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Influence of seasoning on vegetable selection, liking and intent to purchase

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ABSTRACT

Low vegetable intake continues to be a health concern, and strategies to increase vegetable intake have resulted in only small increases. One strategy that has received less attention is the use of seasonings. This study's objective was to determine the impact of seasoning on vegetable selection, liking, and intent to purchase. We conducted a 3-week study in a public café on a university campus. Customers buying a main dish could select a vegetable side (seasoned [SS] or steamed [ST]) at no cost. Based on café data and power analysis (alpha 0.05, 80% power), 2 days per vegetable pair were conducted with carrot, broccoli, and green bean pairs randomized 3 days/week 1 and 3, with normal service week 2. Selection was greater for SS vs ST, n = 335 vs. 143 for all 3 vegetables combined; n = 97 vs 47 for carrots; n = 114 vs. 55 for broccoli; n = 124 vs. 41 for green beans ($p < 0.001$ Chi-Square). Liking responses were similar for SS vs ST and were high for all vegetables. Response distribution was not significantly different for SS vs ST vegetables when people were asked if they would purchase the vegetable that they selected. More customers chose the 'somewhat likely' and 'very likely' (n = 353) than the 'not likely' and 'definitely would not' (n = 121) purchase responses. Regression showed that people who did not often consume a vegetable with lunch while dining out were 1.59 times more likely to select the SS vegetables over the ST ($p = 0.007$). Given a choice, consumers were more likely to select a seasoned vegetable. With low vegetable consumption as a predictor of seasoned vegetable choice, offering seasoned vegetables may increase intake in those with poor vegetable intake in a café setting.

1. Introduction

Vegetables are an important part of any dietary pattern. Because vegetables are typically high in nutrients and low in calories, they can play an essential role in health promotion and disease prevention (Center for Disease Control, 2015). Increasing consumption of vegetables and fruits has been shown to aid in prevention of Coronary Heart Disease (CHD). A meta-analysis of 12 studies with 13 cohorts concluded that increased intake of vegetables and fruits from under three servings per day to more than five servings per day lowered the rate of developing CHD by 17% (He, Nowson, Lucas, & MacGregor, 2007). Similarly, a systematic review of six studies found that a higher intake of dark leafy green vegetables was associated with a 14% decrease in Type 2 Diabetes Mellitus (Carter, Gray, Troughton, Khunti, & Davies, 2010). In addition to disease prevention, dietary patterns rich in vegetables and fruits have been associated with lower body mass index (BMI). Data from the 2007 Behavioral Risk Factor Surveillance Survey showed that only 23.9% and 21.9% of those classified as overweight and obese, respectively, consumed five or more servings of vegetables and fruits per day, compared to 27.4% of those who were of normal BMI. This negative association between BMI and vegetable and fruit intake remained significant after adjustment for confounding variables ($p < 0.0001$) (Heo et al., 2011). According to the World Health Organization (WHO), 5.2 million deaths worldwide in 2013 were attributed to diets lacking in vegetables and fruits (WHO, 2015).

Incorporating vegetables into a dietary pattern can take several different forms. Vegetables can be fresh, frozen, canned, juiced, or dried. In the United States (US), people can access vegetables by growing them or purchasing vegetables from a grocery store,

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farmer's market, restaurant, or other retail outlet. In the US, 65% of vegetables are consumed as a base dish, or "as is". This includes vegetables used as side dishes, snacks, or the entire meal. The next most popular way (29%) to consume vegetables is as an ingredient in another dish. This includes vegetables used in stews, casseroles, and sauces (Produce for Better Health Foundation, 2015).

Daily intake recommendations for vegetables by adults that engage in at least 30 min per day of exercise are 2–3 cups (Center for Disease Control, 2015). These recommendations are dependent on age, sex, and physical activity. Vegetable consumption trends in the US have not been promising over the last few years. The usual quantity of vegetables consumed for Americans at the 75th percentile of intake is two cups (USDHHS, USDA, Dietary Guidelines for Americans, 2015). Eighty-seven percent of Americans did not meet the daily vegetable recommendation set for their age-sex group. These numbers are even higher for adolescents and young adults (Castenson, Dodd, Krebs-Smith, Parsons, & Reedy, 2015). According to the State of the Plate study on America's consumption of fruits and vegetables (FV), the total amount of vegetables consumed from the year 2009–2014 decreased by 7%. When looking at consumption trends over the last decade, fresh vegetables purchased from a retail outlet were the only form of vegetables to show a growth, while intake of canned, frozen, dried, and juice vegetable forms declined (Produce for Better Health Foundation, 2015).

With poor intake of vegetables but known health benefits from greater consumption, allied health professionals are faced with the problem of how to increase vegetable intakes. Erinosho, Moser, Oh, Nebeling, and Yaroch (2012) evaluated the exposure of the More Matters Campaign – a program designed to increase awareness of FV recommendations and actual consumption in adults. Individuals ($n = 3021$) who consumed the recommended five or more FV servings per day were 1.33 times more likely to have heard about the More Matters Campaign, or the 5-A-Day Campaign, and were 1.55 times more likely to know about current FV recommendations. However, it remains unknown whether increased exposure to FV campaigns increases intake, or if adults who already consume more FV are more aware of FV messages. Indeed, a review of vegetable and fruit promotional campaigns has found results to be low to modest at best (Rekhy & McConchie, 2014).

