THE UTILIZATION OF SENSORY EVALUATION METHODOLOGY TO EXAMINE THE ACCEPTABILITY OF RECIPES WITHIN FEDERAL NUTRITION EDUCATION PROGRAMMING

by

MELANIE K. NG

(Under the Direction of Ginnefer Cox)

ABSTRACT

Federal nutrition education programs, such as Supplemental Nutrition Assistance Program Education (SNAP-Ed) and the Expanded Food and Nutrition Education Program (EFNEP), conduct recipe demonstrations as a central component of their curricula to limited resource audiences. These recipe demonstrations aim to influence eating behaviors among participants and promote healthy dietary habits. To maximize recipe demonstration impact, the recipes selected for direct education must be seen as highly acceptable in terms of taste, preparation, accessibility in cooking equipment, and time required. However, little is known regarding acceptability of such recipes among program participants, and there is no standard method of determining which recipes maximize impact. Sensory evaluation, stemming from the field of sensory science, comes to mind as a viable option, but formal evaluation of recipes in this context remains underutilized. As such, this research investigated the application of sensory evaluation methodology for University of Georgia EFNEP and SNAP-Ed recipe offerings and examined factors of recipe acceptability by two stakeholder groups: program participants and peer educators of these programs. This work comprised of three studies that focused on: 1) the

use of sensory evaluation to received feedback on new recipes from UGA SNAP-Ed participants, 2) UGA EFNEP and SNAP-Ed peer educator sensory and preparation perspectives regarding Food Talk program recipes, and 3) peer educator sensory, preparation, and recipe demonstration perspectives regarding recipes modified using the results of the first study. In addition, a methodology was created to guide future sensory evaluation efforts in the community setting. The studies demonstrated that sensory evaluation provided relevant information on recipe acceptability not previously collected by recipe writers for Federal nutrition education programs. Results also showed that peer educators carried a unique perspective about recipe offerings based on their in-depth knowledge of program participants, and these peer educators should be leveraged when testing among program participants is not possible or when a potential recipe needs prompt feedback. It can be concluded that recipe development efforts benefit from formal participant or peer educator input on sensory liking attributes (e.g., tastes, flavor, texture, etc.) and factors of preparation to guide the final recipes used in curricula.

INDEX WORDS: Sensory Evaluation, Federal Nutrition Education Programs, Supplemental Nutrition Assistance Program Education (SNAP-Ed), Expanded Food and Nutrition Education Program (EFNEP), Community Nutrition, Recipe Development, Recipe Demonstrations, Taste Testing, Affective Testing, Acceptance Testing, 9-Point Hedonic Scale, Recipe Acceptance

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DEDICATION

This dissertation is dedicated to my parents—Dixon Ng and Cyndi Chin—for their unwavering love and support as I continue to discover my life's passions and experience the highs and lows that come with them; to my siblings—Stephanie and Hooman, Ryan and Carla, Allie, and Justin—for whom I can always count on for encouragement or a laugh; and to my sweet dogs—Autumn, Mollie Jane, and Specs—for keeping me grounded with their constant zest for life and ensuring that I spend time outdoors and enjoy each and every day.

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CHAPTER 1

INTRODUCTION AND LITERATURE REVIEW [1]

Low-income individuals face unique challenges to healthy eating, including limited access to healthy options; cost, time, and transportation barriers; and reported insufficient education related to purchasing and preparing healthy meals [1-3]. Due to their complex situations surrounding food access and preparation, they typically consume fruits and vegetables at rates lower than higher income individuals [2, 4]. The chronic distress experienced by low-income populations due in part by their socioeconomic status [5], in addition to the aforementioned barriers, may explain their higher rates of noncommunicable disease, such as obesity and heart disease [5-8]. Federal nutrition education programs, such as the Supplemental Nutrition Assistance Program Education (SNAP-Ed) and Expanded Food and Nutrition Education Program (EFNEP), exist at land-grant universities and other health departments across the United States [9, 10] to educate these vulnerable populations about nutrition and health topics. The University of Georgia (UGA) SNAP-Ed and UGA EFNEP programs provide nutrition education to low-income individuals and families in the state of Georgia. The mission of UGA EFNEP is to help "families stretch their food dollars, improve nutrition practices, and prevent food-borne illness" [11], while the goal of UGA SNAP-Ed is to "improve the likelihood that SNAP-eligible Georgians will make healthy food and lifestyle choices that prevent obesity"

[1] Portions have been adapted from Ng, M. K., Lee, J. S., Sanville, L. M., Cotta-Rivera, E., Dallas, J., Pencek, A., Powell, A., Williams, B., Moore, C. J., & Cox, G. O. 2021. Sensory evaluation of new recipes for Supplemental Nutrition Assistance Program Education (SNAP-Ed) informs consumer acceptance and recipe development needs. *Journal of Sensory Studies*. e12730. Reprinted here with permission from the publisher.

through direct education and social marketing materials [12]. Both programs utilize a similar set of lessons in their direct nutrition education program, entitled *Food Talk,* and the many versions it has come since its development in 2008. UGA EFNEP offers three variations of *Food Talk* for different audiences [13]. Two adaptations of the program can also be found in the SNAP-Ed Toolkit of interventions [14]. These lessons aim to ameliorate concerns around food preparation and healthy eating by providing nutrition education on topics ranging from dietary sodium reduction by means of reading nutrition labels, to grocery shopping tips and food budgeting.

Within the *Food Talk* program, participants also observe a food demonstration from a pre-approved set of recipes and can taste and discuss the recipes with their peers and peer educators (called Program Assistants) [15, 16]. The desire to update recipe offerings and discussion of new recipes within curricula prompted a natural collaboration among researchers at UGA. With an overarching goal of improving dietary behaviors among participants, an in-depth approach was necessary to determine recipe performance. This dissertation discusses the utilization of sensory evaluation methodology and recipe acceptability measures in the Federal nutrition education program setting and can be divided into the following chapters:

Chapter 1 contains an overview of the existing literature pertaining to sensory evaluation and community nutrition education programming. This review also addresses important considerations when implementing sensory evaluation in this new setting and provides the reader with an understanding of this research area.

Chapter 2, "Sensory Evaluation of New Recipes for Supplemental Nutrition Assistance Program Education (SNAP-Ed) Informs Consumer Acceptance and Recipe Development Needs," is a manuscript that has been published in the *Journal of Sensory Studies* as an original research article. This article involved the sensory evaluation of seven new recipes among UGA

SNAP-Ed participants in a central location and has received the appropriate copyright permissions from the publisher for use in this dissertation.

Chapter 3, "Application of a Sensory Evaluation Methodology for Recipes Utilized in Federal Nutrition Education Programs," is a short communication manuscript submitted to the *Journal of Sensory Studies* and outlines the process and reflections of conducting sensory evaluation in the community nutrition setting based on experiences from previous work with UGA EFNEP [15] and UGA SNAP-Ed (Chapter 2). This manuscript is intended to provide guidance to other state Extension programs that wish to incorporate sensory evaluation methodology into their program development.

Chapter 4, "Sensory Evaluation Feedback from Peer Educators Offers Perspective on Recipes for Federal Nutrition Education Programs," is a manuscript that will be submitted to the *Journal of Nutrition Education and Behavior* as an original research article. This study introduced the usage of an online sensory-informed ballot and the inclusion of peer educator perspectives for the recipes used as *Food Talk* recipe demonstrations at the time of the study.

Chapter 5, "A Sensory-Informed Ballot Offers Timely Insights on New Recipes Tested by Peer Educators of Direct Nutrition Education Programs," is the final study of this dissertation and will be submitted to the *Journal of Nutrition Education and Behavior* as an original research article. In this study, the usage of a hybrid online survey and modified home-use test method was tested among peer educators rating and preparing recipes modified based on findings from Chapter 2.

Chapter 6 is a concluding chapter to summarize chapters 2-5, note specific limitations and strengths of this research, and close with implications for future research and practice in this field.

The utilization of sensory evaluation methodology can guide recipe development, selection, modification, and elimination within community-based nutrition education programming. The central hypothesis of this dissertation was that the collection of quantitative sensory evaluation data and written comments for recipes used in community-based nutrition education programming would provide important and significant information to guide future recipe development. This dissertation provides evidence for the utilization of sensory evaluation methodology among low-income audiences and peer educators of such programs for the target population. Subsequently, findings may be used to inform community-based nutrition education programs on the sensory characteristics of recipes that participants respond well to, as well as the factors that most influence recipe preparation intent.

