Exploring health-related motive orientations among Dutch seniors

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Abstract

Purpose – Generally, food intake of older consumers is not in line with dietary guidelines. Insight into personal health-related motive orientations (HRMO) in this target group is useful for developing tailored interventions that support healthy food consumption, a better understanding is needed. The purpose of this paper is twofold: first, to identify older consumer groups based on HRMO; and second, to compare their consumption of different food groups and functionalities associated with a main meal.

Design/methodology/approach – An online survey was filled out by 459 Dutch adults aged 55–90 years (mean age = 68.2 years), of the Sento network including 800 vital community-dwelling older consumers.

Findings – Analysis revealed five clusters of older adults with different HRMO profiles: appearance and achievement oriented, active oriented, altruistic oriented, achievement oriented and less health oriented. In addition, these segments differ in importance of functionalities associated with a main meal, i.e., physical, pleasure or rewarding, and in the consumption of specific food groups, i.e., unprocessed meat, meat replacers and unsalted nuts.

Research limitations/implications – Recommendations for interventions and communication strategies to support healthy food consumption in the different HRMO segments are presented.

Originality/value – This exploration showed that different segments of Dutch older adults can be identified based on HRMO. Between these segments there are differences in consumption of protein-rich food groups and functionalities associated with a main meal.

Keywords Cluster analysis, Healthy ageing, Food-based dietary guidelines, Health-related motive orientations, Mealtime functionality

Paper type Research paper

1. Introduction

Worldwide the population aged 60 years or over is growing faster than the total population. According to current estimates, the number of people aged 60 years or over worldwide will exceed two bn by 2050, representing 21 per cent of the total population (United Nations, 2013). Because of the many economic, political and social consequences of this demographic shift, successful ageing needs to be actively promoted. Maintaining a healthy diet in later years can reduce the risk of sarcopenia, osteoporosis, high blood pressure, heart diseases, and certain cancers, and, thereby, contribute to better health and quality of life (Dawson and Axford, 2014; Fardet and Boirie, 2014; Gonzalez, 2006; Gopinath *et al.*, 2015; Houston *et al.*, 2009; Willcox *et al.*, 2009).

Food-based dietary guidelines (FBDG), such as the Dutch Wheel of Five, are intended to support consumers in composing a diet that delivers all essential nutrients and sufficient

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energy reducing the risk of developing chronic diseases. These guidelines include daily amounts of different food groups, such as fruits, vegetables, wholemeal products, dairy etc., that contribute to health benefits (Brink *et al.*, 2016). Data from the Dutch Food Consumption Survey (FCS) showed that compliance with these FBDG among older consumers is low, especially for fruit and vegetables, fish, and wholemeal products (Dijkstra *et al.*, 2014; Ocke *et al.*, 2013). These results emphasise the need for interventions to improve eating behaviour in this older part of the population.

Several studies indicated that "tailoring" is crucial for successful behaviour change interventions for older adults (Noar *et al.*, 2007; Sheats *et al.*, 2015; Zubala *et al.*, 2017). An effective tailoring strategy is alignment with personal motivations and preferences (Nicklett and Kadell, 2013). In general, health-related motivations are important drivers for health behaviours including food choice of older adults (Dijkstra *et al.*, 2014). A better understanding of health-related motivations in older adults might support development of tailored interventions that contribute to healthy eating in segments of older adults. Health is a multidimensional construct which is represented in the health-related motive orientation (HRMO) scale designed by Geeroms *et al.* (2008a). This scale is a tool to investigate psychological meanings that people associate with health and that explain food choice behaviour (Geeroms *et al.*, 2008a, b). Their study identified six health constructs that represent peoples HRMO: healthy is about "energy", "emotional well-being", "social responsibility", "physical well-being", "management" and "outward appearance". Next they identified five segments in an adult population that clearly differed according to HRMO: "energetic experimenters", "harmonious enjoyers", "normative carers", "conscious experts", "rationalists". Between HRMO segments, clear differences were observed in category-specific fruit and vegetable consumption (Raaijmakers *et al.*, 2018) as well as better adaptation to advertisement messages (Geeroms *et al.*, 2008a). The study of Raaijmakers *et al.* (2018) showed that comparable/similar insights are available for the Dutch population. But to the best of our knowledge, this HRMO scale has not yet been applied among older adults, which will be explored in this study.

