Exploring the use of rapid profiling techniques for use in older adult populations

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ABSTRACT

Research involving measurements of sensory perception among the older adult population is complicated by difficulties with traditional testing methods for these individuals. A trend in food sensory testing is the use of rapid profiling techniques. Three rapid profiling techniques – check-all-that-apply (CATA), sorting and projective mapping– were tested in an older adult population (aged 60 +) to determine their appropriateness of use with this population. Participants (n = 60) attended three sessions where seven commercially available instant and ready-made puddings along with two duplicate samples were evaluated using each of the three rapid profiling methods. A younger cohort of individuals (n = 60) was used as a control. All three methods appeared to produce valid results in the older population group, however, higher panelist reliability, lower difficulty and higher percentage of correct completions led to the conclusion that CATA is the most appropriate rapid profiling test for older adults.

1. Introduction

Although declines in taste and smell capabilities are evident in the older adult population, there is still a lack of understanding of how these changes affect older adults' perception of the sensory properties of foods. Often studies examining age related changes in sensory capabilities focus on the relations between threshold levels of detection and liking of foods and don't investigate perception of the sensory properties of the food themselves. Previous research has correlated liking responses from older adults with results from a trained panel evaluation of a food (Tsikritzi et al., 2015), however this is an indirect measure of association and does not directly measure what is being perceived by the older adults. In order to obtain a direct measure of what is being perceived by older adults, a sensory methodology which can be used by older adults to profile the perceived sensory properties of the food must be determined. This is the focus of the current study.

To date, a number of difficulties have been identified when conducting sensory testing with older adults. These difficulties can be associated with the test itself or they can be associated with cognitive difficulties of the individual completing the test. Problems with the test mainly revolve around scale use. A nine-point hedonic scale is the traditional scale used for measuring liking. However, it has been found that older adults tend to use the upper end of the scale more often than

younger adults, giving the perception of higher liking of a food (Forde & Delahunty, 2002; Kozlowska et al., 2003). Kozlowska et al. (2003) speculated that this may be due to difficulty understanding the scale or giving elevated ratings because of a desire to please the testers. Forde and Delahunty (2002) also tested the ability of older adults (aged 65 and older) to use a 100-mm line scale by having them rate the area of five test circles on a scale using two reference circles at the top and bottom end of the scale. It was found that, although the older adults were able to rate the circles correctly in order of size, they used the scale differently than the younger adults; the older group used a smaller portion of the line scale leading to less discrimination between the products (Forde & Delahunty, 2002).

In order to address challenges with conducting testing with individuals with cognitive disorders, Pelletier and Lawless (2003) proposed a new scale called the Cued Facial Scale (CuFS) derived from the smiley face scale often used for hedonic testing with children (Chen, Resurreccion, & Paguio, 1996). During the use of this scale, participants are first presented with three smiley faces, representing "like", "neutral" and "dislike" (Pelletier & Lawless, 2003). If the "like" face is chosen, a second scale is presented with three more faces representing "like", "like a lot" and "like extremely" and a similar scale is presented for subjects who choose "dislike" on the original scale with "dislike", "dislike a lot" and "dislike extremely" options (Pelletier & Lawless,

2003). Although this scale was found to take more time than the traditional 9-point hedonic scale, older adults with cognitive disorders had an easier time comprehending and using the scale (Pelletier & Lawless, 2003). These methods help improve sensory testing in older adults when collecting information about product liking; however, there is not yet a good alternative to gather information about sensory perception of product attributes in this population. Often sensory researchers use trained panelists to gather sensory information to characterize foods developed for the older adult population. Yet there is no evidence that this information reflects the sensory perceptions experienced by older adults, making it important to find a method that gives accurate results for this population. One possible solution that was suggested by Maitre, Simoneaux, and Sulmont-Rosse (2014) is the use of rapid profiling techniques with the older adult population. These new testing methods generally do not use scales as in traditional methods and can be completed quickly in one session. The applicability of these scales for sensory testing with older adults must be examined. Therefore, the aim of this work is to examine three rapid profiling methods – check-all-that-apply, sorting and projective mapping–to determine whether they can effectively be used by an older adult population to characterize food products. Measures of performance associated with ease of use and successful completion of each method by the older adult population were also recorded.

2. Methods

2.1. Samples

Seven commercial instant, cooked and ready-made pudding samples were used for each of the three testing methodologies. The list of puddings is shown in Table 1. Two of the pudding types (Jell-O Vanilla and Jell-O White Chocolate) were each presented twice to panelists as blind duplicates giving a total of nine pudding samples for each test.