Ungar, Sieverding, and Stadnitski (2013) examined methods to increase FV intake by assigning groups the goal of eating "5 servings a day" (5/day group) versus "1 more serving than you already eat" per day (+1/day group); the control group was instructed to eat as usual. A one-week randomized, controlled intervention was conducted with mostly female students ($n = 84$, 85% female). Contrary to expectations, the 5/day group was more effective at increasing their FV consumption. The +1/day group consumed an average of 3.41 servings ($SD = 0.96$) compared to the 5/day group at 5.00 servings per day ($SD = 0.70$). Of note was that FV intake declined to 3.45 ($SD = 1.10$) servings per day in the 5/day group at one week after intervention compared to 2.72 ($SD = 0.84$) in the +1/day group.

In addition to education campaigns, the impact of price on vegetable consumption has been explored. Cost has been reported as a barrier to adequate vegetable consumption (Skuland, 2015). Smith-Drelich, 2015 lowered this barrier by providing reimbursement of up to $50 per week for vegetable purchases in an intervention group ($n = 144$). While more money was spent on vegetables [+$8.16 ($SD = $2.67)/week, $p < 0.01$], vegetables consumption did not increase as a result of reimbursement [+1.3 ($SD = 1.2$) servings/week]. More recently, price was not found to be a barrier to FV consumption in a national Scottish survey (Mc Morrow, Ludbrook, Macdiarmid, & Olajide, 2016). These findings suggest that financial barriers may only be a minor contributor to inadequate vegetable consumption, although cost may be more influential in food insecure households (Mook, Laraia, Oddo, & Jones-Smith, 2016).

Other research suggests that improving the palatability, or taste, of vegetable or vegetable-based dishes may improve intake. Ghawi, Rowland, and Methven (2014) examined whether herbs and spices could be used to enhance liking of low sodium tomato soup. Adults ($n = 148$) participated in this five consecutive day study, where they were given three samples of tomato soup: regular salt; low salt; and low salt enhanced with seasonings. After repeated exposure to the three soup variations, participants reported increased overall liking ($p < 0.02$), flavor liking ($p < 0.02$), texture liking ($p < 0.01$), and aftertaste liking of the low salt enhanced with seasonings soup. No significant changes with repeated exposure to the other two soup variations were identified. However, Wang, Lee, and Lee (2014) found that while some level of herbs in tomato soup increased liking, high levels decreased liking. Tomato soup with herbs did lower the amount of salt needed to result in consumers perceiving that the soup tasted right. Other studies with children have found that seasoned dips can influence vegetable intake (Fisher et al., 2012; Savage, Peterson, Marini, Bordi, & Birch, 2013), although this strategy applied to raw vegetables and may increase calorie or dietary fat intakes. Peters, Polsky, Stark, Zhaoxing, and Hill (2014) examined the effects of seasoning foods on restoring the liking of reduced fat (RF) food items. Participants ($n = 148$) were fed three meals in a randomized order on three different days. One meal was a full fat (FF) meal, one was a RF version of the same meal, and one was a RF version of the meal with the addition of herbs and spices. Reducing the fat content significantly lowered the rating of meal liking (FF = 7.05 vs. RF = 6.29, $p < 0.0001$). However, the RF seasoned meal was liked as well as the FF condition. Individual food items revealed no significant differences between liking distribution of meatloaf and vegetables between the FF and RF seasoned options.

The use of herbs and spices (i.e., seasonings) to enhance vegetable liking is an area of research that needs further attention. With enhanced liking, we expect that vegetable selection, willingness to purchase, and intake will also increase. This may help individuals reach their daily vegetable recommendation in a way that seems effortless and enjoyable. The purpose of this study was to determine whether seasoned vegetables would be selected more often than unseasoned (plain) vegetables. Secondary aims were to determine whether intention to purchase seasoned vegetables would be reported more often than intention to purchase unseasoned, and whether consumption of seasoned vegetables would be greater than unseasoned vegetables.

2. Materials and methods

2.1. Design

This was an observational cross-sectional study over a three-week period (Nov–Dec 2015), with two testing weeks and one wash out week in between to ensure that each vegetable tested had the same entrée pairing. Carrots, green beans, and broccoli were selected as test vegetables, based on their high consumption frequency by US adults (Produce for Better Health Foundation, 2015). One vegetable was offered per test day as both a seasoned and unseasoned choice, and vegetables were randomly assigned to a day of the week. Industry experts in culinary sciences developed the seasoning blends that were unique for each of the vegetables tested in the café. Data were collected on previous vegetable purchase patterns for comparison to selection in the current study. The University Institutional Review Board approved this study; written consent was not required for this exempt protocol (IRB #16360).