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EFFECT OF A HOLISTIC MEAL AND AMBIANCE CONCEPT ON MAIN MEAL ENJOYMENT AND FOOD INTAKE OF DUTCH NURSING HOME RESIDENTS: A PILOT STUDY

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Abstract: *Objectives:* To explore whether or not the implementation of a holistic meal and ambiance concept has the potential to increase the meal enjoyment and/or influence food intake of the elderly in nursing homes who already eat in a social setting. *Design:* In a longitudinal design two groups of subjects (comparison group & experimental group) participated in a 12-week study encompassing an 8-week intervention. In the first four weeks, all residents consumed their normal main meals in the usual setting. In the following eight weeks, the intervention was applied to the experimental group (n=28). The comparison group (n=40) received no intervention. Both groups were interviewed twice (in week 4 and 12). *Setting:* Real-life setting (Dutch nursing homes). *Subjects:* Sixty-eight long-term nursing home residents with primarily somatic disorders. *Results:* The total amount of energy intake for the main meal showed no significant difference between the experimental and comparison group. However, in the experimental group a significant higher intake of vegetables, starch and applesauce and a lower intake of sauce was observed as well as an increased duration of the meal. The meal enjoyment was improved for the items time spent at the table and satisfaction with the amount of food. *Conclusions:* Within 8 weeks of intervention, duration of the meal, meal enjoyment and to a lesser extent food intake of nursing home residents can already be influenced. These influences were already achieved in a relative short time, which is promising for the long term.

Key words: Elderly, energy intake, malnutrition, ambiance.

Introduction

Results from a recent national prevalence study in Dutch nursing homes, revealed that one out of five residents is malnourished and half of the nursing home residents has an increased chance of malnutrition (1). Although the number of residents with malnourishment has diminished over the last four years (1), the present numbers are still alarming. The decrease in nutrient intake associated with malnutrition causes loss of muscle mass and strength, a higher prevalence of infections and dysfunctions, slower recovery from injuries and increased morbidity and mortality (1-6). These consequences of malnutrition impair both the residents' independence and quality of life, and will result in higher government expenses and collective costs in the long term (1, 4).

There are multiple factors that contribute to the high prevalence of malnourishment in nursing homes. Many of these factors are related to the impact of biological ageing on an individual's nutritional intake, for example reduced chewing efficiency associated with ageing (7, 8). Other risk factors for malnourishment among nursing home residents are: psychological factors (e.g. depression), physiological factors such as illness and impairments, and social and environmental factors. In general, food intake can be influenced by internal (appetite, hunger, thirst, satiety, etc.) and external (social environments, economics, time of the day, etc.) factors. In infants, food intake is mainly regulated by internal signals. Later in life, as internal signals become disturbed, external signals are known to play a more dominant role (4). Therefore, the improvement of several external factors in a nursing home setting might be a valuable strategy to counteract the development of malnutrition in the elderly.

There is some evidence that elderly people are responsive to external environmental signals at meal time. Several studies have explored the influence of

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specific variables on food intake in adult populations. The amount of food intake can, for instance, be influenced by the number of people present (with more people there is an increased food intake compared to eating alone) (9), ambient lighting (10, 11) and sounds (12) (warm light and soft background music) and eating locations (restaurant and home-style compared to eating in their own room) (13).

Mathey et al. (12) showed in their 1-year intervention study in Dutch nursing homes that improving the ambiance during mealtimes can improve the nutritional status and stabilize the health of nursing home residents. Another study in Dutch nursing homes, by Nijs et al. (13), also indicated that optimizing the ambiance (in this case a family-style meal-concept) facilitates an increased daily energy intake and prevents malnutrition. However, in both studies dieticians were present in order to observe the amount of food eaten. Their obvious presence might have influenced the obtained results, the so-called experimenter effect (14). Furthermore, in both previous studies the residents' standard eating situation was alone in their room (as this was fairly normal ten years ago in Dutch nursing homes), whereas they were seated in a common eating location as part of the intervention. Triggered by the results of both studies, the majority of Dutch nursing homes have moved towards social eating settings, however, malnutrition of elderly residents still remains a problem (1).

