

Research article:

Appetite for life - Maintaining appetite for foods at old and very old age

K. Wendin^{1,2,3}

¹Kristianstad University, Sweden,

²SP Technical Research Institute of Sweden – Food and Bioscience, Sweden,

³University of Copenhagen, Denmark,

W.L.P. Bredie¹

¹University of Copenhagen, Denmark,

I. Maître¹

¹Unité de Recherche GRAPPE, Univ Bretagne Loire, Ecole Supérieure d'Agricultures (ESA), INRA
Angers, France,

I. Matullat¹

¹TTZ, Bremerhaven, Germany,

V. Olsson¹

¹Kristianstad University, Sweden,

S. Kremer¹

¹WUR, Wageningen, Netherlands,

A. Giboreau¹

¹The Centre for Food and Hospitality Research, Institut Paul Bocuse, 69130 Ecully, France

Ø. Ueland¹

¹NOFIMA, Norway

Abstract :

Maintaining appetite for foods at old and very old age is important for keeping a reasonable health status and quality of life in this growing group of citizens. Since the personal health status and living condition change for people at higher age a loss of independence in the way they are accustomed to prepare and consume foods is often a consequence. This may lead to changes in consumption patterns and a deteriorated living condition. Full attention should be given to different approaches on how quality of life and appetite for food can be maintained in this group of citizens. The present short communication addresses this topic from multiple angles and presents the results from a discussion by experts on the topic.

Keywords : Elderly, Appetite, Food provision.

1. Introduction

The ageing of populations in countries across the globe is a major societal and public health concern now and in the coming decades. Older and very old people form a heterogeneous group with rather different needs for assistance and support in their daily routines and living conditions. One important health issue among the elderly is the increasing risk of developing malnutrition which can be considered as a multifaceted phenomenon linked to health problems and to periodic or permanent loss of independence. The negative consequences of poor nutrition lead to a general decline in the quality of life and associated costs for health and nursing care (Arvanitakis et al., 2008).

With support from society and relatives, a growing share of European elderly live independent, active and healthy lives in their own homes. It is, typically, elderly in the age of 85 or older (referred to as the oldest old) who are most prone to lose the ability to live independently due to limited mobility, frailty, or other declines in physical or cognitive functioning. Depending on the degree of independence in the food provision situation, elderly can be divided into different groups; 1) living in their private home alone or in a household with complete or partial independence of food provision; 2) living at home with complete dependence on food provision (e.g. meals provided by the nursing services coming into their houses) and 3) living in caring and nursing homes with completely arranged food provision.

The food provision situation is influenced by different factors such as financial constraints, decreased mobility (e.g. for shopping) or decreased movability (e.g. for cooking) (Edfors and Westergren, 2012)., The different groups may have impaired physical abilities as well as cognitive, physiological and sensory functions. Even though several changes are clearly apparent, elderly themselves have often insufficient of knowledge about losses in sensory perception and changing nutritional needs.

Although the grouping of elderly according to their degree of independence in food provision is

practiced by decision makers allows an individual to enrol in meals-on-wheels or move to a day-care centre, the underlying causes and risks for losing appetite and developing anorexia may be very different between individuals. Several psychological, personal health and social health factors have been identified leading to losses in appetite and development in anorexia at higher age (Morley, 1997) and deserve careful attention. Eating enough nutritious food is also influenced by the situation of food provision for the individual elderly. Food provision in this context means the ability to perform food shopping, food preparation and eating of the cooked or prepared food. Preparing and cooking foods are challenging tasks for different groups of old people. Furthermore, changes in sensory perception are also considered an important factor to uphold adequate food consumption since sensory perception is key to food liking, which is an important driver for food intake. Studies have shown that compensation for losses in taste and smell by increasing flavour intensity (not oral heat and flavour complexity) among elderly in dependent and independent living situations worked best for elderly being dependent on food provision (Song et al., 2016). Therefore, sensory compensation aspects could be utilised in elderly care to make foods more appealing and appetising. Loss of appetite and reduced food intake is, however, a common phenomenon in the old and very old citizens and may be due to a multitude of factors such as decreased physical ability, the meal situation including social interactions, health condition, etc. (Nyberg et al., 2014). The present report considers several reflections on how food intake in the elderly who are complete or partially dependent on food provision can be maintained or improved.