Community-Based Nutrition Education Programs and Recipe Development

In line with the Dietary Guidelines for Americans' recommendations [17], limiting sodium, saturated fats, and added sugars and promoting certain nutrients are crucial to SNAP-Ed and EFNEP programming. As previously mentioned, Americans often exceed their daily intake of nutrients that should be limited, while they struggle to obtain enough whole grains, fruits, and vegetables—this is especially true for low-income populations [18, 19]. Knowing this, recipes for SNAP-Ed and EFNEP programming should be mindful of the *Dietary Guidelines* and aim to reduce overall intake of nutrients to limit. At the state level, UGA SNAP-Ed also abides by the "UGA recipe guidelines for SNAP-Ed," which are internal guidelines used for standardization among recipe development. The UGA SNAP-Ed recipes are analyzed by a registered dietitian with an emphasis on four key nutrients: 1) total calories per serving will not exceed a reasonable proportion of an average person's daily calorie needs; 2) recipes aim for less than 15 grams of total fat per serving and less than 5 grams of saturated fat per serving; 3) added sugar is less than

3 teaspoons per serving (12 grams); and 4) sodium is low to moderate (daily total target less than 1500 – 2300 milligrams daily). UGA SNAP-Ed also places a focus on the incorporation of whole grains, when possible, and the use of low-fat dairy products.

Researcher Gail Hanula of UGA EFNEP developed *Food Talk* in 2008 and created the recipes for the program [16]. Similar to UGA SNAP-Ed, she emphasized limiting the same nutrients while including food groups promoted through the *Dietary Guidelines*. Her *Food Talk* recipes highlighted the inclusion of at least three food groups—one being a vegetable—in each main dish and a fruit paired with a low-fat dairy product for the dessert recipes. While nutrition content is a primary recipe concern, cost and preparation time are also essential to both programs. Criteria for the development of recipes targeted for limited-resource consumers were informed by Miller, Burgess, and Mason [20]. They proposed that recipes for this audience need to be easy to prepare, use low-cost ingredients, be nutritious and tasty, allow for flexible forms of ingredients (i.e., fresh, frozen, or canned), and have a short ingredients list overall. Dr. Hanula ensured recipes could be demonstrated in fifteen minutes or less to showcase the ease of preparation for participants, and minimal equipment was required to make the dishes. Additions were made to the *Food Talk* recipes to account for food safety and sodium reduction [16]. Other recipe development guidance for limited-resource audiences, seen frequently in the UGA SNAP-Ed and UGA EFNEP recipes, included basic cooking equipment; ease of comprehension and literacy; and use of low-cost and readily available ingredients [21]. Recipes were analyzed for nutrient content, informally tested for appealing taste and texture, and then sampled by local County Extension staff. Recipes were included in the curriculum if rated “excellent” by the Extension staff for “practicality, ease of demonstration, and food safety hazards” [16].

With the goal of improving dietary choices of SNAP-Ed and EFNEP participants, it is necessary that recipes offered through any curricula are realistic and appealing for the target audience while meeting the aforementioned national nutrition standards. With high quality recipes in place, limited-resource consumers who are at a heightened risk of dietary-related diseases may replace one or more of their meals with the provided options that would consequently reduce their overall intakes of sodium, added sugars, and saturated fat. Federal nutrition education programs are positioned perfectly to improve dietary behaviors of low-income individuals and families, and they use many methods to model healthy food and dietary behaviors, including recipe books/cards, examples within their direct education lessons, recipes on program websites, and food demonstrations.

The Role of Food Demonstrations in Nutrition Education

In EFNEP and SNAP-Ed, recipe demonstrations and tastings are utilized to expose participants to new ingredients and increase a person's self-efficacy to try the recipes at home [12, 15]. Research suggests that intentionally including cooking demonstrations, food tastings, or cooking skills in nutrition education programming is useful in educating participants on healthy eating and new foods while promoting preparation of healthy meals at home [22-24]. Furthermore, inclusion of food tastings or demonstrations draws participants into nutrition education programs and ergo exposes them to new health information [25]. These demonstrations help to model healthy cooking methods with new or desirable ingredients to low-income participants, and the recipes support the health-promoting behaviors taught in the direct education lessons [24]. It is well established that hands-on cooking interventions have demonstrated improved dietary related behavior change, such as fruit and vegetable intake [24-26], but even when participants are unable to participate hands-on, such as with an online class

format, they report willingness to try new foods, pay attention to fruit and vegetable intake [27], and may even make the recipes at home despite having not tried the dish before [28]. Studies have also reported that repeated exposure to fruits and vegetables, although not full recipes, alongside nutrition education can improve health promoting dietary behaviors [29-31].

Additionally, there is some evidence to show that recipes that are well-liked in a classroom setting will influence food preparation and eating behaviors in the home, even among youth participants [32]. Thus, behavior change in this setting may depend on the acceptability of the offered recipes and ingredients (including willingness to try the food again), and it can be assumed that recipes used in nutrition education can impact dietary related behavior change, but the recipes must perform well. The use of engaging recipes in class demonstrations has the potential to create lasting benefits in the target audience when recipes are made at home and consequently replace meals higher in sodium, saturated fat, and added sugars [27, 28, 32, 33]. In fact, research involving recipe demonstrations and tasting sessions of new recipes among UGA EFNEP Program Assistants revealed that these peer educators later made the recipes at home, crediting the recipe demonstrations and tasting sessions in a follow-up survey [22].

Peer Educators as Recipe Evaluators and their Impact on Participants

UGA SNAP-Ed and EFNEP, nationally, utilize an Indigenous peer educator/paraprofessional learning model [34, 35] to lead direct nutrition education and act as role models in their communities. Peer educators are tasked with teaching the curricula, demonstrating recipes, and building rapport with participants. As such, they are vital in influencing participant acceptance of recipes, and conversely are privy to the food-related likes, dislikes, struggles, and successes of participants. As part of the core competencies set forth by these programs and the U.S. Department of Agriculture's (USDA) National Institute of Food and

Agriculture, peer educators are charged with "[establishing] respect and rapport with participants," "[demonstrating] [active] listening, [asking] open-ended questions, and [providing] positive feedback," and "[encouraging] participants to apply new information and skills to set goals," among many other competencies revolved around the participant relationship [36]. As a result of their connections with their participants, peer educators are not only healthy role models to their participants, but offer state and national programs valuable insights into the participant experience and their own experiences as peer educators [37, 38]. Because of their close relationships with the target audience and their involvement with recipe demonstrations, peer educators are key stakeholders of the recipe development process. Their own acceptability of recipes provides a benchmark for programmers to follow during recipe development, and this approach has been utilized to select recipes for programming both informally (i.e., "word of mouth" from peer educators to state staff) and formally in the literature by means of survey feedback [16, 22, 39]; however, there has been no standard method of evaluating recipes and their acceptance across studies.

Sensory Evaluation and Affective Testing

Sensory evaluation is "a scientific discipline used to evoke, measure, analyze, and interpret reactions to those characteristics of food and other materials as they are perceived by the senses of sight, smell, touch, taste, and hearing." It is a critical component of research and development in many food companies [40, 41]. Sensory evaluation utilizes standardized methods of reducing biasing effects of products by isolating sensory characteristics to elucidate pertinent information during product development. It has been used to assess consumer acceptance of commercial foods, beverages, and consumer products in the controlled laboratory setting [42]. Depending on the study's objectives, however, panelists that serve on sensory panels can be

trained or untrained, allowing for sensory testing to be utilized with a wide variety of skill levels in different environments. For example, methods of affective (acceptance) testing—central location test (CLT) and home-use test (HUT)—are beneficial for collecting feedback on product preferences or acceptance from lay consumers [42]. While the laboratory setting provides optimal researcher control of the environment, and thus minimal variability, CLT can be useful in collecting a large number of consumer responses from a building more accessible to the public. Home-use tests are beneficial when research is focused on learning more about product performance in the hands of the consumer; the HUT brings a product of interest into the typical consumer environment of that product (usually a home) to see how the product performs when used in the everyday setting [41]. Slight differences in product ratings or consumer attitudes have been noted among the three affective testing methods [43-45]; however, researchers must weigh the advantages and disadvantages of each method when developing a consumer test [41].

Sensory Evaluation as a Recipe Development Tool

Sensory evaluation is traditionally conducted in a laboratory setting at colleges and universities, in sensory programs run through food corporations, or in consumer research firms. However, some emerging work has used sensory evaluation in non-traditional settings, including evaluating consumer acceptance of recipes utilized in community-based nutrition education programs [15]. This novel approach collects quantitative measures of recipe acceptance, including specific sensory liking attributes (e.g., appearance, flavor, texture, saltiness, or sweetness) from participants, and written comments.