The meal and ambiance concept of the present study is a multi-component approach, since various factors influence food intake and therefore, focusing on only one factor may not be sufficient to further improve energy intake in nursing homes, where residents already eat in a social setting. The concept is called "Delicious Green Table" ("De Genietende Groene Tafel"). The approach is to create a rustic and inviting eating environment by mediating on three levels (product, person, situation) and to incorporate a mixture of different variables into the holistic meal and ambiance concept in order to maximize a synergistic effect to enhance the residents' quality of life. It also encompasses an easy applicable format that can be used in a wide range of dining locations and settings and could therefore be implemented on a national scale.

The present study serves as a pilot study for a two-year study in which it will be investigated whether or not a multi-component intervention in a nursing home will increase meal enjoyment, improve nutritional status and thereby contribute to an optimal quality of life of the residents. Both studies are funded by the Dutch government. The main aim of the present study was to explore, in a real-life setting, whether or not the implementation of a holistic meal and ambiance concept has the potential to increase the meal enjoyment and/or influence food intake of the elderly in nursing homes within a relative short period of time. It is hypothesized that by applying a holistic meal and ambiance concept, residents' meal enjoyment will increase and they will eat more of the meal components they like.

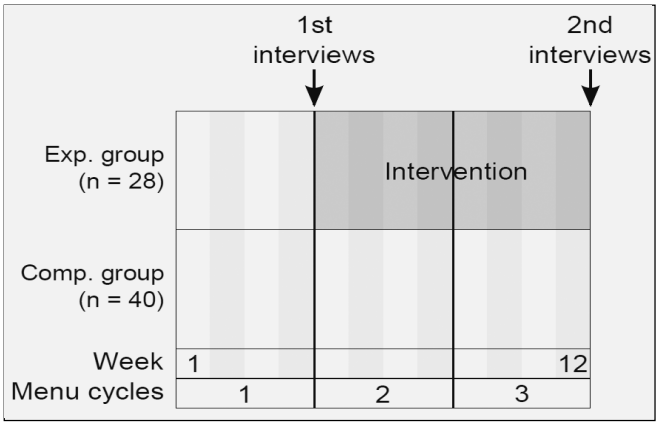
Methods

Experimental design

A longitudinal design with two groups of subjects (experimental and comparison group) was used. For practical reasons it was not possible to randomly assign the subjects to the two groups. The experimental group was hosted in the nursing home 'De Watersteeg' in Veghel and the comparison group was hosted in the nursing home 'Vita Nova' in Oss. Both nursing homes were selected for the study on the basis that they are run by the same care operator (BrabantZorg, The Netherlands) and that they serve meals which are prepared on-site by professional chefs using the same recipes. The allocation of the two nursing homes to either the experimental or the comparison group was made by the care operator together with their local personnel managers.

The study consisted of 12 weeks divided into three menu cycles. In the 1st menu cycle (week 1-4), both groups consumed their normal main meals in the regular setting (control period). In menu cycles 2 (week 5-8) and 3 (week 9-12), the intervention – defined in the "Delicious Green Table – concept" (see Table 1) – was applied to the main meals and the eating environment of the experimental group. The comparison group received no intervention. See Figure 1 for a schematic overview.

Figure 1
Schematic overview of the study design and procedure.



In both nursing homes, the main meals were eaten in small groups (4-8 people per group) around a table. Cameras were used for observation. They were placed above each table on the ceiling, in a position that for ethical reasons prevented facial recognition. Positions of

the individuals on the dinner table were mapped so that they were traceable on the camera recordings.

The study was approved by the Ethical committee of Wageningen University and Research Centre, The Netherlands.

Table 1
Detailed description of the changes made in the intervention period to optimize the ambiance during mealtime

Level	Intervention component	Explanation
Product	Organic and regional products	Main meals were prepared with at least 60% of products from organic origin
		The other ingredients had the status 'free of chemical additives'
	Components	Per meal component, there was always a choice between two alternatives
		A choice of 5 different drinks (apple juice, orange juice, red and white wine, water) was available during mealtime
		Extra vegetables, starch, sauce and applesauce were served in serving bowls per table for self-service
		Per meal, an appetizer was served per person
People	Staff and autonomy	Residents were encouraged to help/serve each other and themselves
		Residents decided for themselves what and how much they ate
		The staff praised the food at the beginning of the meal
		Residents were gathered within 30 min prior to meal time
	Interaction	Meal time started when everybody had arrived at the table, drinks were already served on arrival
		After the main meal, residents were invited to have coffee or tea together
Situational	Table dressing	Table cloth
		Subtle flower or plant
		Napkins
		Full cutlery
		Drinking glass for water and a wine glass for the extra non-water drinks
	Dining room	Room and tables were decorated in a countryside-related theme
	Activities	No none-food related activities took place during meal time (for example cleaning, medication)
		The table was cleared at the end of the meal