That there is a need for segmenting older adults is showed by den Uijl *et al.* (2014) who investigated the functionalities that older adults ascribe to a main meal. Three segments could be described: "cosy socialisers", who are especially motivated by the cosiness and social function of a meal; "physical nutritioners", who are motivated mainly by physical needs, health and nutritional aspects of a meal and "thoughtless rewarders" who tend to eat without having explicit thoughts (den Uijl *et al.*, 2016). Whether there were differences between segments with regard to usual food intake was not studied, yet.

The aim of this study is first to identify segments of consumers in a population of vital community-dwelling older adults based on HRMO and second to compare food consumption of some product groups and meal functionalities of the segments. As health-related motives seem important drivers for food choice, it is hypothesised that food consumption differs between HRMO segments. If so, HRMO seems an appropriate strategy for tailoring interventions to support older adults with healthy food intake.

This study is mainly focussed on the intake of fruits and vegetables, as consumption levels are inadequate according to the Dutch FCS. In addition, it is also focussed on the intake of protein-rich foods, as there is strong scientific evidence that actual consumption levels are commonly inadequate to cover increased protein needs at older age (Tieland *et al.*, 2012).

2. Methods

2.1 Study design and participants

Data were collected through an online questionnaire among 463 older Dutch adults in July 2016. Four respondents did not fully complete the questionnaire and were therefore excluded, leaving data from 459 older adults for the final analysis.

All respondents were members of the SenTo network (Dutch abbreviation of Senioren van de Toekomst: Seniors of the future), an initiative by Wageningen University and Research. The network consists of healthy Dutch older persons living independently in a region of 30 km around the city of Wageningen who are: aged 55 years or over, capable of working online with a computer, able to go out independently, e.g., grocery shopping, and fluent in Dutch. The SenTo network is representative for the Dutch older adult population with regard to health status (25 per cent experiences health problems, 75 per cent does not). However, this panel is less representative with regard to the ratio immigrants/natives, educational level and socio-economic class.

2.2 Measures

The online questionnaire included items on: HRMO; functionalities associated with the consumption of a hot main meal; and usual intake behaviour of selected food groups included in the Dutch FBDG (Brink *et al.*, 2016). A detailed explanation is provided below.

Health-related motive orientations (HRMO). The HRMO scale identifies meanings that respondents attribute to health, i.e., subjective perception of the meaning of health, and that motivate health behaviour (Geeroms *et al.*, 2008a, b). The scale included 34 statements, of which 13 addressed "health" in a rather explicit way (e.g. the meaning of health and people's reasons for striving a good health), and 21 statements addressed health in a more implicit way by focussing on the perceived consequences of bad health. Respondents rated all statements on a nine-point Likert scale ranging from 1 = totally disagree to 9 = totally agree.

An exploratory and confirmatory factor analysis (EFA and CFA) with Oblimin rotation were conducted to confirm the six and eight factors reported by Geeroms *et al.* (2008a, b). The results revealed a six-factor solution in line with a previous Dutch study (Raaijmakers *et al.*, 2018). Within the current study, nine items were deleted, because their factor loadings were too low (< 0.55) (Osborn *et al.*, 2008) and five items were deleted because they loaded on a different dimension than expected based on Raaijmakers *et al.* (2018). The remaining factors included the individualistic oriented motives "achievement", "active", "well-being", and "appearance", and the altruistic oriented motives "caring" and "social" (see Table I).

Mealtime functionality. Respondents completed a questionnaire on functionalities that are associated with the consumption of a hot main meal on a weekly day on a regular consumption location (den Uijl *et al.*, 2014). For each of 13 functionalities (hunger, habit, liking, cosiness, pleasure, energising, rewarding, healthiness, pleasing, calming, physical needs, thoughtless eating and environmental awareness) respondents indicated on a nine-point Likert scale (1 = totally disagree to 9 = totally agree) whether it was relevant for them.

An EFA and CFA with Oblimin rotation revealed a four-factor solution. Two items were deleted because their factor loadings were too low (< 0.55) (Osborne *et al.*, 2008) or because the item loaded on more than one factor. The remaining factors were: "physical", "rewarding", "pleasure" and "habits" (see Table I). The last factor was deleted due to a low reliability score ($\alpha < 0.70$).

Usual food intake behaviour of specific food groups. Usual intake behaviour of different food groups included in the Dutch FBDG was assessed with a modified version of the Food Frequency Questionnaire (FFQ) designed by Van Assema *et al.* (2002). Participants were asked to indicate their average consumption frequency and portion size for different types of food products within the food groups: "vegetables", "fruits", "fish", "legumes", "unprocessed meat", "meat replacers", "eggs", "unsalted nuts", "dairy products" and "cheese".