It has been well-established that flavor, texture, and appearance are all strong drivers of product liking [42, 46-48]. Consumer testing of food products, both savory [46, 47, 49, 50] and sweet [44, 47, 51], have shown similar findings for overall liking and acceptability drivers of

liking. Across beverages [44, 51] and protein food products [46, 47], taste and flavor were the primary drivers of overall liking. Texture also strongly impacted the overall liking of these various food products, and it plays a unique role in sensory evaluation. From the moment a participant sees a food item to the act of mastication, the texture of the item is influencing a participant's perceived, and consequently, actual liking [42]. Most notably, certain textures (e.g., crispy or crunchy; gelatinous or creamy) can add positive or negative associations to eating, depending on a participant's past experiences with similar foods [42, 48]. One particular study utilizing protein beverages determined that viscosity (buttery, milky, smooth, and sweet in a check-all-that-apply evaluation) of the beverage was a shared driver of liking among two distinct consumer clusters whose flavor interests differed [44]. Thus, texture brings a separate but equally important characteristic to a food product. Appearance is another primary indicator of the perceived quality or taste of a product, and a reason why some sensory evaluation occurs with lighting that masks the color of the sample [42, 52, 53].

Insights gained from sensory evaluation can determine consumer acceptance of recipes' individual sensory liking attributes, which can be modified through the recipe development process to improve the recipes. In the case of one study, the researchers also collected information on participants' likelihood to purchase certain ingredients (e.g., meat alternatives like soy crumbles and beans; low-fat dairy; and fresh or frozen varieties of foods) [15]. These findings can be applied to future recipe development, as the researchers have a better understanding of what their specific program participants are willing to purchase. Therefore, they can approach recipe development with the knowledge of what will most fill their participants' needs. As a whole, sensory evaluation methods allow for the largest stakeholders—program

participants and peer educators—to be part of the recipe development process, which is beneficial in creating recipes that excite and appeal to the target audience.

Significance of research on sensory evaluation in nutrition education programming

Formal sensory evaluation methodology, which consists of a standardized recipe preparation, rinse protocol, and test ballot, has scarcely been explored in direct nutrition education settings. Conducting sensory evaluation in community-based nutrition education settings will provide important insights for the UGA EFNEP and UGA SNAP-Ed direct nutrition education programs. It allows for programs to customize their recipe and nutrition education content to their participants, which will lead to improved recipe acceptance and behavior change. For instance, understanding participants' interest in or acceptance of meat alternatives (i.e., soy-based ground "meat" or beans), flavors, and herbs/spices allows for future recipe development to be tailored to participant likes/dislikes. The inclusion of program participants and peer educators in the recipe development process, as opposed to after recipes are finalized in curricula, is needed to promote behavior change in direct education programs and ensure final recipes are well accepted among their target audiences. This work offers an innovative solution to better meeting the needs of low-income consumers participating in EFNEP and SNAP-Ed programming.

This work aimed to use sensory evaluation as an approach for determining recipe performance through acceptability and open-ended feedback measures to improve recipes used in UGA EFNEP and SNAP-Ed programs. The *specific aims* of this dissertation were as follows:

Specific Aim #1: Determine how newly developed recipes and existing, familiar recipes for the University of Georgia (UGA) EFNEP and UGA SNAP-Ed *Food Talk* nutrition education program perform using sensory evaluation methodology.

Specific Aim #2: Develop a methodology for use in future community-based nutrition education programming recipe development using previous sensory evaluation experiences with this audience.

Specific Aim #3: Evaluate quantitative and written feedback of newly developed recipes and existing, familiar recipes for *Food Talk* nutrition education programming from key stakeholders (peer educators).

The inclusion of sensory evaluation methodology in community-based nutrition education programming is just emerging in popularity. The results of this work highlight the benefits of utilizing sensory evaluation methodology in Federal, community-based nutrition education programs. Moreover, study findings provide better guidance for the creation of recipes that have increased acceptability among limited-resource consumers, thereby increasing healthy eating behaviors in the target audience.

CHAPTER 2

SENSORY EVALUATION OF NEW RECIPES FOR SUPPLEMENTAL NUTRITION ASSISTANCE PROGRAM EDUCATION (SNAP-ED) INFORMS CONSUMER ACCEPTANCE AND RECIPE DEVELOPMENT NEEDS [1]

[1] Ng, M. K., Lee, J. S., Sanville, L. M., Cotta-Rivera, E., Dallas, J., Pencek, A., Powell, A., Williams, B., Moore, C. J., & Cox, G. O. 2021. *Journal of Sensory Studies.* e12730. Reprinted here with permission from the publisher.

ABSTRACT

Federal nutrition education programs use food demonstrations and tastings of healthy recipes to elicit behavior change among their target audiences, but acceptance and liking of such recipes has not been systematically evaluated. This study aimed to assess acceptability and key sensory liking attributes (appearance, flavor, texture, saltiness, and sweetness) of culturally tailored recipes using sensory evaluation methods in a non-traditional setting. Affective ballots were used to assess overall liking (OL), key attributes, and preparation intent of seven new recipes on a 9-point hedonic scale. Open-ended feedback was also collected. A convenience sample of 338 low-income adults rated two out of seven recipes as meeting a standard acceptability rating ≥7. These ratings were significantly related to their preparation intent. Flavor and texture were revealed as attributes that significantly influenced OL. Findings support the practicality of sensory evaluation methodology in non-traditional settings for the development of recipes in Federal nutrition education programs.

PRACTICAL APPLICATIONS

This novel application of sensory evaluation in non-traditional settings can provide curriculum developers' of federal nutrition education programs a holistic understanding of their target audience's recipe needs. Developers have the ability to analyze specific attributes, ask preparation intent behaviors, and more accurately determine areas for improvement of each recipe through these targeted consumer sensory tests. Developers can thus ensure that recipes in their curricula (present and future) are well equipped to promote healthy behavior change. Additionally, this information can be built upon over the course of many sensory evaluations of more recipes to create a living record of the target audience's likes and dislikes for future recipe

development. The inclusion of sensory evaluation in Federal nutrition programs provides opportunity for collaboration between sensory scientists and these programs nationwide.

INTRODUCTION

Over 41 million individuals in the United States receive benefits from the Supplemental Nutrition Assistance Program (SNAP) [54], including an estimated 1.7 million residents (16-percent (%)) in the state of Georgia in 2021 [55]. SNAP-Education (SNAP-Ed) is the nutrition education arm funded by the United States Department of Agriculture and disseminates evidence-based, multi-level interventions to SNAP-eligible Americans to promote healthier eating and physical activity behaviors [56]. SNAP-Ed provides culturally appropriate nutrition education with guidance from the Dietary Guidelines for Americans [57] and includes community public health approaches focusing on shifting dietary patterns and preventing obesity [9].

The University of Georgia SNAP-Ed (UGA SNAP-Ed) includes recipe demonstrations and food tasting in direct education. Recipes utilized in SNAP-Ed programming are budget-friendly, easy to prepare, and should taste appealing. Research suggests that direct nutrition education that includes cooking demonstrations, food tastings, or cooking skills are useful in educating participants on healthy eating and new foods while promoting self-efficacy to prepare healthy meals at home [24]. Furthermore, inclusion of food tastings or demonstrations draws participants into nutrition education programs and ergo exposes them to new information [25]. Current dietary patterns among Americans fall short in the categories of vegetables, fruits, whole grains, dairy, and oils; conversely, intakes of saturated fat, added sugar, and sodium exceed recommended daily limits for a vast majority of Americans. Fruit and whole grain consumption are particularly poor in low income (less than 130% of the federal poverty line) families with

children and adolescents when compared to other income brackets [18, 19]. Recipes developed for direct education in the UGA SNAP-Ed program follow specific nutrition and ingredient content guidelines informed by the federal Dietary Guidelines for Americans recommendations [57] and the Dietary Approaches to Stop Hypertension (DASH) diet [58]. The UGA SNAP-Ed recipe guidelines are an internal set of guidelines that emphasize nutrient-rich options from all food groups as defined by the Dietary Guidelines for Americans; ingredients that contribute minimal amounts of added sugars, saturated fat, and sodium; and offer overall appeal regarding flavor, appearance, and texture in a time and resource efficient manner. Recipes created for UGA SNAP-Ed are analyzed by a registered dietitian and graduate students with an emphasis on four key nutrients: Total calories per serving, fat (total and saturated) per serving, added sugar content, and sodium content.

At the time of the study, the recipes being utilized by UGA SNAP-Ed were developed with consideration for nutrition content, cost, and ease of preparation. However, information regarding participants' acceptance and liking of these recipes had not been systematically evaluated. Some of the existing recipes had been in circulation for over a decade [16]. Thus, program leaders decided to explore the development of new recipes using sensory evaluation to ensure recipes appealed to program participants.