"Delicious Green Table"-concept (intervention)

The "Delicious Green Table"-concept is a holistic meal concept, consisting of three levels, namely product, people and situation. The concept aims at increasing meal enjoyment and/or food intake. At each of the three levels, different components were included in direct consultation with the care operator in order to optimize the meal experience of nursing home residents. Besides the focus on practicality, these components form the scientific basis, as previous research has proven that these strategies influence meal enjoyment and/or food intake (8, 9, 10, 11, 12).

1. Product level: increasing the perception of optimal amounts; encouraging sensory stimulation via appetizers; applying product marketing (i.e., positive verbal feedback on foods served, attractive visual presentation)
2. People level: promoting autonomy and choice by, for example, placing extra bowls on the table to facilitate a higher degree of self-service and to give the participant more control
3. Situational level: Promoting an attractive physical and attractive social environment; and a relaxed atmosphere during meal times

Table 1 describes the intervention components for these three levels in more detail. The concept has originated from practical experience and has been developed with the aim of being easy to implement in multiple nursing homes, without necessitating major financial investments or building alterations. The focus is to turn mealtime into a pleasant main event of the daily activity program. The served menus were identical for both groups and contained per menu cycle 28 recipes. The menu cycle was repeated three times.

Participants

Residents were included if they were long-term residents in the nursing homes due to primarily somatic disorders. The specific exclusion criteria were residents who were rehabilitating, or suffered from advanced psycho-geriatric disorders such as Alzheimer's disease or Parkinson's disease. All residents and/or their legal guardians received a brochure, signed an informed consent form and attended an information meeting. Thirty-eight residents with somatic disorders, living in a nursing home, were included in the intervention group and 44 participants formed the comparison group. During the experiment, 3 people died in the intervention group and 7 moved to another institution or nursing ward. In the comparison group, 2 died and 2 moved away. In the end, 68 elderly people finished the experiment. For further population descriptors, see Table 2.

Individual characteristics such as sex, age, height and ZZP (Zorg Zwaarte Pakket) were obtained from patient files. A ZZP is a Dutch Health care package, which refers to the degree of daily care someone needs. An individual ZZP is independently determined by the CIZ (Centrum Indicatiestelling Zorg; Centre for Indicating Care). The higher the number of the care package, the more help a participant receives (ZZP 1-10).

Table 2
Baseline population descriptives for the comparison group (location Oss) and the experimental group (location Veghel). The sample size is notated as n and the average of age and ZZP with M

		Comparison group (n=40)	Experimental group (n=28)
Age (years)		50-96 (M=79.1)	49-97 (M=77.9)
Sex	Male	10 (25%)	5 (18%)
	Female	30 (75%)	23 (82%)
ZZP		5-9 (M=6.35)	5-9 (M=6.39)
Diagnose	CVA	26 (65%)	18 (64%)
	'Injuries'	4 (10%)	1 (4%)
	Neurological	3 (7.5%)	3 (11%)
	Tumors	2 (5%)	2 (7%)
	Different	5 (12.5%)	4 (14%)
MNA®	Yes	3 (7.5%)	1 (4%)
malnourished	risk of	27 (67.5%)	15 (54%)
	No	10 (25%)	12 (43%)
MMSE	No impairment	1 (2.5%)	8 (29%)
	Mild impairment	4 (10%)	2 (7%)
	Moderate impairment	15 (37.5%)	8 (29%)
	Severe impairment	12 (30%)	2 (7%)
	Measurement not possible	8 (20%)	8 (29%)

CVA, cardiovascular disease, MNA®, mini nutritional assessment, MMSE, mini mental state examination, ZZP is a Dutch Health care classification system, which refers to the degree of daily care someone needs (i.e. the higher the number of the care package, the more help a participant receives).

Baseline measurements

Mini Mental state examination

The validated Dutch version of the Mini Mental State Examination (15) questionnaire was employed to measure the mental state of the elderly people in the nursing home. The maximum score is 30 points; a score between 25-30 indicates no mental impairment. A total score between 21-24 indicates mild, between 10-20 moderate, and a score below 9 indicates a severe mental impairment. Results are shown in Table 2.