Consumption frequency was measured on a nine-point scale going from 1 = never, 2 = less than one day per week, 3 = one day per week, 4 = two days per week, 5 = three days per week, 6 = four days per week, 7 = five days per week, 8 = six days per week and 9 = seven days a week. To indicate portion size, a nine-point scale was used ranging from

Health construct	No of items	Item label	Composite reliability
Health = Achievement	5	Implicit: be successful, be classy, be powerful, be ambitious, be stylish	0.867
Health = Active	3	Explicit: keep the body in good condition, lead an active life Implicit: practice sports	0.829
Health = Caring	3	Explicit: live in harmony with family, take care for the health of family. Implicit: care for family	0.749
Health = Well-being	3	Explicit: take time to relax and enjoy life, have the energy to do other things I want to do, emotional well-being/feel good mentally	0.752
Health = Appearance	2	Explicit: staying slim Implicit: stay slim	0.782
Health = Social	4	Implicit: live an active social life, perceive warmth and conviviality, have fun with others, have close friends	0.856
Factor	No of items	Item label Because […]	Composite reliability
Functionality = Physical	3	My body needs it, to get energy, it is healthy	0.758
Functionality = Rewarding	3	It is rewarding, it calms me down, I feel more pleasant afterwards	0.698
Functionality = Pleasure	3	I like it, I enjoy it, it is cosy	0.728
Functionality = Habits	3	Out of habit, unconsciously and I eat whatever is available at that moment	0.514[a]

Table I. Results of confirmatory factor analysis of HRMO scale and associated mealtime functionalities

Notes: [a]Factor is discarded due to poor reliability; Kaiser–Meyer–Olkin, KMO was above 0.5, which indicates that the sample was sufficiently large to determine the factors (Hutcheson and Sofroniou, 1999)

1 = less than ½ serving size to 9 = seven or more serving sizes. Serving sizes differed per product group and were in-line with standard serving sizes as included in the Dutch FBDG.

Total intake per food group were calculated by adding up the average number of servings per week for the different food products within a food group. For some food groups the guidelines include a recommended daily intake (i.e. "fruit", "vegetables" and "dairy products"). In this case, the number of portions per week was divided by seven to calculate the average number of servings per day.

2.3 Data analysis and clustering

In the present study, statistical analysis was performed using two statistical programs: Latent GOLD 4.0 Choice Program and Statistical Package for Social Sciences (SPSS), version 23.

Data analysis and clustering consisted of three steps, which are described below:

Step 1. Data preparation – The analysis started with horizontally centring of the segmentation variables. In this way, it is adjusted that respondents answering tendencies influence the results.

Step 2. Cluster analyses – For clustering, a so-called finite-mixture model was applied using Latent GOLD 4.0 (Vermunt and Magidson, 2005a, b). The finite-mixture model is a proper method to conduct cluster analysis because in this study, a post hoc, descriptive segmentation method is applied. The revealed HRMO factors were used as segmentation variables. The demographic variables gender and age were added as covariates.

In total, ten models were estimated. Each model had a different number of clusters (between 1 and 10). Each of the models was fitted ten times, and for each model, the best-fitting estimates from different random starting values were retained to avoid suboptimal solutions (Wedel and DeSarbo, 2002). Eventually, the model with the lowest consistent Akaike information criterion (CAIC) value was chosen as that is the model that

had the best trade-off between model fit and parsimony (Vermunt and Magidson, 2005a). Furthermore, the Entropy R2 was examined. After selecting the optimal amount of clusters, it was verified whether removal of covariates lowered the CAIC value in the models as not all covariates will necessarily have a significant impact on cluster identification. To this end, a stepwise procedure was conducted. This process was repeated until a combination of covariates with the lowest CAIC value was identified.

Step 3. Profiling of clusters – After cluster identification, the identified clusters were profiled based on meal functionalities and intake of different food groups using frequency analysis and ANOVA. The Bonferroni correction was applied for multiple comparisons.

