy intake/kg BW and length of fasting at night were analysed for differences in medians using the Wilcoxon rank-sum test. The effect of gender and type of living on the four subjective variables appetite, motivation to eat, taste and smell were investigated in 2 by 2 tables using chi-square tests. The statistical software, SAS System for Windows V8, was used for calculations.

Results

For group characteristics and comparison between the groups, see table 1. In the nursing-home population there were 80 % women compared to 62 % in the self-managing group. The general Swedish population in this age group (67 and older) consists of 58 % women.

Table 1
Characteristics of the two groups with significant differences between the groups indicated (Wilcoxon test).

	Self-managing	Nursing home	p-value
Number of residents	29	76	
Age (years)[1]	81.4 (75-91)	85.2 (67-103)	NS
ADL (Katz score)[2]	A (A-C)	D (A-G)	<0.001
BMI (kg/m^2)[1]	21.3 (15.4-30.7)	23.7 (14.6-42.2)	<0.05
Body fat (%)[1]	25.6 (11-38)	28.0 (14-42)	NS
Number of eating episodes[1]	4.2 (2-10)	4.7 (2-8)	<0.01
Energy intake/kg BW (kcal/kg/d)[1]	26.0 (14.7-46.2)	25.4 (12.5-42.1)	NS
Length of fasting at night (hours)[1]	13.0 (10-17)	14.5 (11-18)	<0.001

BW = body weight; [1] mean (range), [2] median (range)

Energy intake

The total daily energy intake was 25-26 kcal/kg BW for elderly people in both types of living (table 1). There was more than a three-fold variation in body-weight related energy intake among individuals in both groups. Table 2 shows that there was a significant negative correlation ($p<0.05$) between energy intake/kg BW and the length of fasting at night in the nursing home, but not among the self-managing elderly. The daily energy intake/kg BW was not correlated to ADL or the number of eating episodes in either of the groups (table 2).

Table 2
Comparison between different variables in the two groups with significant correlations indicated (Spearman's rang correlation test).

Variable 1	Variable 2	Self-managing n=29 r_s=	Nursing home n=76 r_s=
Appetite	Motivation to eat	0.66***	0.77***
Nh n=65, Sm n=28	Energy intake/kg BW	-0.30	-0.02
Motivation to eat	Energy intake/kg BW	-0.31	0.06
Nh n=62			
Sense of taste	Sense of smell	0.75***	0.87***
Nh n=59	Appetite	0.37	0.45***
	Motivation to eat	0.29	0.54***
	Energy intake/kg BW	-0.15	-0.05
Sense of smell	Appetite	0.28	0.33**
Nh n=58	Motivation to eat	0.25	0.37**
	Energy intake/kg BW	0.16	-0.01
Number of eating	Length of fasting at night	-0.73***	-0.56***
episodes	BMI	0.25	0.19
	Energy intake/kg BW	0.22	0.11
Energy intake/kg BW	ADL	-0.03	0.07
	Length of fasting at night	-0.11	-0.23*

BW = body weight; Nh = elderly persons in nursing home; Sm = self-managing elderly persons; *p=<0,05 **p=<0,01 ***p=<0,001

Distribution of energy intake

Figure 1b shows that men and women in the nursing home had a similar distribution of daily energy intake, and almost 100% of these residents ate at the defined eating time points (8 a.m., 12 a.m. and 4 p.m.). The largest intake of energy was at 12 a.m. when men consumed a mean of 590 kcal and women 470 kcal. In the frail, self-managing elderly, the daily energy intake was more evenly spread over the day, where 20-40% ate within each hour from 7 a.m. to 8 p.m. (figure 1a).