2. The Workshop

This communication reports on the “Appetite-for-life in a sensory perspective” workshop held at the 11th Pangborn Sensory Science Symposium in Gothenburg, Sweden, 24 August 2015. This workshop followed the earlier discussions at the “Health and quality of life in an aging population:

Food and beyond” workshop during the 6th Eurosense meeting, 7-10 September 2014 in Copenhagen, Denmark (Giacalone, et al., 2016). The workshop was divided into five themes of 1) Appetite and health status in different groups; 2) The food provision situation; 3) Living situation; 4) Design of nutritious foods; and 5) Sensory Variety. The central question addressed was how to stimulate appetite and nutritious food intake in the elderly from a sensory perspective? The workshop was organized around brief presentations by invited speakers on the five themes followed by group discussions in the audience. Each group discussed specific questions in depth according each theme. The outcome from all the groups was gathered and presented followed by a joint discussion among all participants.

The aim of “Appetite-for-life” workshops was to discuss the current situation of food appetite in the elderly, define challenges and bring out new ideas on how to increase appetite from a sensory and living condition perspective, especially for those elderly being at risk for developing malnutrition.

Theme 1 Appetite and health status in different groups

A recent example of studying appetite and health status among elderly is the French Aupalesens survey (Maitre et al., 2014). The survey was conducted in four French cities (Angers, Brest, Dijon, Nantes) on 559 elderly people over 65 years with a good cognitive health (MMSE>20), dependent for food or not. Its main objective was, in a multidisciplinary approach, to identify how appetite, eating pleasure, meal satisfaction and sensory abilities were correlated to nutritional status and health. Using a Clustering and Disjoint Principal Component Analysis, we identified seven clusters which naturally split in three groups being on average less than 80 years old and four groups being on average more than 80 years old. As expected, the nutritional status, measured by the Minimal Nutrition Assessment (Guigoz, et al. 2002), decreased with age. Since malnutrition in the groups of elderly below 80 years was almost non-existing and the proportion of individuals at risk of malnutrition was moderate, interventions at this stage seems most relevant. Among the groups of less than 80 years old, one group consisted of

individuals living at home, of which 64% were living alone. This group was characterized by less eating pleasure and a lower level of satisfaction with meals. They were as selective as the two other groups but liked meat less (Maître et al., 2014). The elderly groups of 80 years and older had lower olfactory capacities, in particular odour discrimination (Sulmont et al., 2015) compared to the groups below 80 years of age. Among them, those who had a good appetite and kept pleasure in eating had a better nutritional status than the other ones, characterized by either loss of interest in food, associated to depression, either difficulties in eating.

***Theme 1 question:** Could we imagine a holistic approach, including sensory keys, to keep the motivation to eat for elderly who are no longer interested in eating?*

Theme 2 The food provision situation

The autonomy and involvement of the elderly is of key importance when creating new solutions for better food provision situations at home (Edfors & Westergren, 2012). The adoption of information and communications technology (ICT) tools such as smartphones, tablets, etc. could provide opportunities to improve the food provision for the individual. Also, these mobile devices may support elderly during their preparation of food. It has been shown that elderly still have the ability to learn to use unfamiliar technology (Pijukkana & Sahachaisaeree, 2012). However, people above 55 years have been slower in adopting PCs and using the Internet. Once the initial lack of confidence has been removed, they became and remained enthusiastic users. Interactive communication platforms including face-to-screen communication and social networks are widely available and may be more effectively used in promoting food consumption. Besides ICT tools to engage elderly in food preparation and eating, other tools are available for people lacking physical abilities. These tools can be very simple adjustments of cutlery to advanced robotised aids to assist transport of food from the plate to the mouth (Lindborg and Lindén, 2015).