3. Results

3.1 Description of the study sample

Table II presents characteristics of the study population. Age of the participants ranged between 55 and 90 years ($M = 68.2$; SD = 6.11). Females were slightly overrepresented (59.9 per cent) as were respondents with a higher educational level (55.9 per cent) and two-person households without children (68.9 per cent). More than half of the respondents

	Cluster[a] *n*	Appearance and achievement 130	Active 110	Altruistic 54	Achievement 64	Less health 101	Statistics[d]
Gender (%)							
Male	40.1	35.4	42.7	31.5	48.4	42.6	$\chi^2 = 5.300$; df = 4
Female	59.9	64.6	57.3	68.5	51.6	57.4	
Age (average)							
55–90	68.56	69.84	67.73	67.46	67.91	68.82	$F = (4,454) = 2.622$*
Educational level[b,c] (%)							
Low	18.2	18.1	13.6	18.0	27.1	18.1	$\chi^2 = 10.529$; df = 8
Middle	25.8	26.7	34.0	26.0	22.0	18.1	
High	55.9	55.2	52.4	56.0	50.8	63.8	
Household composition (%)							
One person household without children	23.3	33.9	13.6	8.2	19.0	31.2	$\chi^2 = 34.699$; df = 16**
Two persons household without children	68.9	60.2	77.7	79.6	72.4	62.4	
One person household with children	1.2	2.5	1.0	0.0	0.0	1.1	
Two persons household with children	5.9	2.5	5.8	12.2	8.6	5.4	
Otherwise	0.7	0.8	1.9	0.0	0.0	0.0	
Perceived health status (%)							
Excellent	21.1	21.0	23.1	14.0	13.6	27.7	$\chi^2 = 27.623$; df = 12*
Good	62.7	70.6	60.6	74.0	52.5	55.3	
Reasonable	14.6	7.6	15.4	12.0	30.5	13.8	
Moderate	1.6	0.8	1.0	0.0	3.4	3.2	
Bad	0	0.0	0.0	0.0	0.0	0.0	

Notes: [a]Clusters sorted by highest average HRMO score, clusters numbers are based on size of the clusters (1 is the largest); [b]Educational level: Low = primary school, lower vocational technical education, household school, LBO, MAVO, MULO/ULO. Middle = MMS, HBS, HAVO, VWO, Lyceum, Gymnasium, MTS, MBO, UTC. High = HBO, HTS, Academic/scientific education, Promoted/PhD; [c]Percentages do not add up to 100 due to missing cases; [d]ANOVA for age, χ^2 for all other demographic variables. *$p < 0.05$; **$p < 0.01$

Table II. Characteristics of cluster and five segments (% of respondents, $n = 459$)

perceived their own health status as good (62.7 per cent), 21.1 per cent as excellent and 14.6 per cent as reasonable. None of the participants considered their health status as bad.

Overall, the functionalities "physical" and "pleasure" were most strongly associated with consumption of a hot main meal, whereas the functionality "rewarding" was considered less important (Table III).

Regarding dietary intake, mean intake of the food groups "fruit", "vegetables" and "dairy" was below the Dutch FBDG in the total population. For "fish", "legumes", "eggs" and "unsalted nuts" mean intake was about equal to the recommendations. Mean intake of "unprocessed meat" was below the maximum intake level.

3.2 Cluster identification

The finite-mixture model showed an optimal solution of five clusters (CAIC = 9,799; Entropy R2 = 0.76). This model had the lowest CAIC value and a comparable Entropy R2 value with other models. The demographics gender and age were also tested but did not provide a better fit and therefore were not included in the final analyses.

3.3 Health-related motive orientations

Table III shows the uncentered means of the importance ratings of the different HRMO for each cluster. Centred means are more difficult to interpret than uncentered data and it is more common to look at variables in their original scales. All clusters attached high importance to the "well-being" and the "social" orientations of health, whereas "achievement" related health orientations were least important. Two clusters, "appearance and achievement oriented" and "active oriented" attached the highest

		Cluster[f] *n*	Appearance and achievement 130	Active 110	Altruistic 54	Achievement 64	Less health 101	*F* (4,454) =
Health constructs[g]								
Health = Well-being	Mean	7.06	6.77^{a}	7.17^{b}	7.83^{c}	6.84^{ab}	7.03^{ab}	6.428***
	SD	1.39	1.36	1.23	0.92	1.49	1.59	
Health = Social	Mean	7.04	7.08^{b}	7.37^{bc}	7.74^{c}	7.02^{b}	6.28^{a}	10.913***
	SD	1.55	1.47	1.06	0.99	1.35	2.09	
Health = Active	Mean	6.35	6.71^{b}	7.15^{c}	6.40^{b}	4.01^{a}	6.47^{b}	40.216***
	SD	1.92	1.6	1.23	1.72	1.48	2.13	
Health = Caring	Mean	6.04	6.08^{b}	6.84^{c}	7.39^{d}	6.40^{bc}	4.15^{a}	55.981***
	SD	1.88	1.75	1.29	1.04	1.59	1.72	
Health = Appearance	Mean	5.59	6.51^{c}	5.57^{b}	4.56^{a}	4.66^{a}	5.58^{b}	15.765***
	SD	2	1.67	1.52	2.11	2.09	2.19	
Health = Achievement	Mean	4	5.78^{e}	3.87^{c}	1.89^{a}	4.63^{d}	2.59^{b}	125.835***
	SD	1.91	1.54	1.1	0.8	1.68	1.22	
Functionality associated with a hot main meal[h]								
Physical	Mean	6.79	6.55^{a}	7.07^{b}	7.09^{b}	6.45^{a}	6.86^{ab}	4.107***
	SD	1.46	1.44	1.08	1.56	1.54	1.66	
Rewarding	Mean	3.85	4.23^{b}	4.14^{b}	3.35^{a}	3.95^{b}	3.22^{a}	7.972***
	SD	1.66	1.57	1.52	1.67	1.74	1.66	
Pleasure	Mean	6.56	6.39^{a}	6.69^{ab}	7.08^{b}	6.59^{ab}	6.35^{a}	3.121*
	SD	1.43	1.39	1.24	1.43	1.50	1.54	