Sensory evaluation is "a scientific discipline used to evoke, measure, analyze, and interpret reactions to those characteristics of food and other materials as they are perceived by the senses of sight, smell, touch, taste, and hearing." Sensory evaluation often utilizes standardized methods of reducing biasing effects of products by isolating sensory characteristics to elucidate pertinent information during product development. It has been used to assess consumer acceptance of commercial foods, beverages, and consumer products in the controlled

laboratory setting [42]. Other methods of affective testing—central location test (CLT) and home-use test (HUT)—are beneficial for collecting feedback on product preferences or acceptance from lay consumers. While the laboratory setting provides optimal researcher control of the environment, and thus minimal variability, CLT can be useful in collecting a large number of consumer responses from a building more accessible to the public. Home-use tests are beneficial when research is focused on learning more about product performance in the environment in which consumers would make or consume the product. Slight differences in product ratings or consumer attitudes have been noted between the three affective testing methods [43-45]; however, researchers must weigh the advantages and disadvantages of each method when developing a consumer test [41]. In the present study, a CLT was conducted to gather a large sample size at the sites of UGA SNAP-Ed program sessions without interfering with the target audience's usual schedule.

Emerging work has used sensory evaluation to evaluate consumer acceptance of recipes in community nutrition education programming [15]. This novel approach to community nutrition recipe evaluation collects quantitative measures of recipe acceptance from participants. The feedback received from sensory evaluation can be applied to the recipes utilized in programming, allowing recipes to be modified based on sensory evaluation feedback. Furthermore, sensory evaluation methods allow for the largest stakeholders—program participants—to partake in the recipe development process, which is useful in creating recipes that excite and appeal to the target audience.

The purpose of this study was to evaluate the acceptance of seven newly developed, health-focused, culturally tailored recipes among SNAP-Ed participants using sensory evaluation. The study also evaluated the degree to which specific sensory liking attributes (i.e.,

appearance, flavor, texture, saltiness, and sweetness) were related to ratings of overall liking; the relationship between overall liking of recipes and participants' likelihood to prepare the recipes at home; and age- and sex-related differences in the likelihood to prepare and acceptance of attributes in each recipe.

METHODS

Study Setting, Sample, and Design

This study tested seven new "inherently Southern" recipes (see Appendix C) that would fill requests from former participants for meatless entrees (Rustic Rotini with Tomatoes and Beans and Vegetarian Tacos with Homemade Salsa), soup (Chicken Chili with White Beans), whole grain breakfast (Banana Pudding Overnight Oats), fruit-based dessert (Whole Wheat Berry Bake), and salad made with leafy greens (Kale and Orange Salad)—all meal types that are not yet included in UGA SNAP-Ed programming. Recipes were analyzed through the NutritionistPro (2019 NexGen Axxya Systems LLC) program. Key nutrients of each recipe can be found in **Table 2.1.**

Testing was conducted at six UGA SNAP-Ed farmers market locations in Fulton County, Georgia during the program's summer sessions. Fulton County, Georgia is the largest county in Georgia and has over 1 million residents (51.6% female; 12% persons ≥ 65 years; 44.5% African American; 7.2% Hispanic or Latino). Nearly 14% of residents lived in poverty in 2018 [59]. Participants were Fulton County SNAP-Ed eligible adults who attended a SNAP-Ed farmers market educational lesson. Sensory evaluation for this study was conducted in place of a food demonstration to maintain the typical duration of the standard presentation (45 minutes or less), and participation was voluntary. Informed consent was obtained from all participants. This study

was approved by the UGA Institutional Review Board for human subjects research before the start of the study.

Sensory Evaluation

In this scaled acceptance test, researchers used a standardized protocol as described below to collect sensory evaluation feedback on seven new recipes from SNAP-Ed participants in farmers market settings.

*Staff Training***.** The research team, comprised of UGA SNAP-Ed state and county staff, attended three training sessions led by the researcher (Cox) to learn the principles of sensory evaluation and ensure consistent recipe preparation across all data collection sessions.

*Recipe Preparation***.** Recipes and ingredients for on-site cooking were prepared the day before the sensory evaluation sessions in the UGA Sensory and Product Development Laboratory. All recipes were prepared using standardized procedures. When applicable, recipes and ingredients were adequately cooled and refrigerated in accordance with USDA Food Safety Guidelines [60] and transported via cooler to the SNAP-Ed farmers market locations. The recipes and ingredients were refrigerated upon arrival, and the remainder of the preparation was completed on-site. For recipes that were served hot, cooking was done on-site to ensure the recipes reached appropriate temperatures per food safety guidelines. Recipe samples were transferred to lidded 2.0- or 3.25-ounce cups no more than 30 minutes prior to the sensory evaluation portion of the session. Each sample was portioned with its specific preparation instructions (e.g., “Portion 1 tablespoon oats into 2-ounce cups; before serving, add 1 (¼”) slice banana and ¼ mounded teaspoon of graham cracker crumbs to each tasting cup”) to ensure consistency of every sample in the evaluation session. When possible, the same researchers portioned the samples for all evaluation sessions of the same recipe.

Study Measures. The primary measures of this study were overall liking (OL), like/dislike of sensory liking attributes, and the likelihood of preparing each recipe at home. The ballot (**Figure 2.1** and Appendix A) consisted of questions about OL, followed by sensory liking attributes. Two recipes were evaluated for their sweetness: Banana Pudding Overnight Oats and Whole Wheat Berry Bake. Five recipes were evaluated for their saltiness: Chicken Chili with White Beans, Rustic Rotini with Tomatoes and Beans, Vegetarian Tacos, Homemade Salsa, and Kale and Orange Salad. All sensory evaluation questions were based on a 9-point hedonic scale (1=dislike extremely; 5=neither like nor dislike; 9=like extremely), which is a commonly used quantitative measure in the hedonic assessment of foods and beverages [61]. An OL rating ≥7 was used to indicate an acceptable recipe, per sensory science industry standards for consumer acceptability [62]. A question on the recipe preparation intention was added at the end of the ballot with a modified 9-point categorical scale (1=extremely unlikely; 5=neither likely nor unlikely; 9=extremely likely). Space for comments was made available after each question.

Data Collection. Participants were provided with a paper bag that held a paper ballot, pencil, bottle of room temperature water, utensils, and a SNAP-Ed "educational extender," such as a vegetable peeler or refrigerator thermometer, which served as an incentive for participating. After the researcher explained the contents of the paper bag and instructed participants to write their name and the date on the front page of the ballot, recipe samples were passed out. Participants were asked to take a sip of the room temperature water prior to tasting the sample to cleanse their palates. They were then instructed to taste the sample and score the recipe based on their OL of the recipe. After another sip of water, participants were led through the next four questions on the ballot that asked about their liking of selected sensory attributes (i.e., appearance, flavor, texture, saltiness, and sweetness). Research team members were available to

assist participants with literacy concerns and difficulties in writing and encouraged completion of the evaluation. After the sensory evaluation portion of the session was completed, the participants completed a separate questionnaire containing sociodemographic questions (see Appendix B).

Statistical Analysis

Ballots were collected by a member of the research team and stored at the UGA SNAP-Ed state office. The raw data were entered separately by two researchers (Ng and Powell) into Microsoft Excel spreadsheets on encrypted USB flash drives. All data were cross-checked. In the event of incongruent data, the original paper ballots were consulted, and the highest comprehensible mark was recorded when applicable. In addition, sociodemographic questionnaire data were coordinated with the sensory evaluation data to provide researchers with individual participant demographics.

Because recipes were tested by different participants, researchers chose to use a linear mixed effects model. This allowed the researchers to compare recipes "as if" the recipes were evaluated by the same group. For the relationships between OL, sensory liking attributes, and likelihood to prepare, non-parametric bivariate Spearman's correlations were conducted, as the data do not follow a normal distribution. Mann-Whitney non-parametric tests were used to determine the relationship between gender and OL of each recipe, age and OL, gender and likelihood to prepare, and age and likelihood to prepare. All data analyses were conducted using SPSS Statistics for Windows (Version 25.0, IBM Corporation, Armonk, NY, 2015). Written comments were compiled, organized by sensory attribute within each recipe, and relevant comments were pulled to support the quantitative results. The data that support the findings of

this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

RESULTS

Participant Information

A total of 338 participants attended the sensory evaluation sessions; however, some participants attended multiple sessions and evaluated more than one recipe. Thus, 566 ballots were collected. Ballots for each recipe ranged from 59 to 113. Key sociodemographic characteristics (i.e., age, gender, ethnicity, and race) of participants also varied by the recipe (**Table 2.2**), as the recipes were evaluated at different SNAP-Ed farmers market locations with different groups. According to the 566 ballots that were collected, 84.6% (n=400) were female, 82.3% (n=393) were over the age of 60, 80.5% (n=402) reported their race as Black, and less than 3% (n=12) of participants reported their ethnicity as Hispanic.

