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Short communication

Comparable increases in energy, protein and fat intakes following the addition of seasonings and sauces to an older person's meal☆

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ABSTRACT

Under-nutrition in older individuals is a serious and growing problem, as a result, amongst other factors, of decreased intake. Research has shown some support for the use of flavour enhancers or flavoursome foods as a tool for increasing nutritional intake in older individuals. In this study, seasonings and sauces were added to an older person's meal to investigate and compare effects on food consumption. Participants' were 18 free-living older individuals from Belfast. They consumed three meals on three separate occasions: one with seasoning, one with sauce, and one without seasoning or sauce, and intakes of energy, protein, carbohydrate and fat were compared. Other measures included pre and post-meal hunger and desire to eat, and pleasantness, familiarity, and flavour intensity of the meal. Significantly greater amounts of energy, protein and fat were consumed in the meals with seasoning and meals with sauce compared to meals served plain (smallest $t(17) = 2.11$, $p = 0.05$), with no differences between seasoning and sauce conditions (largest $t = 0.51$, $p = 0.62$). Flavour intensity ratings were also significantly higher for meals with sauce and meals with seasoning compared to meals served plain (smallest $t(17) = 2.78$, $p = 0.01$). These findings suggest that the addition of both seasoning and sauce to an older person's meal can result in comparable increases in energy, protein and fat intake. Effects support a role for flavour in increasing food intake in older individuals. These effects, however, need to be demonstrated repeatedly over a longer time period before their true value can be established.

Introduction

The older population in the UK is growing, and it is estimated that a substantial proportion of older individuals suffer from under-nutrition (Forster & Gariballa, 2005; Margetts, Thompson, Elia, & Jackson, 2003). The consequences of under-nutrition in the older population are wide-ranging and include reduced quality of life, increased risk of illness and hospitalization, longer hospital stays, and considerable healthcare costs (Hickson, 2006; Morley, 1997). Adequate protein intake is particularly important for older people given its role in immune function, and the decline in muscle mass and bone density that occurs with age (Visvanathan & Chapman, 2010). Reasons for under-nutrition in older individuals are numerous and include reductions in appetite, chronic disease, poor dentition, poverty, social isolation and depression (Hays & Roberts, 2006).

One factor believed to affect appetite in older people is the decline in chemosensory function that occurs during aging (Mojet, Christ-Hazelhof, & Heidema, 2005; Murphy, 1993). Approximately 50% of the older population are believed to suffer from olfactory impairment, as evidenced by lower ability to identify odours, higher odour thresholds, and lower perception of odour intensities (Duffy, Backstrand, & Ferris, 1995). Chemosensory changes can lead to loss of appetite, altered food choices, and decreased enjoyment from eating (Schiffman & Graham, 2000).

Due to the adverse consequences of impaired chemosensory function on appetite and nutrition, researchers have investigated the effects of enhancing the flavour of food on eating behaviour in older individuals. Research has indicated a preference for flavour enhanced foods in older individuals (De Jong, de Graaf, & van Staveren, 1996; Griep, Mets, & Massart, 1997; Griep, Mets, & Massart, 2000). However, the effect of flavour enhancement for foods on intake has been controversial. While some studies have shown no effect of flavour enhancement on food intake in older individuals (Essed, van Staveren, Kok, & de Graaf, 2007; Koskinen, Kälviäinen, & Tuorila, 2003), others have shown positive effects on intake (Schiffman, 1998; Schiffman & Warwick, 1993). Schiffman and Warwick (1993), for example, found that flavour enhancement of 30 foods for older adults in residential care resulted in increased consumption of 20 out of the 30 foods, and led to increased consumption of flavour-enhanced

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items in the meal and decreased consumption of non-enhanced food items (Schiffman & Warwick, 1993). Schiffman (1998) found that flavour enhanced meals for hospital patients resulted in consumption of 10% more calories compared to non-enhanced meals.

The addition of flavoursome foods such as seasonings and sauces has also shown positive effects on food intake in older people. Mathey, Siebelink, de Graaf, and Van Staveren (2001) used powdered seasonings to increase the flavour of meals of nursing home residents over a 16-week period, and found increases in dietary intake, daily feelings of hunger, and body weight. Another study used natural food flavours such as ginger, garlic and sesame oil to enhance the flavour of older hospitalized patient's meals, and found increases in energy, protein and fat intakes (Henry et al., 2003). Recently, Appleton (2009) investigated the use of sauces as a method for increasing nutritional intake in older people, and found that meals with sauce also resulted in significantly greater energy, protein, and fat intakes compared to meals without sauce.