Table III.
Cluster mean of the HRMO and associated meal functionalities of a hot mail meal

Notes: [a,b,c,d,e]Post hoc tests were performed to check which means differ significantly from each other. Different superscript letters (i.e., [a,b]) indicate that the means are statistically different ($p < 0.05$). [e]Clusters sorted by highest average HRMO score, highest mean value of clusters is marked grey; [f]For the items of the scales for the health constructs: 1 corresponds to "totally disagree" to 9 "totally agree"; [g]For the items of the scales for the meal functionality: 1 corresponds to "totally not" to 9 "very strong". *$p < 0.05$; ***$p < 0.001$

importance to all different health orientations, whereas cluster "less health oriented" attached the least importance to these health orientations. Cluster "altruistic oriented" was most outspoken compared to other clusters. Interestingly, although generally less relevant, all clusters significantly differed regarding the "achievement" health orientations.

Cluster "appearance and achievement oriented" (n = 130, 28.3 per cent). This cluster included older adults who attached relatively more importance to individual orientations of health such as "achievement" and "appearance". On average, members attached medium importance to the altruistic health-related orientations "social" and "caring". Furthermore, they associated "rewarding" related functionalities to the consumption of a hot main meal.

Women were strongly overrepresented (64.6 per cent) in this cluster and in comparison with other clusters its members were slightly older (mean age: 69.8 years) and the number of one person households without children was slightly higher (33.9 per cent). Most members of this cluster perceived their health status being good (70.6 per cent), and in comparison with the other clusters, least respondents consider their health status as reasonable.

Cluster "active oriented" (n = 110, 24 per cent). As compared to other clusters, older adults in this cluster attributed significantly more importance to the "active" health-related orientations and also a relatively higher mean value to the "social" (Mean = 7.37) orientations of health, although the latter is not significant.

The functionalities that members ascribed to the consumption of a hot main meal were mainly "physical" and "rewarding".

Consumers in this cluster were slightly younger with a mean age of 67.7 years and the majority received middle to high level education. Only 13.6 per cent of the members had a low educational level. This cluster included the highest percentage of consumers that perceived their health being excellent, i.e., 23.3 per cent.

Cluster "altruistic oriented" (n = 54, 11.8 per cent). In comparison with other clusters, older adults in this cluster attributed significantly more importance to the altruistic-related orientations, e.g., "social" and "caring" and were least driven by individual-related orientations of health, e.g., "achievement". In addition, members attached the highest importance ratings to "well-being" and "caring" health orientations, and the least importance to the "achievement" related health orientations.

For this cluster "physical" and "pleasure" related functionalities of a hot main meal are most important, whereas "rewarding" functionalities are less relevant.

Similar to the cluster "appearance and achievement oriented", the majority of the older adults in this cluster were women (68.5 per cent). The average age was 67.5 years and most of its members lived in a two-person household without children (79.6 per cent) or with children (12.2 per cent). Compared to the other clusters the percentage of consumers that perceived their health status being good was highest 74.0 per cent.

Cluster "achievement oriented" (n = 64, 13.9 per cent). Members of this cluster were medium involved in the "achievement" orientations of health (Mean = 4.63). Next to that the "active", "appearance" and "well-being" orientations of health received relatively low importance.

Members indicated that "physical" functionalities of a meal were least important.

Almost half of older adults in this cluster were men (48.4 per cent) with an average age of 67.9 years. On average, members in this cluster had the lowest educational level (27.1 per cent) and most perceived their health status being reasonable.