All puddings were prepared according to package directions using pasteurized 2% milk for cooked and instant puddings. Puddings were prepared 24 h prior to testing and stored in a 5 °C refrigerator until 30 min prior to the testing session when they were taken out to equilibrate to room temperature. For each test, panelists were served 50 mL of each pudding in 2-oz sample cups which were labelled using random three-digit codes.

2.2. Methodology

2.2.1. Experimental overview

Rapid profiling testing was performed in three sessions – one for each of the three methods. As the same samples were tested in all three

Table 1
Product descriptions.

#	Product	Manufacturer/Location
1	Jell-O Vanilla instant pudding	KRAFT Canada Inc./Don Mills, Ontario
2	Jell-O Vanilla instant pudding	
3	Jell-O White Chocolate instant pudding	
4	Jell-O White Chocolate instant pudding	
5	Jell-O Fat Free Vanilla instant pudding	
6	Snack Pack No Sugar Vanilla pudding	Product of USA. Imported by CONAGRA Foods Canada Inc. Mississauga, Ontario
7	Kozy Shack Original Rice Pudding	Kozy Shack Enterprises, LLC/Arden Hills, MN
8	Dr. Oetker Pudding Supreme French Vanilla instant pudding	Dr. Oetker Canada Ltd. Mississauga Ontario
9	Dr. Oetker Shirriff Vanilla cooked pudding and pie filling	Dr. Oetker Canada Ltd. Mississauga Ontario

testing methods, measures were taken to prevent memory effects. Sessions were separated by a minimum of two weeks, and participants were randomly allocated to three test groups, each of which completed the three tests in a different randomized order (i.e. projective mapping, sorting, CATA; CATA, projective mapping, sorting; or sorting, CATA, projective mapping).

2.2.2. Panelists

Rapid profiling was performed using two groups of subjects: a younger group of subjects aged 18 to 30 which acted as the control group for whom these rapid profiling tests have already been validated and, a test group of older adults all of whom were at least sixty years of age. The age cut-off of 60 for the older participants was chosen as it has previously been reported that the decline in sensory capabilities rapidly increases above this age (La Rue, 1992; Mojet, Christ-Hazelhof, & Heidema, 2001). Sixty participants were recruited from each of the two age categories based on the minimum recommended number of panelists for CATA testing, which had the largest recommended panel size of the three profiling methods (Ares, Tárrega, Izquierdo, & Jaeger, 2014).

Sixty younger adults and sixty older adults were recruited to participate in the rapid profiling tests. Demographic information for each age category is summarized in Table 2. The younger age group had participants between 18 and 30 years of age with an average age of 21 ± 3 years. The older group had a larger age range with participants between 60 and 88 years of age and an average age of 68 ± 6 years. Both groups had similar gender distributions with fewer male participants than female. The younger adults group had only 30% male participants, while the older group had 40%.

2.2.3. Testing methodologies

To ensure that comparison of results could be made among the three testing techniques, a list of attributes (Table 1) to describe the sensory characteristics of the pudding samples was generated. This list was provided to all participants during each testing session. Attribute generation was completed using a discussion group of ten healthy participants, aged 18–30, recruited from the University of Guelph.

2.2.3.1. Check-all-that-apply (CATA).
Panelists were presented the nine samples, one at a time, in a randomized order. For each sample they completed a check-all-that-apply questionnaire. The questionnaire contained a list of twenty-two terms that was developed by the discussion group prior to the rapid profiling testing (Fig. 1). The terms were organized based on modality and their order of presentation was randomized between panelists and between samples within panelists. CATA testing was performed using *Compusense®* Five software (Compusense Inc, Guelph, Canada) except for four panelists who completed paper questionnaires due to lack of access to the software.

2.2.3.2. Sorting.
During the sorting session, participants were presented all of the samples at once, in a randomized order. They were asked to try all of the samples and to sort them into anywhere between two and eight groups based on overall similarities. Participants were then asked to describe the groupings that they made using the same list of terms that was developed in the discussion group and used

Table 2
Participant demographics.

	Younger Adults	Older Adults
Mean Age in years (± SD)	21 ± 3	68 ± 6
Age Range in years	18–30	60–88
Number of Males (%age)	18 (30%)	24 (40%)
Number of Females (%age)	42 (70%)	36 (60%)