Mini Nutritional Assessment

The nutritional status of the residents was assessed by the validated Mini Nutritional Assessment® (MNA®) questionnaire(16), and was completed by the staff members. The maximum score of the MNA is 30 points. A total score of > 23.5 indicates an acceptable nutritional status. A score of < 17 indicates malnutrition, and a score between 17 -23.5 indicates a risk of malnutrition. Results are shown in Table 2.

Study parameters

Meal enjoyment and Quality of Life

Residents were interviewed one –to one at the end of menu cycles 1 (during week 4) and 3 (during week 12). The same group of interviewers (n = 7) conducted the interviews on both locations. Prior to the interviews, they received a 2h training on the consistent use of the interview protocol. Depending on the individual clients physical and/or mental capabilities, it took them 45-60 minutes to conduct one interview. Since in the experimental group visible changes have been made (for example, the use of table cloth) to the dining room, the interviewers were not blind to the fact that this was the experimental group.

First, nine questions about meal enjoyment were asked. Seven of them were multiple-choice questions, with a five point graded scale. The interviewer asked about the taste (gradation from like to dislike), temperature (hot - cold), food appearance (like - dislike), amount of food (too much – just right - too little), time spent on the meal (short - long), ambiance (like - dislike) and table decoration (like - dislike). The questions were asked as open questions, for example 'What is your opinion about the amount of food during the main meal?'. If the answer was not distinct enough, the interviewer would ask another question to specify the answer, for example 'Do you sometimes find the amount of food is too much or too little for you, or do you always have the correct amount?'. In the last two questions, the residents were asked to grade/score the food and ambiance on a ten point scale (in analogy to Dutch school grades, with 10 indicating high quality). The interviewer wrote down the answers given.

The second part of the interview consisted of the validated Dutch Quality of Life of Somatic Nursing Home Residents questionnaire (17) about the perceived Quality of Life of elderly people in a nursing home. The questionnaire consists of fifty statements. Within the questionnaire there are five subscales: sensory functioning (8 statements), physical functioning (17 statements), psychosocial functioning (17 statements), perceived autonomy (4 statements) and perceived safety (4 statements). Each of these subscales represents a Quality of Life dimension. The number of statements is not equally divided over the 5 subscales. The answers to the statements are scored on a dichotomous scale (yes or no). The questionnaire result was scaled to a range of 0-100 by multiplying the score with a factor of 100 divided by the number of questions. A high score indicates a high Quality of Life.

Food intake (in kcal)

Individual food intake measurements were taken two days per week during the main meal, with an adjusted observation and weighing-back method. The intake was measured by a combination of out-of-sight weighing of the initial meal components and camera observation. The meal components were categorized as meat, vegetables, starch, sauce (cream sauces, butter sauces and gravy), applesauce and dessert. In the Netherlands, applesauce is frequently eaten as a garnish during meals, and it was served on a daily basis in both nursing homes. For this reason, it is treated as a separate category in the present study. The camera observations were mainly used to assess the meal duration and to note possible extra scoops of meal components which the participants received or took themselves.

For the variations of each meal component (for example: rice, potatoes, pasta for starch component), the standard weight of one serving spoon was assessed by weighing ten spoons of the specific meal component and taking the average. The caloric value of these standard servings in kilocalories (kcal) was calculated using the NEVO database(18). These standard values were used to estimate the energy content of the first plate and of any additional servings.

The initial meal orders were taken by the staff and the researcher noted the amount of standardized serving spoons that each resident received of a particular product. Second helping - normally ordered via staff - could be taken by the participants themselves during the intervention. After a resident finished his meal, the researchers weighed the leftovers per product, in a place shielded from the resident's view. The total amount of energy intake was then calculated per individual. The extra appetizers/drinks that were served during the intervention were not included in these calculations.

Meal duration

Meal duration was measured on the two measurement days per week. The meal duration was calculated individually from the camera observations.

Body Weight

The residents' weight assessments were done by the professional staff of the nursing home at the end of menu cycle 1 and 3.