Cluster "less health oriented" (n = 101, 22 per cent). In general, older adults in this cluster attributed relatively lower importance to the different health orientations as compared to the other clusters. With regard to meal functionality, these respondents indicate that "rewarding" functionalities of a meal are least important, whereas "physical" and "pleasure" functionalities receive medium scores.

Members in this cluster have an average age of 68.8 years, 63.8 per cent of its members are highly educated and most of them are part of a two-person household without children (62.4 per cent).

3.4 Dietary intake of the clusters

Between the five clusters it was observed that there are significant differences for intake of "meat", "meat replacers" and "unsalted nuts". No significant differences were found regarding intake of the other food product groups (see Table IV).

In all clusters, the intake of unprocessed meat was below the recommended maximum of five portions per week, but members of cluster "achievement oriented" consumed significantly more unprocessed meat as compared to the other clusters. All clusters consumed meat replacers, but the average intake of the cluster "active oriented" was significantly higher.

With regard to unsalted nuts, the intake of the cluster "less health-oriented" was significantly higher compared to the other clusters.

4. Discussion

This study showed that different clusters of older adults can be identified based on their HRMO. These clusters vary in the functionalities that members associate with the consumption of a hot main meal. Furthermore, it was demonstrated that these HRMO-based clusters differed with regard to adherence to the Dutch FBDG for a few protein-rich food groups, e.g., "unprocessed meats", "meat replacers" and "unsalted nuts". These findings are in-line with previous research showing that older consumers are a heterogeneous group of people (den Uijl *et al.*, 2014; Dijkstra *et al.*, 2014), but according to our best knowledge it has not been shown yet that variation in health motives may be related to different consumption patterns with regard to some food groups.

In accordance with the studies by Geeroms *et al.* (2008b) and Raaijmakers *et al.* (2018). this study showed that health is a construct comprising multiple psychosocial dimensions that are weighted differently between consumers. In line with Raaijmakers *et al.* (2018), also performed in a Dutch population, our study divided health in six orientations: four individual-focussed health orientations, i.e., "active", "well-being", "achievement" and "appearance"; and two altruistic-focussed health orientations, i.e., "caring" and "social". As compared to the studies by Geeroms *et al.* (2008a, b), performed in a population including both young and older adults from Belgium, there are some differences with regard to the revealed factor structure of the six distinct health orientations constructs. The most outstanding differences consider the health orientations "active", "social", "well-being" and "appearance". In our study, the older Dutch respondents are more oriented towards the being "active" aspects of health than in the having energy aspects. Possibly for older consumers being able to be active is of greater importance than having enough energy. Another notable difference is that our results reveal a distinction between the social and emotional well-being aspects of health, resulting in two distinct orientations, whereas in the studies by Geeroms *et al.* (2008a, b) this is combined into one health orientation. Furthermore, it seems that in Belgium individual and social well-being are considered as one orientation of health, while in the Netherlands these are two separate health orientations. The last marked difference is that Dutch participants consider "be classy" and "be stylish" as an "achievement" health orientation, whereas the Flemish participants considered this as an appearance-related health orientation. It seems that "status" is perceived differently in both countries. So, although health can be divided into distinct motive orientations, is seems to differ over countries. Whether there are additional health orientations that are relevant for older adults but not represented in HRMO scale is yet unknown.

In our study, the most important functionality associated with consumption of a main meal was physical, followed by pleasure and rewarding. This is in accordance with the results published by den Uijl *et al.* (2014). For both achievement-oriented clusters, the

Table IV.
Overview of intake different food groups and the food-based dietary guidelines