Theme 2 question: *How much and in which way can ICT help us to support the food provision and to improve sensory pleasure during eating.*

Theme 3 Living situation

Several elderly who are living independently are in need for professional guidance to avoid development of malnutrition. Dean et al (2009) showed that the variety of food intake was dependent on material resources such as income, mobility, living arrangement and health. Also other factors, eg appetite, food knowledge, distance to shop, access to high-quality products, kitchen facilities, access to service were shown to contribute to the variety of food intake.

Poor cooking skills, especially among elderly men, have been shown to be a barrier to energy intake, healthy eating and appetite (Hughes et al., 2004). Frailty and motoric difficulties may further hinder food provision and cooking. Aids and adaptations are often only accepted by those wholly dependent upon them. The various aids and adaptations for cooking and eating are insufficiently known among elderly people and care takers.

There is also a need for the development of easy-to cook, nutritious recipes that meet the sensory needs and food culture of the individual. The dishes should contain few and easily accessible ingredients, readily available from the nearest food-store or provided in a practical way (e.g. a prepacked, home-delivered grocery bag). The recipes should consider the design and availability of kitchen utensils and appliances.

Being independent and being able to eat and cook for your self are strongly associated with wellbeing and increased self-esteem. Since food consumption is not only an exercise of nutritional intake but also part of a meal occasion providing comfort and wellbeing for the individual, it is crucial to develop various types of strategies that may enhance mealtime experiences (Mahadevan et al., 2014).

Theme 3 question: *How to design recipes for easy home cooking in a culinary and efficient way?*

Theme 4 Design of nutritious foods

Relationships between orosensory exposure, food intake and degree of satiation have been well established. Among others, the sense of taste is thought to be a nutrient sensor which informs the brain and the gut about the inflow of nutrients. The ingestion of energy-yielding beverages and foods low in fibre content, which can be consumed very quickly and have a short orosensory exposure, leads to a higher energy intake in humans (Viskaal-van Dongen et al. 2011). It has also been shown that a prolongation of the orosensory exposure time to foods triggers an earlier meal termination and/or a higher satiety response in young adults. Obviously, the focus in all these studies was mainly on unravelling the underlying mechanisms with the aim of being able to design foods that promote earlier satiation and/or a longer satiety response. However, these mechanisms might also prove to be useful when one aims to design foods in such a way that they promote a certain amount of overeating in nutritionally frail seniors (Doets and Kremer, 2016).

Recently, several interesting observations have been made with regard to seniors. Firstly, a prolonged orosensory exposure time (i.e. 150% or 200% of the habitual number of chews) reduced the postprandial pleasantness of a food, i.e. pizza rolls, but did not impact on actual appetite or consumed meal size in older consumers. Interestingly, in young adults, the same intervention resulted – in line with the above described mechanisms – in a reduced meal size (Zhu and Hollis, 2014). Secondly, a recent study showed that with repeated exposures the wanting and consumption of a soup increased in seniors, despite the fact that the liking for this soup remained stable. Finally, in older consumers it was observed that regardless of energy content and portion size of a meal, absolute intake was always around 81% (beef meals) and 89% (chicken meals) of the served portion (Ziylan et al., 2016). Thus, it seems that the participants ceased eating when a certain percentage of the provided meal was consumed, rather than when a certain amount of energy was consumed. Taken together, these findings suggest that seniors' meal size might be based on habitual intake behaviour rather than on food liking and/or actual feelings of hunger. For

future research, systematic studies that examine both orosensory exposure times of foods and total portion size as possible modulators of seniors' intake are strongly encouraged.