Recipe Acceptance: Overall Liking

The summary statistics for the mixed-effects model of overall liking of these recipes can be found in **Table 2.3.** Two out of seven recipes met standards for high consumer acceptance (OL rating ≥7). The Chicken Chili with White Beans ("Chicken Chili") recipe received the highest rating for OL (7.33, SD 1.76), while the Banana Pudding Overnight Oats ("Banana Oats") received the lowest rating for OL (5.17, SD 2.50). Open-ended feedback of the OL of the Chicken Chili was generally positive and included the following: "Very good," "like very much," and "tasty," with three additional comments pertaining to the flavor or desire to include more of a certain ingredient (e.g., celery or salt). A significantly lower liking of the Banana Oats was seen across all questions ($p < .001$). Open-ended feedback for the Banana Oats included the following: a general dislike of bananas and oats mentioned at least five times across all open-

ended comments; the desire for more sweetness mentioned at least 22 times in reference to the liking of sweetness question alone; and the "wrong flavor" for many, with individual comments following the liking of flavor question that mentioned bitterness, the need for more cinnamon and sugar, or the sample leaving "a sour taste in mouth." Recipes containing meat/meat alternatives appeared in the top four highest rated recipes by OL (Chicken Chili OL: 7.33; Vegetarian Tacos OL: 7.26; Rustic Rotini with Tomatoes and Beans ("Rustic Rotini") OL: 6.78).

Recipe Acceptance: Sensory Attributes

Liking of selected sensory attributes in the mixed-effects model is shown in **Table 2.4.** When rating for appearance, the Homemade Salsa received the highest rating, and the Banana Oats received a rating significantly lower ($p < .001$) than the other six recipes. The remainder of the recipes did not differ significantly from each other in terms of liking of appearance; however, recipes more homogenous in color, such as the Chicken Chili, Whole Wheat Berry Bake ("Berry Bake"), and Banana Oats received the lowest ratings for appearance. Feedback from one participant used the word "bland," and another the word "colorless" to describe the appearance of the Banana Oats. "Bland" was also mentioned by a participant commenting on the appearance of the Chicken Chili. A participant who evaluated the Chicken Chili suggested adding minced red pepper for more color. There was a dislike of the "mushy" and "grainy" appearance in the Berry Bake, as described by three participants. Regarding flavor of each recipe, Banana Oats were liked significantly less ($p < .001$) than the Kale and Orange Salad ("Kale Salad"), Rustic Rotini, Berry Bake, Vegetarian Tacos, and Chicken Chili.

Preparation Intent

Table 2.5 shows the average ratings and standard deviations for the participants' likelihood to prepare each recipe at home after sampling it. None of the recipes met the industry

standard of ≥7 out of 9 for likelihood to prepare a recipe. Age-specific analysis using Mann Whitney results for the relationship between likelihood to prepare a recipe and the age of the participants are also shown in **Table 2.5**. Participants 18-59 years old (n=8) were significantly more likely to prepare the Vegetarian Tacos than the 60+ (n=54) age group. The twelve comments recorded under the Vegetarian Taco's likelihood to prepare scale question did not explain this significant difference. All comments for the Vegetarian Tacos recipe, regardless of age group, were positively related to their desire to prepare the recipe. There were no significant associations found in the Mann Whitney Non-parametric test results for the relationships between OL and gender, likelihood to prepare and gender, or likelihood to prepare and age of participants by each recipe (data not shown).

Relationship among OL, Sensory Liking Attributes, and Preparation Intent

Table 2.6 shows the bivariate Spearman's correlations and significance for the relationships between OL of each recipe, its sensory attributes, and likelihood to prepare the recipe. Apart from the Chicken Chili, the OL of all other (n=6) recipes correlated significantly with their sensory attributes. The Chicken Chili received a negligible correlation strength with texture and saltiness of the recipe, but these findings were not significant. The OL of all seven recipes was significantly correlated with the likelihood to prepare the recipe, ranging from moderate (n=5) to high (n=2). The flavor attribute garnered the highest correlations with their respective rating of OL in six recipes. Significant Spearman correlations for OL and flavor of these six recipes ranged from moderate (n=1) to high (n=4) to very high (n=1). Meanwhile, the saltiness/sweetness measure was the least influential on OL, with significant but negligible (n=1), low (n=2), moderate (n=2), and high (n=2) correlation strengths across six of the seven recipes. Texture was moderately to strongly correlated with many recipes, and open-ended

feedback provided insights on the participants' ratings of recipes' texture: one participant commented specifically on their dislike of the "squeaky feel" of the meat alternative used in the Vegetarian Tacos; another enjoyed the "crunchy" texture of the Kale Salad; and the texture of the Banana Oats reminded one participant of uncooked oatmeal (unappealing).

DISCUSSION

This study was designed to examine the consumer acceptance of newly created recipes, the recipes' individual sensory attribute components, and the likelihood to prepare the recipes. Of the seven recipes, two received an overall liking rating ≥7, which indicates a highly acceptable rating of consumer acceptance per sensory evaluation standards for consumer acceptability [62]. Regarding the sensory liking attributes, flavor and texture were the strongest and most consistently correlated attributes related to how participants rated their OL of each recipe; however, for the least liked recipes, there was a strong association with the participants' dislike of the recipe's sweetness or saltiness and their OL of the recipe. These results are in line with a similar study in this area of research, wherein sensory evaluation of recipes among EFNEP participants also concluded OL was highly and consistently correlated with the flavor ratings of recipes [15]. Consumer testing of other food products, both savory [46, 47, 49, 50] and sweet [44, 47, 51], have shown similar findings for overall liking and acceptability drivers of liking. Across beverages [44, 51] and protein food products [46, 47], taste and flavor were the primary drivers of overall liking in these studies. Texture also strongly impacted the overall liking of these various food products. This provides the researchers with insight as to what areas of a recipe are most important to participants when they are deciding whether or not they enjoy a recipe as a whole. These findings may indicate that SNAP-Ed participants are willing to see past

certain attributes (e.g., saltiness or sweetness) when other attributes, such as flavor and texture, meet their standards of liking.

Texture plays a unique role in sensory evaluation. From the moment a participant sees a food item to the act of mastication, the texture of the item is influencing a participant's perceived, and consequently, actual liking [42]. Most notably, certain textures (e.g., crispy or crunchy; gelatinous or creamy) can add positive or negative associations to eating, depending on a participant's past experiences with similar foods [42, 48]. One particular study utilizing protein beverages determined that viscosity (buttery, milky, smooth, and sweet in a check-all-that-apply evaluation) of the beverage was a shared driver of liking among two distinct consumer clusters whose flavor interests differed [44]. In the present study, open-ended feedback provided researchers with an idea of what textural aspects of the recipes were appealing or unappealing to the target audience. For example, the "squeaky feel" of meat alternatives may have negatively impacted their ratings of the Vegetarian Tacos, but the acceptance of the Kale Salad was partially due to their liking of the "crunchy" texture. The influence of texture on liking may be personal in another sense—differences in liking of a product's texture may even stem from a physiological difference in how a person manipulates food while eating [63, 64]. Although researchers did not specifically examine texture and these individual differences in mastication, understanding the importance of texture attributes for different audiences, and tailoring attributes to their liking, can guide recipe improvements and final selection for community nutrition programming.

In the field of sensory science, it is well understood that appearance is a primary indicator of the perceived quality or taste of a product, and a reason why some sensory evaluation occurs with lighting that masks the color of the sample [42, 52, 53]. Then, it is not surprising that the appearance of the samples was significantly correlated with their OL (**Table 2.4** and **Table 2.6**).

For instance, the appearance of the Kale Salad received a high correlation strength with the OL of the recipe. Comments about the appearance of the recipe, however, indicated that some participants wanted more color, whereas other individuals found the salad "appealing" and "pretty" as it was presented. The researchers agreed that the use of massaged kale—raw kale leaves that have been mechanically manipulated with one's hands and oil to brighten and tenderize the leaves—and canned mandarin oranges instead of fresh oranges may have influenced their numeric score of the appearance. Regardless of whether the participants liked or disliked the Kale Salad, its appearance ratings mirrored its OL ratings.

One specific recipe, the Banana Oats, elucidated an unexpected result during data analysis: In addition to being the least liked recipe across all sensory attributes and likelihood to prepare, the recipe provided important insight about balancing the convenience of a recipe with its ingredients and preparation methods. Prior to the study, the researchers were excited to offer a recipe that would be advertised as a "quick, whole grain breakfast" with reduced preparation equipment that parents and working adults alike would enjoy as a make-ahead breakfast option. Participants, however, did not like the recipe's "bland" appearance and flavor, as well as its unappealing texture, being "more like tuna fish," as one participant commented, and "mushy" and unappetizing served cold. Other concerns with the recipes included the name, which misled participants into asking for more pudding flavor in the recipe, for which no pudding was included in the recipe. Concerns with this recipe, however, highlight the benefit of sensory evaluation during the recipe development stage, as the feedback provided by participants will allow for recipe modifications to be made before recipes are permanently included in UGA SNAP-Ed programs.