Data analyses

For all measured variables (questions of meal enjoyment, food intake, quality of life and body weight) an independent samples t-test was performed to compare the exposure group with the comparison group. The independent samples t-test was performed at differences between the values of the variables between cycle 1 and 3. The differences were calculated as: value cycle 3 – values cycle 1. The independent samples t-test was performed with equal variances, unless the Levene's test for equality of variances indicated differently. The p-values were calculated with a two-sided alternative hypothesis. For food intake and duration of the meal, averages were calculated for each person over all measurements within a menu cycle. The food intake averages per person were based on at least four or more of the eight possible observations per cycle; participants with less observations were excluded from the calculations. All analyses were done with SPSS statistics 17.0 with a significance level of 0.05. A significance level between 0.05-0.10 is described as a trend.

Results

The results of the different variables are summarized in Table 3. For all variables the number of observations of the comparison and exposure group is given (ncomp and nexp). The averages over all persons of the calculated difference between cycle 3 and cycle 1 (average dcomp and average dexp) is reported. Finally the two-sided p-value of the independent samples t-test is given.

Meal enjoyment

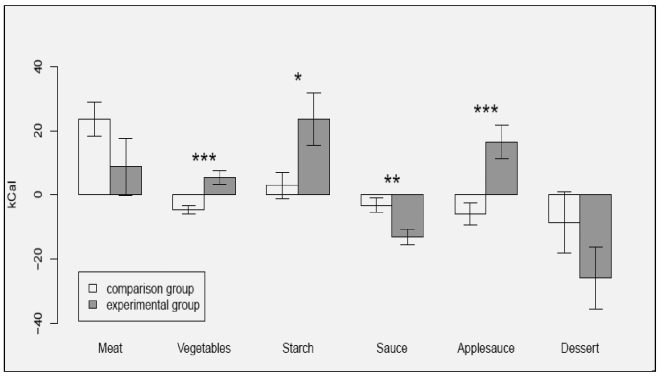
For the nine different aspects of meal enjoyment only the time spent on the meal demonstrated significant changes. In the experimental group the average score in cycle 1 was equal to 3.6 (too long) and decreased to 3.2 in cycle 3. The comparison group showed average scores of 2.8 in cycle 1 and 3.0 in cycle 3. With a two-sided p-value of 0.084 a trend was observed with regard to residents' satisfaction with the amount of food that was served. The average score for the experimental group decreased from 3.7 (too much) in cycle 1 to 3.0 (just right). In the comparison group the scores were 3.1 and 3.0, respectively.

Energy intake (in kcal)

The average calorie intake per meal component varied between 40-200 kcal for meat, 5-30 kcal for vegetables, 50-150 kcal for carbohydrates, 0-40 kcal for gravy, 10-40 for applesauce and 150-200 kcal for dessert. The total amount of energy intake for the main meal showed no significant difference between the experimental and comparison group at the end of the third menu cycle. However, a significantly higher intake of vegetables, starch and applesauce is found in the exposure group. A significant

lower intake of sauce in the exposure group was observed compared to the comparison group.

Figure 2
Mean changes in energy intake (±SEM) between menu cycle 1 and 3, for both the comparison and experimental group. The differences are given per meal component. Mean values were significantly different from those of the comparison group: *P <= 0.05 **P <= 0.01 ***P <= 0.001



Finally, there were no significant changes in the intake of meat and dessert between the two groups.

Meal duration

A significant difference was found between the comparison and the experimental group for the duration of the meal. For the experimental group the average duration of the meal increased from 41.3 (with standard deviation of 10.7) minutes in cycle 1 to 47.7 (10.9) in cycle 3. For the comparison group, we see a decrease in duration of the meal. These values are 43.9 (12.2) and 38.3 (8.7), respectively.

Quality of Life

No significant difference in Quality of Life was observed between the experimental and the comparison group. Notable is the high standard deviations of the differences in scores between cycle 3 and cycle 1, which implies that the questions asked do not give consistent results.

Body Weight

For body weight there was no significant difference found between the experimental and the comparison group. On average the comparison group lost 0.3 kg and the exposure group gained 0.6 kg in this experiment. However, with a two sided p-value of 0.129 and considering the short time span of this experiment it seems an interesting result in itself. The more so since in this specific case, it also seems plausible to calculate the p-value one sided (because the objective of the intervention is clearly to gain more weight/slow down weight loss). The one sided p-value is equal to 0.065, which might indicate a trend with regard to the body weight.