Theme 4 question: *Could (protein-enriched) foods be designed in such a way that they could promote a certain amount of overeating in nutritionally frail seniors?*

Theme 5 Sensory Variety

Seeing, smelling, touching or tasting a food can lead to a decrease of its liking during consumption. This phenomenon is known as sensory specific satiety and can be measured in real consumption settings (Fernandez et al. 2013). The working hypothesis of the present theme is based on the reverse phenomenon: could an increase in sensory variety lead to an increase of eating pleasure and hence of food intake. For instance tasting a variety of foods has been shown to delay satiation and choice variety appeared to increase food intake (Hollis et al., 2007). Changing food contextual elements (choice variety or condiments) of the meal improved residents' meal satisfaction and increase food intake of meat or vegetables. However, factors affecting the context of the meal (names of dishes, decor) in the elderly nursing home proved to be ineffective.

Pouyet et al. (2015) tested single versus pair presentations of small aperitif toasts made of eggplant puree on soft bread (104 participants; mean age 89). The number of toasts increased significantly when two variants were presented as compared to when only one type of toast was

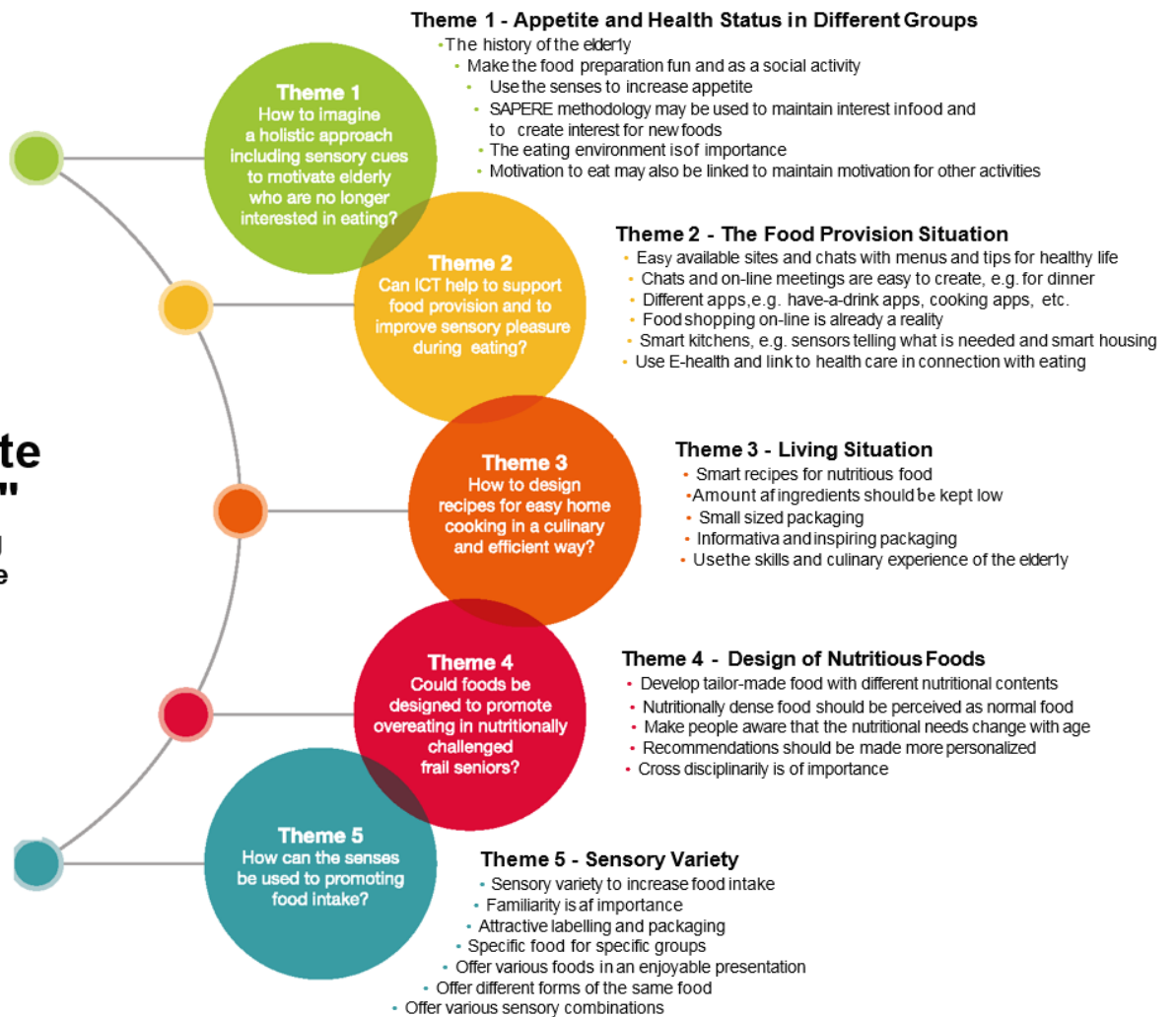
presented. Results showed a positive influence of sensory variety on food intake of elderly in nursing homes. However, the effect was not shown in elderly with cognitive impairments. Sensory variety could be brought by varying the flavour, the colour or the texture of a given food or by increasing the number of food presented without increasing the overall quantity of the offered food and without affecting the overall cost of the meal. For instance, we compared a green beans portion to a portion of mixed green and yellow beans one presented in a nursing home restaurant (78 participants, mean age 84). Results showed an increase of food consumption, with a significant increase of the meat consumption.