Figure 1a

Self-managing elderly. Distribution of mean energy intake and percentage eating at each hour (n=29)

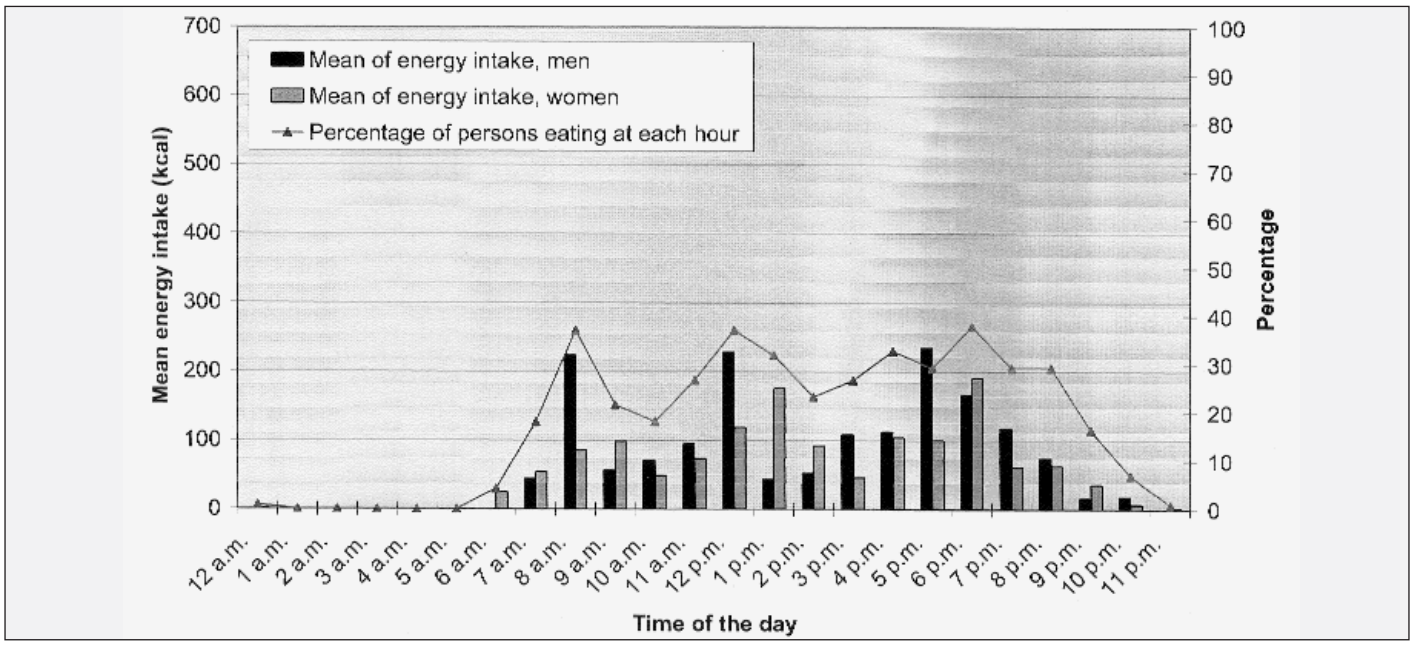


Figure 1b

Elderly living in nursing home. Distribution of mean energy intake and percentage eating at each hour (n=76)