			Recommendations according to the Wheel of Five	Recommendations as applied in research		Cluster	Appearance and achievement	Active	Altruistic	Achievement	Less health	F-waarde
Vegetables	Total Sample		250 grams per day	5 portions per day	Mean	3.94	3.96	3.95	4.14	3.78	3.89	$F = (4,454) = 0.372$
					SD	1.65	1.85	1.51	1.75	1.62	1.49	
Fruit	Total Sample		2 portions	2 portions per day	Mean	1.76	1.70	1.84	1.77	1.47	1.92	$F = (4,454) = 2.105$
					SD	1.04	0.97	1.01	1.10	0.88	1.17	
Fish	Total Sample		100 gram per week	1 portion per week[c]	Mean	1.74	1.81	1.72	2.09	1.29	1.75	$F = 4,454) = 2.159$
					SD	1.55	1.28	1.22	2.46	1.17	1.73	
Legumes	Total Sample		2–3 serving spoons per week	2–3 serving spoons per week	Mean	2.90	2.97	2.64	3.09	2.86	3.03	$F = (4,454) = 0.298$
					SD	3.13	2.72	2.97	3.25	2.78	3.87	
Unprocessed meat	Total Sample		Max. 500 grams per week	Max. 5 portions per week[d]	Mean	4.09	4.21[a]	3.38[a]	4.48[a]	4.81[b]	4.05[a]	$F = (4,454) = 3.238$**
					SD	2.78	2.62	2.25	3.62	2.93	2.79	
Meat replacers	Total Sample		–	–	Mean	0.75	0.61[a]	1.03[b]	0.79[a]	0.44[a]	0.78[a]	$F = (4,454) = 2.931$*
					SD	1.23	1.11	1.61	1.23	0.84	1.06	
Eggs	Total Sample		2–3 pieces per week	2–3 pieces per week	Mean	2.50	2.59	2.42	2.00	2.59	2.69	$F = (4,454) = 1.393$
					SD	1.87	2.02	1.65	1.37	1.98	2.02	
Unsalted nuts	Female	Total	15 grams per day	0.6 portion[d]	Mean	0.51	0.60	0.53	0.56	0.27	0.45	$F = (4,270) = 2.024$
					SD	0.60	0.71	0.60	0.62	0.42	0.45	
	Male	51–69	25 grams per day	1 portion[d]	Mean	0.49	0.39	0.48	0.61	0.49	0.51	$F = (4.88) = 0.312$
					SD	0.52	0.36	0.56	0.70	0.56	0.49	
		⩾70	15 grams per day	0.6 portion[d]	Mean	0.42	0.42[a]	0.38[a]	0.28[a]	0.16[a]	0.75[b]	$F = (4,86) = 2.804$*
					SD	0.54	0.49	0.50	0.36	0.21	0.75	
Dairy products	Female	51–69	3–4 portions per day	3–4 portions per day	Mean	1.62	1.66	1.48	1.66	1.40	1.86	$F = (4,158) = 0.688$
					SD	1.20	1.09	0.97	1.14	0.73	1.72	

(*continued*)

Table IV.

			Recommendations according to the Wheel of Five	Recommendations as applied in research		Cluster	Appearance and achievement	Active	Altruistic	Achievement	Less health	F-waarde
		⩾70	4 portions per day	4 portions per dag	Mean	1.63	1.48	1.68	1.66	1.98	1.69	$F = (4,106) = 0.528$
					SD	1.08	1.14	0.72	1.11	1.11	1.25	
	Male	51–69	3 portions per day	3 portions per day	Mean	1.42	1.53	1.68	1.76	0.97	1.28	$F = (4,88) = 1.395$
					SD	1.13	1.38	1.21	1.20	0.70	1.03	
		⩾70	4 portions per day	4 portions per day	Mean	1.76	1.75	2.09	1.45	1.31	1.77	$F = (4,86) = 0.979$
					SD	1.25	1.28	1.44	0.80	0.98	1.20	
Cheese	Total Sample		40 gram per day	2 portions[e]	Mean	0.62	0.59	0.72	0.57	0.59	0.61	$F = (4,454) = 0.735$
					SD	0.71	0.64	0.82	0.71	0.75	0.64	

Notes: [a,b,c]Post hoc tests were performed to check which means differ significantly from each other. Different superscript letters (i.e., [a,b]) indicate that the means are statistically different ($p < 0.05$). Not all food groups were included. Missing food groups: bread, cereals and potatoes, butter, margarine and oils and beverages. [c]1 portion is 100 grams; [d]25 grams of unsalted nuts is 1 portion; [e]40 grams of cheese = 2 portions (40 grams of cheese are 2 slices of cheese. 1 portion is 1 slice of cheese. *$p < 0.05$; **$p < 0.01$

physical functionality is less relevant, whereas for the cluster "Altruistic oriented", the functionality rewarding seems less relevant.

For the evaluation of food consumption FFQ (Van Assema *et al.*, 2002) was used. When interpreting the results, one should be aware that over- and underreporting may have occurred as this is common for self-reported dietary assessment methods (Bogers *et al.*, 2004). Especially reported consumption of healthy foods, such as fruit and vegetables, is frequently higher than actual intake due to socially desirable answers (Maurer *et al.*, 2006; Thompson and Subar, 2013). Still, the consumption of fruit, vegetables and dairy products was lower than the recommended daily amounts, which is in line with results from the Dutch FCS (Ocke *et al.*, 2013). Dairy products are an important source of dietary protein and commonly used products by older adults. Increasing the consumption of dairy products to recommended levels seems therefore a good strategy to increase protein intake.