Theme 5 question: *Which sense is the most efficient to increase food intake: appearance (colour enhancement)/ flavour (taste – aroma – trigeminal enhancement)/ texture (soft/hard contrast)?*

3. Results

The central question was: How to stimulate appetite and nutritious food intake in the elderly from a sensory perspective? This question was then divided into the five themes: 1 Appetite and health status in different groups: 2 The food provision situation, 3 Living situation, 4 Design of nutritious foods and 5 Sensory variety. The results were divided into these themes and an overview of suggestions given on how to answer the different theme-questions are given Figure 1 and in the text below.

"Appetite for life" promoting food intake



Theme 1 Appetite and health status in different groups

Knowing the individual history of the elderly, why they lost interest in food seems very important to adapt food and food supply. Food preparation, packaging, labelling, etc. should be thought to make the food easy, attractive, interesting and appealing in different ways adapted to different groups of the elderly, taking into account how variable the elderly population can be. We have to make the food preparation fun, as a social activity and as an opportunity to use the senses to increase appetite. E.g. take care of which spices to use, less hot ones but avoid tasteless food, colours to make the food attractive, etc. SAPERE methodology may be used for elderly to maintain interest in food and also create interest for new foods. The eating environment is of importance, lighting, sound, the

social interaction and conviviality. Motivation to eat may also be linked to maintain motivation for other activities, including activities related to smelling, or related to discover other cultures.

Theme 2 The food provision situation

It should be easy to find sites and chats where menus and tips for a healthy life on-line can be found and shared with each other. Here also chats and on-line meetings are easy to create, e.g. to have dinner together or just talking within own generation or with young people. The step is not far to have apps in mobile devices, e.g. have-a-drink apps, cooking apps, etc. Food shopping on-line is already a reality for many people and more and more elderly may be encouraged using this kind of service. Smart kitchens, e.g. fridge with sensors telling what is needed and smart housing. The use of E-health and link to health care in

connection with eating is an important task. ICT security issues have to be taken into account such as easy safe passwords and accessibility.

Theme 3 Living situation

Smart recipes should provide nutritious food with ingredients easily found in food stores and easy to cook. The amount of ingredients should be kept low. The packaging of the food ingredients should be of small sizes and also be informative and inspiring. When developing recipes targeted for different groups of elderly it is important to use the skills and culinary experience of the elderly and consider how such knowledge can be transferred between elderly and between generations.