Discussion

The aim of this 12-week intervention study was to investigate the effect of a holistic meal concept on the food intake and meal enjoyment during the main meal of elderly people in nursing homes.

The total amount of energy intake for the main meal showed no change for both groups, which was also the case for the different meal components in the comparison group. However, in the experimental group a higher intake of vegetables, starch and applesauce and a lower intake of sauce were observed. Meat and dessert consumption did not increase, most likely because the residents received the same portions before and after the intervention. For financial reasons, it was not possible to include extra meat portions in the self-service bowls, because it is a relatively expensive product. However, meat was in the present study the major contributor (30-40%) to the total amount of energy intake of the residents. This clearly demonstrates a practical dilemma, since on the one hand meat is an excellent energy and protein source and on the other hand the amount that residents are allowed to consume per day in a nursing home setting is financially restricted.

The observed decrease in intake of sauce could be related to the increased intake of applesauce. During the intervention, residents were able to pour their own sauce and probably favoured applesauce over the other available sauces, as is implied by the large amount of applesauce eaten by this group.

Changes were observed for the experimental group on 2 out of 9 aspects in the meal enjoyment assessment. Firstly, the residents tended to comment that the amount of food was 'just right', while before they found it on average 'too much'. A reason for this could be that extra food was served in extra serving bowls and as a result, people experienced more control over the amount and/or choice of meal components (19). Secondly, the residents commented that before the intervention, the meal took 'too long'. In contrast, after the intervention, the mealtime was more frequently perceived as 'just right', even though the time they spent on the meal was actually longer. In the scientific literature on time perception, it is reported that negative stimuli cause an overestimation of the time spent attending to them, and positive conditions cause an underestimation (20, 21). For the present study this implies that the meal enjoyment was indeed positively influenced by the intervention. In our opinion, this is highly interesting, especially since all other aspects of meal enjoyment were rated as good/positive by the

Table 3
Results of the different measured variables. In the columns with average differences (dcomp and dexp) the standard deviation of the differences are between brackets. (DQoL = Dutch Quality of Life of Somatic Nursing Home Residents questionnaire)

	Variable	n_{comp}	n_{exp}	Average d_{comp}	Average d_{exp}	p-value
Meal enjoyment	Taste	25	21	0.2 (1.3)	0.2 (1.4)	0.981
	Temperature	22	21	0.2 (0.6)	-0.2 (0.9)	0.107
	Appearance food	24	21	0.1 (1.4)	0.2 (1.3)	0.775
	Amount of food	24	20	-0.1 (0.6)	-0.7 (1.2)	0.084
	Time spent	23	21	0.1 (0.7)	-0.4 (0.8)	0.029
	Ambiance	23	20	-0.2 (0.7)	0.3 (1.7)	0.255
	Table decoration	25	20	0.0 (1.1)	0 (1.6)	0.919
	Food score	17	18	-0.1 (0.6)	-0.5 (1.0)	0.192
	Ambiance score	17	16	0.2 (0.9)	-0.3 (1.1)	0.230
Food intake (kcal)	Meat	38	28	23.6 (32.9)	8.7 (47.3)	0.137
	Vegetables	38	28	-4.6 (8.4)	5.5 (11.1)	0.000
	Carbohydrates	38	28	2.9 (25.8)	23.6 (43.5)	0.018
	Gravy	38	28	-3.2 (14.3)	-13.1 (12.6)	0.005
	Applesauce	38	28	-6.0 (21.4)	16.6 (28.2)	0.000
	Dessert	38	28	-8.5 (58.8)	-25.9 (51.6)	0.216
	Total Amount	38	28	-8.4 (95.5)	13.9 (116.4)	0.397
Meal duration (min)	Minutes	38	28	-5.6 (11.2)	6.4 (13.5)	0.000
Quality of Life	Total DQoL-score	23	15	-1.4 (15.5)	-5.0 (23.9)	0.581
Body weight (kg)	Weight	39	26	-0.3 (2.2)	0.6 (1.9)	0.129

residents. Previously, it has been hypothesized in the literature that elderly people are keen to please the experimenters who pay attention to them via the experiment and are less inclined to express direct criticism (22, 23). Therefore, ratings of meal duration might have the potential to become a very useful implicit measure of meal enjoyment in the elderly. This observation merits further research.