5. Implications

Overall, older consumers seem to be interested to some extent in "well-being" and "social" orientations of health. So, for the food groups for which consumption levels are below recommended amounts across all HRMO clusters, i.e., fruit, vegetables, dairy (including cheese) and unsalted nuts, consumption could be promoted for example by stressing the importance of "well-being" and highlighting the "rewarding" or "physical" meal functionalities.

However, the heterogeneity of older consumers with regard to the other health motives and the differences in food consumption between HRMO-based clusters, suggest that a tailored approach might be more supportive. Our study suggests that "appearance and achievement oriented", "active oriented" and "altruistic oriented" clusters seem potentially easier to reach as they are more open towards and outspoken about their health orientation and their associated mealtime functionalities. Next to that, members of "active oriented" cluster seem to have healthiest eating pattern as their intake comes closest to the dietary guidelines. To support these consumers in coming still closer to the guidelines stressing the being active orientation in combination with rewarding meal functionality is expected to attract them. Slogans and recipes that support staying active and getting energy from your meals could be appealing for this cluster. As consumption of meat replacers is most common in this cluster, suggestions to replace meat with plant-based foods or adding nuts may be a good strategy. As this cluster included small household sizes, recipes for one or two persons may be most appropriate.

Clusters "Appearance and Achievement oriented" and "Active oriented" are more focussed on their own individual orientations, as opposed to members of the cluster "Altruistic oriented". For the cluster "Altruistic oriented" interventions that target caring, e.g. take care of yourself, and social aspects, e.g. preparing a meal for others, may be most attractive.

Clusters "achievement oriented", and especially "less health oriented", together accounting for 36 per cent of the study population, seem more difficult to reach with interventions addressing health motive orientations since scores on the different HRMO orientations are relatively lower. Next to general wellbeing, the cluster "achievement oriented" might be reached with messages about ambitions or being successful in combination with the pleasure functionality of the meals. For the cluster less health oriented other tailoring strategies focussed on, for example price or convenience may be more effective for supporting healthy food choice.

It seems that the clusters that are already more interested in health orientations might be easier to reach. These clusters also seem to have more healthy dietary behaviours. The effectiveness of segmentation-based communication strategies or interventions should be further explored in order to support campaigns and marketers in tailoring their products and messages.

5.1 Limitations

Some limitations of the study have to be considered when interpreting our results. This study included community-dwelling older consumers of the SenTo network. It should be taken into

account that the panel is a representative sample of older adults in the Netherlands with regard to age and health status, but less representative with regard to education level. It is known for example that older adults with low socio-economic status are less interested in health motives like disease prevention (Dijkstra *et al.*, 2014). Thus, our study population might be more health oriented than the general population of older consumers.

In general, participants in our study judged their health status as good. Maybe health orientations change with life-changing events, e.g., events that affect their own health status or the health status of a close relative. Such events may provide a "window of opportunity" to initiate behaviour change and therefore consumers may be more sensitive to interventions (Schäfer *et al.*, 2012). This needs further exploration especially in older adults.

With regard to food consumption, the focus of this study was to evaluate intake of food groups included in the FBDG. Food groups not included in the FBDG, i.e., less healthy groups as processed meat was not included in our evaluation. So, this study does not provide data on overall consumption patterns. Protein is an important nutrient for older consumers in relation to maintaining muscle health. In this study only low-fat dairy and low-fat meat and unprocessed meat were considered. Other protein sources such as high-fat dairy, fat or processed meats were not considered and therefore from our data it cannot be judged whether protein intake was sufficient or not.

The issue of obesity, overweight and its relation to food intake is highly relevant also for the target population of our study. Data from a Dutch Population monitor show that the chance of being overweight increases with age (RIVM, 2018). This is in line with the study of Peralta *et al.* (2018) who state that the prevalence of obesity has increased rapidly in the last 40 years, particularly among adults aged 60 to 74 years. In order to develop targeted\tailored interventions, we not only should measure consumption of those food groups being part of the Dutch dietary recommendations, but especially the consumption of less healthy food groups as well as BMI. These insights might help to even better understand dietary determinants of overweight of the different segments and its link to health-related motive orientations.

6. Conclusion

This study showed that healthy community-dwelling Dutch older consumers can be divided into five different clusters. These clusters significantly differed with regard to health-related motive orientations, functionalities ascribed to mealtimes and consumption of few product groups. The effectiveness of tailoring communication strategies and other interventions to the clusters identified in this study should be further explored.

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