Nationally, 13% of SNAP participants are age 60 or older, while an estimated 11% of SNAP participants in Georgia are classified as elderly [65, 66]. With over 82% of participants in this study older than 60 years of age, results cannot necessarily be applied to the entire target audience. Over the aging process, sensory perception of food changes primarily related to olfaction, flavor, and taste sensations [67]. This may be due to a variety of factors, including a decline in oral health [68], medication usage that changes flavor perception [69, 70], and other physiological changes that impact vision and hearing [70]. As a result, older adults may be drawn to foods with higher concentrations of sugar, fat, and salt to reach the same flavor and taste perception as their younger counterparts. Texture does not appear to be impacted as heavily during the aging process, with few differences noted in texture perception between younger and older subjects [71, 72]. Older populations may, however, prefer intermediate textures that are easier to chew [67, 73]. Knowing this, it is uncertain whether ratings of the seven new recipes in this study are reflective of the "typical" SNAP-Ed participant.

Other demographics of this study, such as race and ethnicity, also do not entirely match the nationwide demographics of the typical SNAP-Ed participant in the state of Georgia (57% African American; 2.7% Hispanic; 57% female nationally). In the present study, nearly 85% of participants were female, 80% reported their race as Black, and less than 3% identified as Hispanic. In addition to differences in age, there are potential differences in losses of sensory perception (taste and olfaction) during aging that vary based on gender, race, and ethnicity [74]. Beyond sensory perception, cultural implications of new recipes must be considered. In an attempt to create healthy, inherently Southern (United States) recipes, it is possible that the majority non-White participants of the present study did not think the recipes would fit within their own cultural food choices. This may explain low likelihood to prepare ratings overall

(**Table 2.5** contains data for likelihood to prepare ratings by age; other relationships not shown). A detailed perspective of eating behaviors, healthy eating perceptions, and other factors related to ethnically diverse older adults has been published by Asamane et al. [75]. Culturally adapted health interventions that include culturally tailored recipes as opposed to the original program recipes translated to the target language are becoming more frequently explored [76, 77]. Culturally tailored recipes and nutrition education have the ability to change healthy eating intent and behavior [78-81], though the limited work in this area has also demonstrated no healthy behavior change despite culturally tailored recipes and cooking [82]. Barriers to making changes in eating habits include the social expectations of the person cooking for their family [83]. It is crucial that curriculum developers of SNAP-Ed programs take into consideration the cultural differences in what defines "healthy eating" and how to best support their target audiences to make changes that still support their cultural backgrounds.

Limitations

While the results of this study are promising for a standardized way of receiving recipe feedback from the target audience, researchers did not include control recipes that contained traditional levels of sodium, fat, and sugar. Consequently, no baseline measurements exist. In traditional sensory testing, participants are isolated in individual booths to avoid influence from other participants through facial expressions or verbal comments [42]; however, in the community CLT environment, this is not feasible. Although the researcher leading the sensory evaluation asked for participants not to discuss their responses with their neighbors, they noted that some participant interaction still occurred.

Published guidelines for community-setting sensory evaluation suggest a minimum of 100 participants [84], which this study did not meet for some recipes. Regardless, researchers did

find statistically significant differences in outcomes of interest, and the results still provide unique information to inform future recipe development and modifications of recipes. Despite the challenges of conducting sensory evaluation in community settings, the inclusion of these limited-resource consumers is crucial to understanding the likes and dislikes of generally under-represented populations. These consumers are less mobile, so the act of bringing the evaluation to the consumers' location is necessary to obtain their input on recipes that are directly related to their wants and needs. Additional measures, such as fewer participants per evaluation and visiting more sites to obtain a larger sample; an ingredient warning in case of allergies; being verbally led through the ballot; preparing recipes in a different location, as feasible, to reduce aromas during evaluation; and providing appropriate sensory methodology supplies like a water bottle for cleansing the palate, maintained the integrity of sensory evaluation in a non-traditional testing setting.

A scaled acceptance test, such as the hedonic scale used in this study, allows for participants to provide information on whether a sensory attribute is liked or disliked in an absolute sense, while qualitative data provides additional insight into the ratings. Although there is a benefit in gaining valuable participant feedback through written comments, it is understood that consumers tend to respond to a survey or leave written feedback when they are highly satisfied or dissatisfied with a product or service [42, 85]. This may have resulted in comments that are not representative of the overall results. For this reason, the use of a fixed 9-point scale allowed for a more accurate interpretation of the recipes and still allowed for comments to be included as supplementary data to support or oppose recipe modifications; however, future studies should determine whether a 5-, 7-, or 9-point hedonic scale is the optimal length to retain validity for untrained, lower literacy participants in community settings where time is limited

[41]. It is also uncertain whether the use of a bipolar scale with a labeled, neutral point (neither like nor dislike; neither likely nor unlikely) contributes to participant bias through the idea of satisficing or overuse due to confusion by the participant [86, 87]. These are concerns that must be addressed in future study designs of sensory evaluation with this population. Furthermore, despite the best efforts of the research team (e.g., reading aloud to participants, assisting one-on-one when requested), participants still experienced literacy limitations in reading the ballots, as evident through conflicting marks and incomprehensible comments on the sensory evaluation ballots. In the future, the use of focus groups could offer insight on why participants responded to the ballots in the ways they did, and further explain the correlations found among OL and sensory liking attributes.

It is possible that study participants had difficulty hearing the researcher and experienced reduced fine motor skills, which is common for older populations [88, 89]. In cases like this, smaller sessions of sensory evaluation are likely necessary to ensure all participants receive the necessary assistance. Lastly, participants who attended lessons during the study were unable to observe much of the preparation and did not have the opportunity to learn through the cooking demonstration that follows standard sessions; however, participants were still given the opportunity to taste and rate a recipe, as well as seriously consider their likelihood of preparing the recipe they tested. Although sensory evaluation results may not equate to participants' true behaviors, such as their likelihood to make a recipe at home, even when a mark of ≥ 7 is recorded, responses provide a starting point for determining participant behaviors [90, 91]. Through the sensory evaluation process, researchers and recipe developers for SNAP-Ed programming can empirically gain a better understanding of the drivers of liking among their specific target audience.

IMPLICATIONS FOR RESEARCH AND PRACTICE

The findings of this study support the use of sensory evaluation methodology in the community nutrition setting and support the inclusion of the top two highly rated recipes into the SNAP-Ed curriculum with minor modifications to address participant concerns. This is the first of the researchers' knowledge to explore the acceptance of culturally relevant recipes in the SNAP-Ed programming environment by including the participants in the recipe development stage via sensory evaluation. The use of sensory science in the community nutrition field is just emerging, and the incorporation of sensory evaluation is beneficial in understanding the likes and dislikes of the target audience. The feedback from current SNAP-Ed participants through sensory evaluation ballots provides UGA SNAP-Ed with a unique opportunity to alter recipes based on target audience feedback prior to adding them to the existing programming or during formative evaluation of new programs. With a goal to improve dietary choices of SNAP-Ed participants, it is necessary that recipes offered through the curriculum are realistic and appealing for the target audience while meeting national nutrition standards. Thus, these programs can continue to support low-income audiences' likes/dislikes while abiding by the *Dietary Guidelines* recommendations. In doing so, limited-resource consumers at a heightened risk of dietary-related diseases may replace one or more of their meals with SNAP-Ed options that consequently reduce their overall intakes of sodium, added sugars, and saturated fat. Additional research to include participants in recipe development (i.e., sensory evaluation) should be conducted to determine a participant's willingness to try a modified recipe again, considering their previous experience(s) with the recipe, and whether participants are actively preparing the recipes at home. Follow up studies utilizing qualitative methods like focus groups can elucidate a deeper understanding of their recipe needs and factors related to recipe preparation. Despite the limitations, it is

paramount to include the largest stakeholders—participants—in the recipe development process, and sensory evaluation methodology is a useful tool for collecting quantitative measures of recipe acceptance. The SNAP-Ed program's recipe development would benefit from formal participant input on the sensory liking attributes (e.g., tastes, flavor, aroma, etc.) to guide the final recipes for the curricula.

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TABLES AND FIGURES

Table 2.1. Nutrient analysis of seven new recipes† for SNAP-Ed eligible Georgians‡.