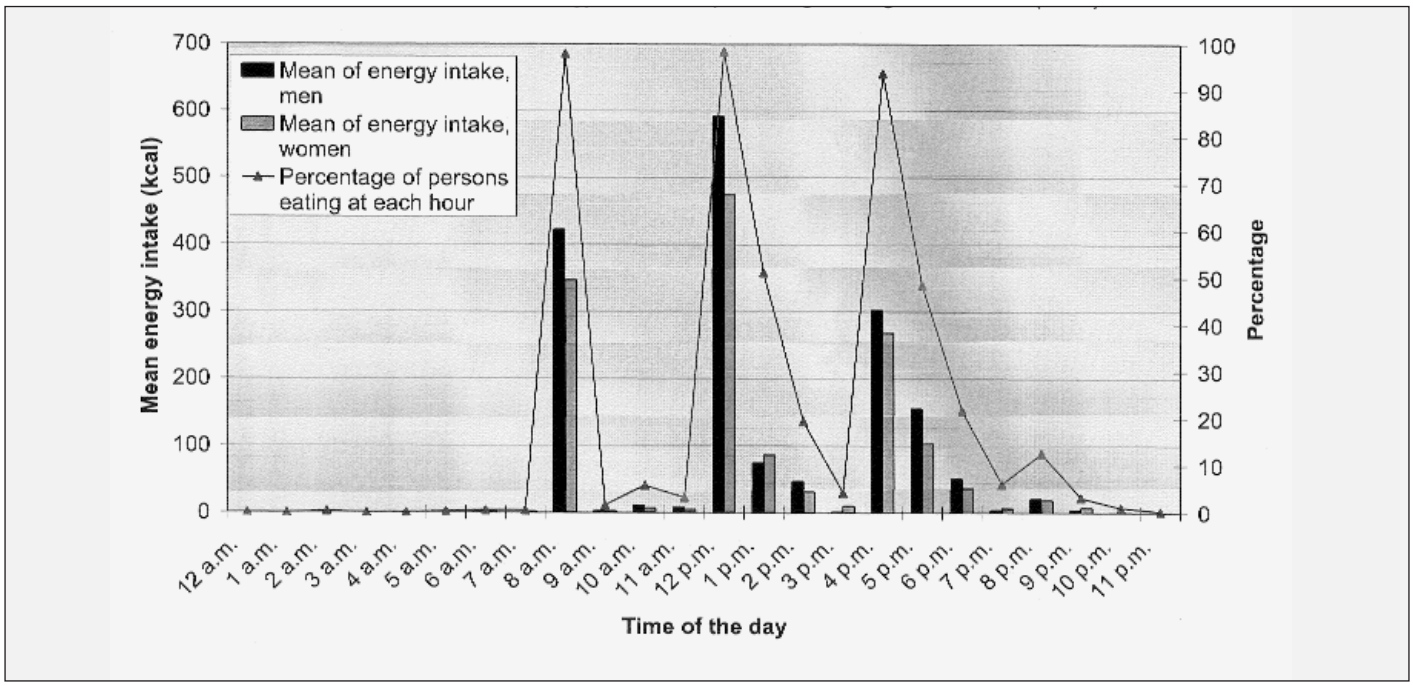
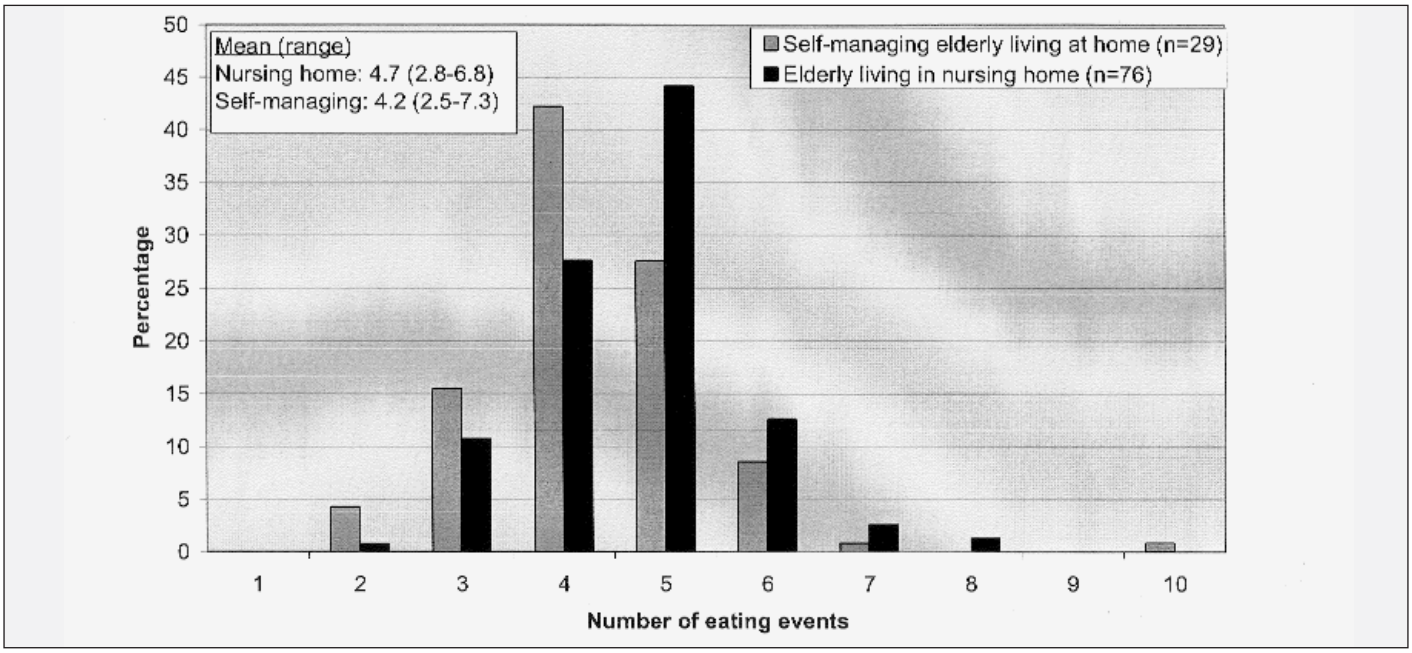