Sauces may be more beneficial than dry seasonings when promoting food intake in older people due to the semi-solid nature of the sauce. In older individuals, where gastro-intestinal secretions and motility are known to be reduced or impaired (Cowan, Roberts, Fitzpatrick, While, & Baldwin, 2004; Donini, Savina, & Cannella, 2003), semi-solid foods may facilitate chewing and swallowing and aid the passage of foods through the digestive system (Appleton, 2009). The impact of seasoning and sauces on food intake, however, remains unknown. This study aimed to investigate and compare the effects of the addition of seasoning and sauce to an older person's meal.

Method

Participants

Eighteen individuals participated in the study, of which 4 were male and 14 were female. Participants' age ranged from 65 years to 91 years with a mean age of 77 years. Participants' BMI ranged from 23.4 kg/m^2 to 38.3 kg/m^2 with a mean BMI of 30 kg/m^2. Participants were recruited from sheltered housing for older people and recreational groups/organizations for older people in the Belfast area. They were suitable for the study if they were 65 years of age and older, were not allergic or intolerant to any of the foods provided in the study, were not on any medication and did not have any illness that may affect taste or appetite, were able to travel to and from Queen's University, Belfast for testing, and were able to give full consent and complete all measures in the study themselves. The study was approved by the Ethics Committee of the School of Psychology at Queen's University, Belfast, before commencement.

Meals

Participants consumed 3 meals on 3 separate occasions, one day a week. On each occasion, the same basic meal was served, composed of chicken, two types of vegetables and mashed potatoes, but on one occasion, seasoning was added to the meal; on one occasion, sauce was added to the meal; and on one occasion, neither seasoning nor sauce was added to the meal (meal served plain). Participants were offered a choice of seasoning and sauce for the conditions in which these were added to the meal. Seasonings offered were: *Schwartz perfect shake* chargrilled chicken seasoning, *Reason to Season Bags Better Chicken*: Cajun seasoning, *Reason to Season Bags Better Chicken*: Smoky Barbecue seasoning, *Nando's* lemon and herb peri-peri seasoning rub, *Nando's* lime and coriander peri-peri marinade, and *Nando's* sun-dried tomato and basil peri-peri marinade. Sauces offered were *Bisto* chicken gravy, *Bisto* onion gravy, *Homepride* honey and mustard sauce, *Homepride* creamy mushroom sauce, *Homepride* creamy stroganoff sauce, and *Tesco* tomato and basil sauce.

All foods in the meal were provided in portion sizes that were approximately twice that usually provided for an adult's main meal. Two teaspoons of seasoning were rubbed onto the chicken before cooking in the seasoning condition. Approximately 100 g of sauce was added over the chicken in the sauce condition. *Ad libitum* water was also provided with each meal. Meals were served at 12.30 pm in the Eating Behaviours Research Unit in the School of Psychology at Queen's University Belfast. All participants consumed all three meals using a repeated measures design, but the order in which participants received meals was counterbalanced to prevent order effects.

Appetite

Appetite was assessed through the measurement of food intake and subjective ratings. For the measurement of food intake, all individual food items provided were weighed before and after consumption to obtain a measure of all individual food items consumed. These were then converted into total energy, protein, carbohydrate, and fat intake for each meal using manufacturer's information. For the measurement of subjective ratings, likert scales were used to measure hunger, desire to eat, pleasantness, familiarity and flavour intensity of the meal. Before and after the meal, participants were asked 'How hungry are you?' and 'How strong is your desire to eat?', and could choose from the following responses: 'not at all', 'slightly', 'moderately', 'considerably' and 'extremely'. After the meal, participants were asked 'How pleasant was this meal?' and 'How familiar was this meal to you?' and could choose from the responses mentioned above. Participants were also asked to rate the flavour intensity of the meal using a 10-point scale where 1 represents low flavour intensity (such as the flavour intensity of water) and 10 represents high flavour intensity (such as the flavour intensity of chilli powder).

Procedure

On arrival, participants were seated in an individual booth and asked to complete measures of hunger and desire to eat. They were then served the meal and were told to eat as much or as little as they liked. Participants had no time limit for eating. Immediately after the meal, participants completed measures of hunger, desire to eat, pleasantness, familiarity and flavour intensity. Participants were free to leave following completion of these measures. All meals were prepared, all measures were conducted and all instructions were given by the researcher throughout the study to ensure consistency. Participants were informed not to communicate with others in the room while eating or completing any of the measures. Participants were also instructed to eat the same breakfast at the same time on all 3 testing days, so as not to affect pre-meal hunger and desire to eat. Participants were fully debriefed and given the opportunity to ask questions on completion.

Analysis

One-way repeated measures ANOVA's were conducted for all measures of food intake and subjective ratings, to investigate differences between meals with seasoning vs. meals with sauce vs. meals served plain. Paired *t*-tests were conducted when ANOVA revealed significant main effects. Analyses for all food intake measures were conducted twice; once for total intake (including seasonings and sauces), and again for basic intake, where the energy, carbohydrate, protein, and fat consumed from the seasonings and sauces served with two of the meals was excluded. PASW statistics 17 was used for data entry and analysis of results.