Recipe (per serving)	Calories	Total Fat (g)	Saturated Fat (g)	Protein (g)	Total Sugar (g)	Added Sugar (g)	Sodium (mg)
Chicken Chili (1 cup)	280	10	2	31	4	0	390
Rustic Rotini (1/6th recipe)	470	8	1	20	11	0	220
Homemade Salsa (2 tbsp)	30	0	0	1	5	0	65
Berry Bake (1/9th recipe)	190	8	2.5	3	17	11	210
Vegetarian Tacos (2 tacos)	100	3	0	14	3	0	290
Banana Oats (1/4th recipe)	210	3	0.5	9	16	1	90
Kale Salad (2 cups)	170	10	1.5	6	10	0	280

†Banana pudding overnight oats (banana oats), whole wheat berry bake (berry bake), chicken chili with white beans (chicken chili), rustic rotini with tomatoes and beans (rustic rotini), vegetarian tacos (vegetarian tacos), homemade salsa (homemade salsa), and kale and orange salad (kale salad).

‡Recipes focus on four key nutrients per serving: (1) Total calories; (2) <15 grams of total fat and <5 grams of saturated fat; (3) Added sugar <3 teaspoons (12 grams); and (4) Sodium daily total target less than 1500 – 2300 milligrams daily.

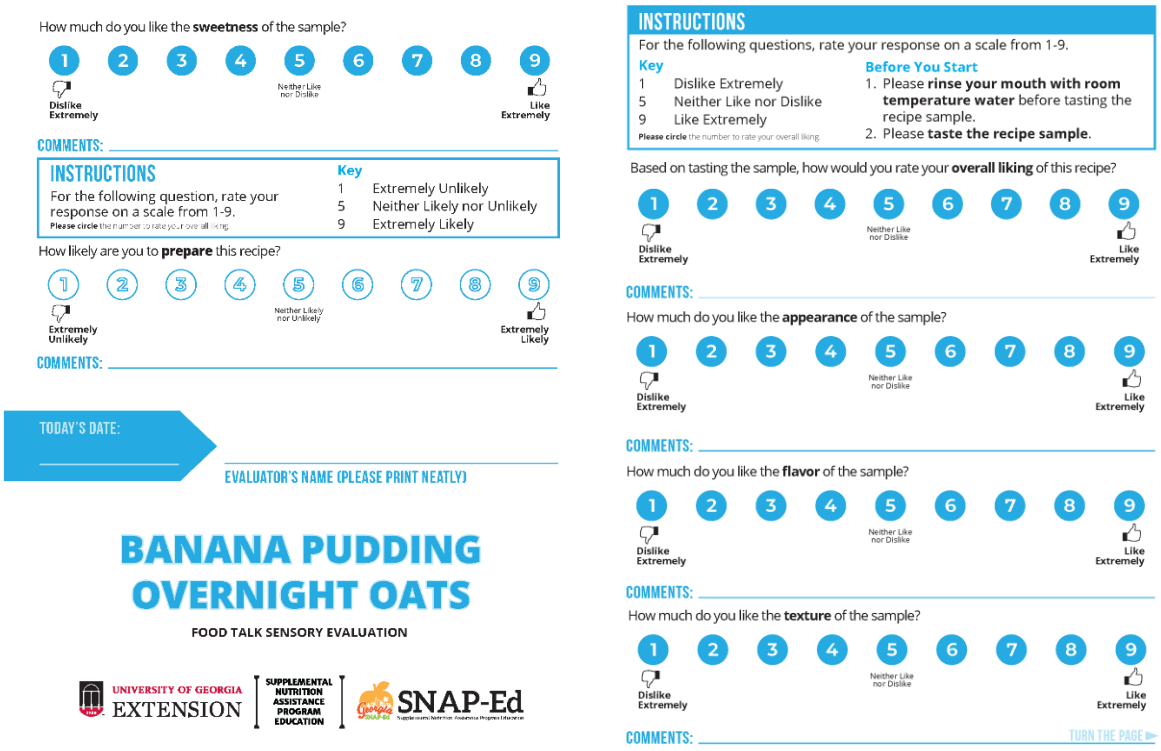

Figure 2.1. Sample ballot used during sensory evaluation. Ballots were folded horizontally in half, making the title page being the front flap, the "inside" being four like/dislike questions, and the back flap is the last like/dislike question and preparation question.

Table 2.2. Key demographic characteristics of participants for sensory evaluation ballots of the seven new recipes †

		Gender (%) †		Age (%) †		Ethnicity (%) †		Race (%) †	
Recipes	**N**	**Male**	**Female**	**18-59**	**60+**	**Non-Hispanic**	**Hispanic**	**Non-Black**	**Black**
Banana Oats	95	20.2	79.8	21.0	79.0	97.5	2.5	9.3	90.7
Berry Bake	56	12.5	87.5	27.1	72.9	97.8	2.2	20.8	79.2
Chicken Chili	75	11.8	88.2	18.8	81.2	98.4	1.6	22.5	77.5
Rustic Rotini	108	22.3	77.7	15.6	84.4	97.8	2.2	7.1	92.9
Vegetarian Tacos	68	12.9	87.1	12.9	87.1	96.6	3.4	25.0	75.0
Homemade Salsa	68	16.1	83.9	12.9	87.1	94.9	5.1	25.0	75.0
Kale Salad	69	11.9	88.1	15.5	84.5	98.0	2.0	26.7	73.3

† Percentages used to account for participants who did not answer all demographic questions.

Table 2.3. Mixed-effects model for recipe preference of participants†.

Recipe	Mean	Std. Error	df	Lower 95% CI	Upper 95% CI	Bonferroni Comparisons‡		
Chicken Chili	7.33	0.241	490.95	6.86	7.81	A		
Vegetarian Tacos	7.31	0.253	490.87	6.81	7.81	A	B	
Berry Bake	6.88	0.292	482.81	6.30	7.45	A	B	
Rustic Rotini	6.83	0.208	474.73	6.42	7.24	A	B	
Homemade Salsa	6.31	0.257	490.31	5.81	6.82	A	B	
Kale Salad	6.25	0.265	488.49	5.73	6.78		B	
Banana Oats	5.17	0.224	480.68	4.73	5.61			C

†**Overall liking** on a 9-point hedonic scale. Recipes with pairwise comparison of Bonferroni Method indicate significant differences in overall liking among recipes with different letters.
‡Recipes with the same letter are not significantly different at $\alpha = .05$. Recipes are significantly different at $F = 11.027,\ p < .001$.

Table 2.4. Mixed-effects model for **liking of selected sensory attributes**, from highest to lowest average rating on a 9-point hedonic scale. Recipes with pairwise comparison of Bonferroni Method indicate significant differences in liking of sensory attribute among recipes with different letters.

Appearance

Recipe	Mean	Std. Error	df	Lower 95% CI	Upper 95% CI	Bonferroni Comparisons †		
Homemade Salsa	7.63	0.234	496.55	7.17	8.09	A		
Vegetarian Tacos	7.46	0.234	496.74	7.00	7.92	A		
Kale Salad	7.42	0.242	494.49	6.94	7.89	A		
Rustic Rotini	7.40	0.194	473.02	7.02	7.78	A		
Chicken Chili	7.35	0.223	497.00	6.92	7.79	A		
Berry Bake	7.29	0.266	487.17	6.77	7.82	A		
Banana Oats	6.19	0.206	478.11	5.78	6.60			B

† Recipes with the same letter are not significantly different at $\alpha = .05$. Recipes are significantly different at $F = 5.186,\ p < .001$.

Flavor

Recipe	Mean	Std. Error	df	Lower 95% CI	Upper 95% CI	Bonferroni Comparisons †		
Chicken Chili	7.12	0.243	494.89	6.65	7.60	A		
Vegetarian Tacos	7.00	0.257	494.43	6.50	7.51	A		
Berry bake	6.88	0.289	485.23	6.31	7.45	A	B	
Rustic Rotini	6.67	0.214	466.55	6.25	7.09	A	B	
Kale Salad	6.22	0.264	492.97	5.70	6.73	A	B	
Homemade Salsa	5.86	0.255	494.48	5.36	6.37		B	C
Banana Oats	4.84	0.228	474.64	4.39	5.29			C

† Recipes with the same letter are not significantly different at $\alpha = .05$. Recipes are significantly different at $F = 13.097,\ p < .001$.

Table 2.5. Mann Whitney Tests for the relationship between likelihood to prepare (average rating shown) and age of participants. Participants aged 18-59 years old were significantly more likely (U=105, p=.015) to prepare the Vegetarian Tacos than those who reported their age as 60+ years.