Even though no significant increase in total energy intake via the main meal was observed in the present study, a small trend towards weight gain was observed for the experimental group at the end of the third menu cycle. Two explanations are possible for this observation. Firstly, during the intervention, extra appetizers and drinks were served and their caloric content has not been taken into account. If they are taken into account, the total energy intake via the main meal was indeed higher in the experimental group. Secondly, the experimental group could also have increased their energy intake during other eating moments of the day. An unobtrusive "real-life" 24h energy intake measurement was outside the scope of the current research. Nonetheless, it might be hypothesized that an increased meal enjoyment and/or food choice control could be key to an increased feeling of well-being, which in turn might also trigger a higher energy intake during other moments of the day. Obviously, a longer intervention period is required (such a study is in preparation) to establish whether or not this observation is clinically relevant on the long-term.

Nijs et al. (4) and Mathey et al. (12) also investigated a meal concept in nursing homes. Their long-term interventions resulted in an increase in daily energy intake. The body weight of the experimental group increased only in the study of Nijs et al. (4). Both studies were conducted for 1 year, whereas the present study lasted 12 weeks. The residents in both previous studies normally ate alone, in contrast to the current residents who were already used to eating in a social setting. In addition, the present study used a meal and ambiance concept that had some differences with the above-mentioned studies. Extra activities were created to stimulate interaction between the residents and between the residents and staff. Appetizers were served to introduce an extra topic to talk about. Also, there was the possibility to drink something other than water, like wine and juices. Together, these activities generated an eating atmosphere where residents were able to take their time to eat and enjoy the meals and ambiance.

For practical reasons, it was not possible to randomly assign the subjects to two groups (experimental and comparison). The two locations were run by the same care organization (BrabantZorg) and had a very similar set up. They both had meals prepared by a professional kitchen staff on location and they used the same recipes for their meals during the 12 weeks of research. During each cycle, the menus were exactly the same. Only the origin of the food products and the presentation of the food were altered in the intervention period for the experimental group.

Another practical limitation of the present study is that it was possible for the interviewers to see some of the implemented changes during the intervention and thus they have not been completely blind to the fact which of the two nursing homes was the experimental group.

The sample of the present study was drawn from a population of residents with mainly somatic disorders (exclusion criterion: psycho-geriatric disorder). Consequently, the chosen sample does not represent the Dutch nursing home residents' population as a whole.

In the comparison group more residents suffered from severe cognitive impairments compared to the intervention group and in both groups, it was not possible to perform interviews with all residents due to limited cognitive and/or communicative abilities. Within the group of residents that have been interviewed, possible influences of mental state on the outcome measures were visually inspected by descriptive data analyses. The data was randomly distributed, and therefore mental state was not included as a covariate in the final data analysis.

The results of the Quality of Life questionnaires were similar for both groups and they did not change over time. The authors acknowledge that the duration of the present study was probably too short to produce any significant changes in this measure. Furthermore, the validated Dutch Quality of Life of Somatic Nursing Home Residents questionnaire used in the present study consisted of fifty statements (17). During the interviews, it became obvious that it was not only very tiresome for some of the residents to answer the fifty items but also that a lot of the items are concerned with negative aspects (i.e. decline in health). As a consequence, the questionnaire was experienced as confronting and emotionally disturbing by some of the residents and the interviewers decided to stop the interviews for ethical reasons in 8 cases. Therefore, it is recommended that future research should investigate more indirect and unobtrusive measures of Quality of Life in elderly nursing home residents, with the aim to reduce the above mentioned stress.

From the results of the present study, it is not possible to determine which variables from the holistic meal concept are the main drivers for energy intake and/or meal enjoyment. A mixture of different variables was incorporated into the holistic meal and ambiance concept in order to maximize the synergistic effect, without losing the concept's practicality. Nonetheless, more research is needed to determine the main drivers behind improved meal and ambiance concepts.

Conclusion

An easily implementable meal and ambiance concept for nursing homes was investigated in a real-life setting in order to estimate its potential to reduce malnourishment among nursing home residents. The main aim of this applied holistic concept is to centralize the needs of residents and to improve their nutritional status by improving external meal ambiance-related factors. The results of the present study show that after eight weeks of intervention, two aspects of meal enjoyment and the intake of staple foods and vegetables can be positively influenced. These positive influences were already achieved in a relative short time, which is promising for the long term.

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