Figure 2
Numberg of eating events per day among nursing home patients and self-managing, frail elderly



Number of eating episodes per day

Figure 2 shows the number of eating episodes per day in the two groups. The mean number of eating episodes per day was significantly lower ($p<0.01$) among the self-managing elderly (4.2) compared with the elderly in the nursing home (4.7). There was a significantly longer ($p<0.001$) mean length of fasting at night in the nursing home compared with self-managing elderly, 14.5 vs. 13.0 hours (table 1). In both groups, a negative correlation ($p<0.001$) was found between the number of eating episodes and the length of fasting at night (table 2). The number of eating episodes was not correlated with either BMI (table 2), appetite, motivation to eat, sense of taste or sense of smell in either group (not shown).

Subjective variables

Appetite: About 30 % of the men and 40 % of the women in both groups estimated their appetite as "slightly reduced" or "much reduced". There were strong correlations between appetite and motivation to eat in both groups ($p<0.001$). There was, however, no correlation between appetite and energy intake/kg BW in either group (table 2).

Motivation to eat: The motivation to eat was scored as "slightly reduced" or "much reduced" by 27 % of the men in the self-managing elderly group, by 18% of the men at the nursing home and by approximately 40 % of the women in both groups (not shown). No correlation was found between motivation to eat and energy intake/kg in either group (table 2).

Sense of taste: About 40 % of the men in both groups estimated their sense of taste as "slightly reduced" or "much reduced" in contrast to only 20% of the women in the nursing home and 10% of the frail, self-managing women. In the nursing home the sense of taste was strongly correlated to appetite and motivation to eat ($p>0.001$). There was also a strong correlation between sense of taste and sense of smell in both groups. No correlation was found between sense of taste and energy intake/kg BW (table 2).

Sense of smell: About 30 % of the women in both groups, and frail, self-managing men, estimated their sense of smell as "slightly reduced" or "much reduced". So did 45% of the men in the nursing home. Sense of smell was strongly correlated with appetite and motivation to eat in the nursing home ($p<0.01$). No correlation was found between sense of smell and energy intake/kg BW (table 2).

Gender and type of living did not seem to affect the outcome in any of the four subjective variables; all chi-square tests had $p>0.05$.

Discussion

Eating episodes

Among the self-managing elderly, the meals were spread over the day indicating large variations in mealtime habits. In the nursing home, the meals and in-between meals were served at defined time-points of the day due to the organization of the nursing home and staff routines. Similar findings have been published previously (7, 25). Despite these differences, the average mean intake of energy/kg BW was the same in both groups.

The elderly in the nursing home had significantly more eating episodes than the self-managing elderly. This is in line

with a previous report that the number of eating episodes increases when elderly move to an institution (4). The difference in eating episodes with no difference in energy intake/kg BW between the groups indicates fewer, but more energy-dense, meals in self-managing elderly and more frequent but less energy-dense, meals among the elderly in the nursing home. Like Wahlqvist et al (6), we found no correlation between the number of eating episodes per day and energy intake/kg BW. The observed significant negative correlation between energy intake/kg BW and length of fasting at night in the nursing home indicates a potential to increase energy intake in elderly living in institutions by decreasing the length of fasting at night. Thus, elderly living in nursing home may increase their total energy intake by spreading the eating episodes throughout the day, but not by having extra eating events between the three traditional meals (breakfast, lunch and dinner).