Theme 4 Design of nutritious foods

It is possible to tailor-make food for different groups, with different nutritional contents, even though it is not easy. The sensory goal is to have nutritionally dense food to be perceived as low nutritious food. It is well known that different sources of proteins may give different effects on satiety. E.g. “bubbles” of proteins can be used in the development of such foods, and also use advantage of different flavourings. To make people aware that the nutritional needs change with age and tips on how to combine protein intake with exercise might be a motivation factor. General recommendations should be avoided and instead be made more personalized and turn to different target groups with specific recommendations and advices. Cross disciplinarily is of importance.

Theme 5 Sensory variety

Sensory variety is a potential lever to increase food intake. Familiarity is to be considered as a pre-requisite before looking for any variety. Sensory variety should be searched within familiar food forms to avoid rejection. Labelling, packaging or the dressing of the food have to be attractive and create positive feelings. The food itself should be specific to the targeted group in terms of convenience, size, texture, etc. Further suggestions are: to offer various foods in a enjoyable presentation; to offer different forms of the same food such as raw/ half cooked/ cooked and; to offer various sensory combinations concerning colour, flavour intensity, contrasted textures.

The results show the need for individual attention around food provision addressing the wide variety of living conditions and requirements in the older citizens. The importance of food and eating as a social activity and the importance food attractiveness, variety and convenience are highlighted. Also familiarity of foods and dishes is an important issue as well as the eating environment. New technologies and ICT should be adapted and used as tools to facilitate everyday life. Food and food activities should be fun and easy to increase appetite as well as appetite for life.

4. Discussion and Conclusion

The discussions during the workshop certainly reflected the ongoing discussions in the society where it is often stated that the individual has to be in focus. Individual needs, requirements and requests differ between groups and individuals, and this is something that we need to take into consideration if we should be able to reach the EU-devised “add life to years”.

In addition to the sensory perspective in improving appetite and food intake among elderly people, the scientific approach in the workshop pinpointed the importance of social aspects associated with food and food consumption contexts. Several suggestions were presented for how new interactive technology could be incorporated into the daily food routines for elderly people in order to offset disadvantages related to, for instance, lack of company or memory deficiencies.

Because of the multidisciplinary aspect of all food intake related factors and elderly consumers, use of knowledge and involvement of specialists from disciplines not normally working together, was seen as central for bringing the field forward. For instance, specialists in welfare technology as well as in ICT need to collaborate with health personnel as well as chefs, scientists and designers are combinations that can contribute fruitfully with new ideas and innovative solutions.

On a more general plane, future research should be focused on holistic and individualized solutions concerning living conditions, nutrition and health

in older citizens becoming more dependent on food provision.

Acknowledgements

The authors wish to thank the many colleagues, collaborators and participants in the workshop 'Appetite for Life' for valuable inputs and discussions. Special thanks are to Sylvie Issanchou and Claire Sulmont-Rossé for their contribution to the background description of theme 1.

