



Sensory and consumer science methods used with older adults: A review of current methods and recommendations for the future



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ABSTRACT

Capturing the sensory perception and preferences of older adults, whether healthy or with particular disease states, poses major methodological challenges for the sensory community. Currently a vastly under researched area, it is at the same time a vital area of research as alterations in sensory perception can affect daily dietary food choices, intake, health and wellbeing. Tailored sensory methods are needed that take into account the challenges of working with such populations including poor access leading to low patient numbers (study power), cognitive abilities, use of medications, clinical treatments and context (hospitals and care homes). The objective of this paper was to review current analytical and affective sensory methodologies used with different cohorts of healthy and frail older adults, with focus on food preference and liking. We particularly drew attention to studies concerning general ageing as well as to those considering age-related diseases that have an emphasis on malnutrition and weight loss. Pubmed and Web of Science databases were searched to 2014 for relevant articles in English. From this search 75 papers concerning sensory acuity, 41 regarding perceived intensity and 73 relating to hedonic measures were reviewed. Simpler testing methods, such as directional forced choice tests and paired preference tests need to be further explored to determine whether they lead to more reliable results and better inter-cohort comparisons. Finally, sensory quality and related quality of life for older adults suffering from dementia must be included and not ignored in our future actions.

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1. Introduction

Aging is generally associated with an impairment of sensory perception. Visual and hearing impediments are perhaps the most widely recognised, followed by changes in taste, smell and texture perception (Doty & Kamath, 2014; Hutchings, Foster, Grigor, Bronlund, & Morgenstern, 2014; Winkler, Garg, Mekayarajananonth, Bakaeen, & Khan, 1999; Withers, Gosney, & Methven, 2013). Changes in sensory perception can affect the enjoyment of food and dietary choices (Davenport, 2004). Older people are often faced with other physical sensory barriers such as dysphagia, dentures or motor deficiencies; they may also be taking medication, and may have psychological sensory barriers e.g. diminished cognition, low state of mind. This aggravates their ability to perceive sensory stimuli, which in turn may lead to an inadequate diet, putting them at risk of protein and energy malnutrition. Malnutrition is significantly more common in older people and the ageing population will only exacerbate the problem in years to come. The National Health Service in the UK estimated that in 2014 about 3 million people were malnourished at any time and many more were at risk of becoming malnourished. Around one in three people admitted to hospital or care homes in the UK are found to be malnourished or at risk of malnourishment (National Health Service, 2015).

The European Unions' ageing policy considers adults both over 60 and 65 years of age as elderly (European Commission, 1998). The UK defines older adults as those over 65 years (Office of National Statistics, 2013a, 2013b). In this review we consider studies with people over 65 years of age. The review then refers to both "healthy" and "frail" older adults, and yet each group is highly heterogeneous. Both groups will vary substantially in their sensory capabilities (vision, hearing, taste, olfaction and mouth-feel perception), cognitive capabilities and physical capabilities.

We take into account studies performed with frail elderly people. Morley, Perry, and Miller (2002) defined frailty as a pre-disability state and a condition in which there is decreased physiological reserve and resilience. When frail persons are exposed to a stressor, they are at increased risk for developing disability or dying (Morley et al., 2002). However, we have used frailty in a broader context to cover older adults living in nursing homes or in residential care, or being treated as patients in hospital elderly care wards, or with specific disease states. Protein and energy malnutrition is often experienced by frail elderly people and contributes to sarcopenia, impaired immune function, delayed wound healing, gastrointestinal malfunction, fatigue and delayed recovery from acute events. The broad categorisation of older adults into "healthy" and "frail" is artificial and does not account for the diverse spectrum of different levels of frailty, different disease states and extent of disease, nor the diversity of older people in both "healthy" and "frail" group. However, there are insufficient studies within all possible group types to review and so the purpose of the classification is merely to ensure we have considered sensory and consumer methods used in studies across a diverse range of older adults.

Sensory evaluation has been defined as the accurate measurement of human responses to foods, having minimised the potential biasing effects such as brand identity (Lawless & Heymann, 2010). The focus here is analytical, on the perception of food. However sensory science also encompasses affective measurements from consumers on aspects such as hedonic liking, preference and acceptability. Meiselman considers eating behaviour to be comprised of three variables; the food, the people and the environment (encompassing all environmental factors; the physical environment of shopping and eating, as well as the social and economic context) and that these three factors should be fully integrated (Meiselman, 2007).

Table 1
Limitations and opportunities of sensory and consumer studies with healthy and frail older adults.

Limitation	Opportunity
Visual or hearing impairment of participants	Simple scales (e.g. the "School scale") or paired preference tests are easier to use than category or line scales for hedonic measurement
Dentures, medication and health status	Dentures, medication and health status all significantly affect perception and should be systematically considered in all studies
Fatigue	Study designs to present minimum sample numbers and questionnaires should be short. Options: <ul style="list-style-type: none"> – In threshold testing consider the rapid staircase method where an accurate threshold is needed, or the simpler solution drop to tongue method where an approximate threshold sufficient – In hedonic testing carry out larger studies with healthy older cohorts first to screen down to less products to test with frail older cohorts
Cognition: confusion in understanding perceived intensity scales	Keep scales simple. Options: <ul style="list-style-type: none"> – Scales with semantic descriptors (gLMS or category scales) rather than VAS – Discrimination tests to determine extent of difference between samples
Cognition: confusion in understanding hedonic scales	Keep scales simple. Options: <ul style="list-style-type: none"> – Stating of a simple score out of 10 ("School scale") – Paired preference tests are easier to use than category scales, and category scales are easier than VAS – Facial coding of the participants using either the cued facial scale (CuFS) or combined CuFS and adapted acceptance-rejection pain scale – Record choice rather than rating liking
Low participant numbers	Large study sizes with clinical groups often prohibitive. Options: <ul style="list-style-type: none"> – Carry out larger studies with healthy older cohorts first to screen down to less products to test with frail older cohorts – Restrict testing in clinical setting to tightly defined cohorts where variation in liking across the cohort may, therefore, be reduced – Carry out intake or recorded choice studies rather than liking studies in clinical settings
Context	Context can have a marked effect on hedonic ratings and yet ratings are often compared between clinical and non-clinical environments. Options: <ul style="list-style-type: none"> – Use simulated or evoked context study designs with non-clinical groups
Testing products where participants have no prior experience	When testing foods for special medical purposes (FSMP), participants may have no prior experience of the product type or category. Options: <ul style="list-style-type: none"> – Familiarise consumers with the product category prior to testing – Use evoked context study designs

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