Subjective estimates of meal-dependent variables

Clinical experience has lead us to believe that elderly people sometimes "force" themselves to eat without much feeling of appetite, because they know that food is "good" for them; because the "food is served"; because it has become a habit to eat in a certain way or time; or because doctors and staff have told them so for various health reasons. Thus, we had anticipated that the elderly residents would perceive "appetite" and "motivation to eat" differently. However, we observed a strong positive correlation between these concepts, which may indicate that the elderly subjects had difficulties differentiating these variables. There may also be methodological reasons for this finding (see below).

About 40 % of the females and 20-30 % of the males estimated a reduced appetite as well as reduced motivation to eat. This indicates that reduced appetite and motivation to eat may be a widespread problem in elderly individuals.

About 10-30 % of the females and 30-40 % of the males estimated a reduced sense of taste and/or sense of smell. These findings may be due to a combination of e.g. age, disease, drug-related changes in food intake regulation and a low level of physical activity. There is also evidence that the pleasantness that comes as food is eaten to satiety is weakened along with aging. This can possibly be caused by a decline of sensory processing and acuity with age (26), which may explain why elderly report a reduced appetite and motivation to eat. We were not able to consider the subjects' current or former smoking habits, which have been reported to influence sensory functioning (19).

Energy intake did not correlate with any of the subjectively estimated variables. This is in accordance with previous findings that poor sensory perception in the elderly does not influence intake of food and energy (19). This may indicate a dysfunction in the food intake regulating mechanisms among elderly persons. It would certainly constitute clinically important information if such dissociation between meal/eating-dependent perception and actual energy intake in the elderly would be corroborated in future studies.

As many as 40 % of the males, but only 10-20 % of the females in both groups estimated a reduction in taste. This is in line with the theory of Rolls (26) that elderly women may be more sensitive to flavour, and therefore do not estimate their sense of taste as reduced, even if objective changes may have appeared. Also worth considering is that even if impaired taste and smell do not directly influence energy intake, the reduced sense of taste and/or smell may well influence the quality of life.

In line with a previous report (19), we found no difference in the subjective estimated variables between either gender or type of living.

Methodological considerations

Uneven groups: We chose to compare the relative differences for the two groups of elderly residents, realising that they were uneven regarding both number and gender distribution (15 men and 61 women in the nursing home and 11 men and 18 women in the frail, self-managing group).

Eating episodes: As mentioned above, there is no accepted method for quantifying periodicity of eating in a standardized manner (27, 28). In this study we used a straight classification based on each hour of the day to get as objective information as possible of the distribution of energy intake. Several studies have chosen similar methods (5, 6, 11) in order to avoid subjective terms such as 'meals' or 'snacks' that may vary in meaning between individuals, age-groups, cultures etc.

The observation of a significant negative correlation between energy intake and length of fasting at night in the nursing home elderly, but not in the self-managing elderly may be due to low statistical power in the self-managing group.

Food intake analysis: The weighed food record is considered to be the method of choice to determine the food and nutrient intake in humans (29-31). For practical reasons, the weighed food record could only be used in the nursing home. Thus, the data from the nursing home most likely gives an adequate picture of the habitual dietary intake. The estimated food record used among the frail, self-managing elderly implies a greater risk of underestimating the dietary intake, which may influence the results of the present study, both regarding energy intake and number of eating episodes. However, we believe that the combination of home visits and individual discussions of the food records make also these data quite reliable, and therefore comparable with the weighed food record used in the nursing home.

Subjective variables: The self-managing elderly could estimate the four subjective variables without problems. In the nursing home, about 50 % of the residents had difficulties filling in the 10-point VAS and needed help from the examiner, who translated the subjects´ descriptions of the meal-dependent variables into three defined VAS-categories. The responses from about 10 % of the residents had to be recorded entirely by

contact persons. However, the contact persons knew the residents very well, which may have rendered these estimates as accurate as possible. Another methodological problem may be that elderly people could have difficulties understanding the difference between appetite and motivation to eat, or that the individuals had different definitions of the word appetite.

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