References

- Arvanitakis, M., Beck A., Coppens P., De Man, F., Elia M., Hebuterne, X., Henry, S., Kohl, O., Lesourd, B., Lochs, H., Pepersack, T., Pichard, C., Planas, M., Schindler, K., Schols, J., Sobotka, L., Van Gossum, A., (2008). Nutrition in care homes and home-care. How to implement adequate strategies. *Clinical Nutrition*, 27: 481–488.
- Dean, M., Raats, M., Grunert, K., Lumbers, M. (2009). Factors influencing eating a varied diet in old age. *Public Health Nutrition*, May 2009; 1-7.
- Doets, E. L., Kremer, S. (2016). The silver sensory experience – A review of senior consumers' food perception, liking intake. *Food Quality and Preference*, 48: 316-332.
- Edfors, E., Westergren, A. (2012). Home-living elderly people's views on food and meals. *Journal of Aging Research*, ID 761291, 9 p.
- Fernandez, P., Bensafi, M., Rouby C., Giboreau, A. (2013). Does olfactory specific satiety take place in a natural setting? *Appetite*, 60: 1-4.
- Giacalone, D., Wendin, K., Kremer, S., Frøst, M. B., Bredie, W. L. P., Olsson, V., Otto, M. H., Skjoldborg, S., Lindberg, U., Risvik, E. (2016). Health and quality of life in an aging population - Food and beyond. *Food Quality and Preference*, 47: 166-170.
- Guigoz, Y., Lauque, S., Vellas, B. (2002). Identifying the elderly at risk for malnutrition. *The Mini Nutritional Assessment. Clinics in Geriatric Medicine*, 18: 737-757.
- Hollis, J. H., Henry, C. J. K. (2007). Dietary variety and its effect on food intake of elderly adults. *Journal of Human Nutrition and Dietetics*, 20: 345-351.
- Hughes, G., Bennett, K. M., Hetherington, M. M. (2004). Old and alone: Barriers to healthy eating in older men living on their own. *Appetite*, 43: 269-276.
- Lindborg, A. -L., Lindén M., (2015). Development of an eating aid – From the user needs to a product. Blobel, B., Lindén, M. and Ahmed, M.U.(eds) *pHealth2015* 191-199.
- Maitre, I., Van Wymelbeke, V., Amand, M., Vigneau, E., Issanchou, S., Sulmont-Rossé, C. (2014). Food pickiness in the elderly: Relationship with dependency and malnutrition. *Food Quality and Preference*, 32: 145-151.
- Mahadevan, M., Hartwell, H., Feldman, C., Ruzsilla, J., Raines, E. (2014). Assisted-living elderly and the mealtime experience. *Journal of Human Nutrition and Dietetics*, 27: 152-161.
- Morley, J. E. (1997). Anorexia of aging: physiologic and pathologic. *American Journal of Clinical Nutrition*, 66: 760-773.
- Nyberg, M., Olsson, V., Pajalic, Z., Örtman, G., Blücher, A., Andersson, H., Wendin, K., Westergren, A. (2014). Elderly with eating difficulties: Nutritional status, food choice, preferences, and meal experiences – a literature overview from a Scandinavian context. *Journal of Food Research*, 4: 22-37.
- Pijukkana, K., Sahachaisaeree, N. (2012). Graphical design and functional perception on technology-driven products: Case study on mobile usage of the elderly. *Procedia - Social and Behavioral Sciences*, 42: 264-270.
- Pouyet, V., Cuvelier, G., Benattare, L., Gibaureau, A. (2015). Influence of flavour enhancement on food liking and consumption in older adults with

poor, moderate or high cognitive status. *Food Quality and Preference*, 44: 119-129.

Song, X., Giacalone, D., Johansen, S. M. B, Frøst, M. B., Bredie, W. L. P. (2016). Changes in orosensory perception related to aging and strategies for counteracting its influence on food preferences among older adults. *Trends in Food Science and Technology*, 53: 49-59.

Sulmont-Rossé, C., I. Maître, Amand, M., Symoneaux, R., Van Wymelbeke, V., Caumon, E., Tavarès, J. Issanchou, S. (2015). Evidence for different patterns of chemosensory alterations in the elderly population: Impact of age versus dependency. *Chemical Senses*, 40: 153-164.

Viskaal-van Dongen, M., Kok, F. J., de Graaf, C. (2011). Eating rate of commonly consumed foods promotes food and energy intake. *Appetite*, 56: 25–31.

Zhu, Y., Hollis, J. H. (2014b). Increasing the number of chews before swallowing reduces meal size in normal-weight, overweight, and obese adults. *Journal of the Academy of Nutrition and Dietetics*, 114: 926-931.

Ziylan, C., Kremer, S., Eerens, J., Haveman-Nies, A., de Groot, L. C. G. M. (2016). Effect of meal size reduction and protein enrichment on intake and satiety in vital community-dwelling older adults. *Appetite*, 105: 242