Recipe	Likelihood to Prepare (average across all ages±SD)	Mann-Whitney U	Mean Rank (18-59)	Mean Rank (60+)	Significance (two-tailed)
Chicken Chili	6.75±2.59	252.50	42.58	32.59	.091
Rustic Rotini	6.73±2.33	605.00	49.67	48.88	.919
Homemade Salsa	6.00±2.83	139.50	42.06	30.54	.092
Berry Bake	6.13±2.87	216.00	23.62	24.83	.783
Banana Oats	4.77±2.94	488.00	41.00	39.75	.843
Vegetarian Tacos	6.81±2.53	105.00	46.38	29.91	.015*
Kale Salad	6.16±2.52	143.00	38.11	27.92	.092

* Indicates significance at the *p=.05* level

Table 2.6. Bivariate Spearman Correlation Coefficients (Spearman's ρ) for the relationship between overall liking (OL) and appearance, flavor, texture, saltiness/sweetness, and likelihood to prepare for each of the seven recipes. Significant values are in bold.

Recipes	OL and Appearance		OL and Flavor		OL and Texture		OL and Saltiness/ Sweetness		OL and Likelihood to Prepare	
	Spearman's ρ	*P* value	Spearman's ρ	*P* value	Spearman's ρ	*P* value	Spearman's ρ	*P* value	Spearman's ρ	*P* value
Chicken Chili	-.031	.881	-.036	.865	.116 [e]	.591	.146 [e]	.497	**.649** [c]	.000
Rustic Rotini	**.599** [c]	.000	**.780** [b]	.000	**.649** [c]	.000	**.391** [d]	.000	**.654** [c]	.000
Homemade Salsa	**.510** [c]	.000	**.882** [b]	.000	**.789** [b]	.000	**.656** [c]	.000	**.729** [b]	.000
Berry Bake	**.575** [c]	.000	**.859** [b]	.000	**.617** [c]	.000	**.634** [c]	.000	**.716** [b]	.000
Vegetarian Tacos	**.571** [c]	.000	**.679** [c]	.000	**.705** [b]	.000	**.498** [d]	.000	**.571** [c]	.000
Kale Salad	**.756** [b]	.000	**.908** [a]	.000	**.863** [b]	.000	**.732** [b]	.000	**.669** [c]	.000
Banana Oats	**.474** [d]	.000	**.822** [b]	.000	**.619** [c]	.000	**.747** [b]	.000	**.634** [c]	.000

Note: Correlation strengths are defined as [a]Very High (0.9−1.0), [b]High (0.7−0.9), [c]Moderate (0.5−0.7), [d]Low (0.3−0.5), or [e]Negligible (0.0−0.3) per previously published guidelines in sensory analysis [62]

CHAPTER 3

APPLICATION OF A SENSORY EVALUATION METHODOLOGY FOR RECIPES UTILIZED IN FEDERAL NUTRITION EDUCATION PROGRAMS [2]

[2] Ng, M.K., Adhikari, K., Andress, E.L., Henes, S., Lee, J.S., & Cox, G.O. Submitted to and under review with the *Journal of Sensory Studies* as a short contribution of methodological development, 03/15/22.

ABSTRACT

Federal nutrition education programs, such as EFNEP and SNAP-Ed, utilize recipe demonstrations to engage with low-income participants and promote healthy eating behaviors; however, recipes created for these programs are developed in state extension offices or in collaboration with local cooks/chefs, and the fit of the recipes within their educational programming is subjective. Thus, a sensory evaluation methodology was developed to support recipe and curricula development. It is intended for use with a unique population of low-income participants of federal nutrition education programs in central locations. The inclusion of sensory evaluation methods allows state extension staff to make sensory attribute-specific improvements to their recipes prior to implementing them in their curricula. This article will detail the methodology that has been used for two successful studies in the community and briefly explain the researchers' "lessons learned;" suggested statistical analyses and relationships to analyze; and the future implications of this methodology.

PRACTICAL APPLICATIONS

To encourage behavior change and promote healthy eating, nutrition education programs can utilize this sensory evaluation methodology to guide their recipe development and curricula decisions. The inclusion of sensory evaluation may present with an upfront higher recipe testing cost and increased time required by stakeholders to provide feedback, but it offers a deeper understanding of the target audiences' likes and dislikes. This information can be used to determine gaps in information on specific foods or nutrients within nutrition education lessons; to improve upon the recipe offerings in direct education; and to inform recipe development as new recipes are introduced to the target audience. Finally, the addition of questions related to

preparation or purchase intent may allow content developers of these programs to infer the practicality of the recipes and predict behavior change.

INTRODUCTION

Low-income individuals face unique challenges to healthy eating, including limited access to healthy options; cost, time, and transportation barriers; and insufficient education/experience to purchase and prepare healthy meals [1-3]. Additionally, they typically consume fruits and vegetables at rates lower than higher income individuals [2] and experience higher rates of preventable disease, overweight, and obesity [6-8]. Two Federal programs in the state of Georgia provide nutrition education to low-income individuals and families: University of Georgia (UGA) EFNEP (Expanded Food and Nutrition Education Program) and UGA SNAP-Ed (Supplemental Nutrition Assistance Program Education). These programs offer direct, interactive educational sessions with an aim to improve health behaviors, such as food choices, on a budget [11, 12, 92]. In Georgia, both programs utilize a similar set of lessons for their unique audiences through their *Food Talk* program, created in 2009 [16]. Within *Food Talk*, participants observe a food demonstration and tasting of low-cost recipes that focus on health.

With the programs' target audiences in mind, recipes used for direct education should be enticing enough to encourage participants to make them at home; those chosen for demonstrations and tastings are capable of influencing eating habits and food choices [24]. Nearly a decade after the inception of *Food Talk*, the recipes in the curriculum had not been systematically evaluated for their acceptance with the target audience. Thus, the authors worked with UGA SNAP-Ed and UGA EFNEP to develop a sensory evaluation methodology and execute two studies to evaluate the recipes for acceptability in the communities served by *Food Talk* [15, 93].

METHODS

An affective test, which collects information on participant acceptance, or liking, was used. Both studies performed sensory evaluation using a similar protocol with slight differences to fit the needs of their respective programming formats and study objectives.

Participants

Research was conducted with untrained, low-income participants (as defined by the individual EFNEP and SNAP-Ed programs) enrolled in *Food Talk* and related programs, all of whom were informed that participation was voluntary. Per sensory evaluation guidelines for non-laboratory settings, a goal of 75-100+ participants per recipe was established [84]. The use of convenience samples in a central location was deemed most realistic. This approach allowed all participants, regardless of transportation constraints, the opportunity to participate while already at a nutrition education lesson. It also informed the simplicity of the sensory ballots (**Figures 3.1 and 3.2**). Informed consent was obtained from study participants. Both study designs were approved in advance by the UGA Institutional Review Board for the Protection of Human Subjects (ID: STUDY00000941 and STUDY0005591) and by their respective federal programs. Groups who wish to conduct sensory evaluation involving program participants should ensure they receive approval from their governing bodies.

General Study Design

A standardized recipe sample was provided to each participant alongside a sensory evaluation ballot and kit containing plastic silverware, a bottle of room temperature water, and a pencil. The researchers utilized a 9-point hedonic scale with verbal anchors (1=dislike extremely, 5=neither like nor dislike, 9=like extremely) for all sensory questions. A 9-point categorical scale was used for other questions regarding preparation and ingredient purchase intent (1=extremely

unlikely; 5=neither likely nor unlikely, 9=extremely likely) (**Figures 3.1 and 3.2**). This scale length was chosen due to its appropriate use for hedonic consumer research [41, 94]. Participant ratings were denoted by circling, filling in, or checking their chosen number. Samples were served in consistent portions in disposable soufflé cups with lids or on small plates. The portions should be specified in the preparation steps (i.e., "fill 3.25-ounce tasting cups halfway with salad. Add ¼ teaspoon diced onion and 2 mandarin orange slices.") of each recipe to ensure consistency. Having the same researcher portion all samples of one recipe, even across different sessions, was ideal. Bottled water was provided as the palate cleanser. Rinses and samples were swallowed, not expectorated. Sensory evaluation was led by a trained researcher, who guided the participants through the ballot questions and sampling process. This method is most successful with three to six researchers assisting with the evaluation.

Food safety should be carefully monitored to avoid foodborne illness. Hot and cold holding of foods can be difficult over the course of cooking, storage, transportation, sample preparation, and serving. In the case of this study design where all participants evaluated the recipes at one time, researchers could control the temperature of the samples until they were portioned and distributed. Recipes that required refrigeration were made ahead of time and stored following Federal Food Safety Guidelines [60]. They were then transported in coolers that maintained an environment below 40 degrees Fahrenheit until portioned no more than 30 minutes before the sensory evaluation session. Preparation was done on site for recipes that required cooking to a temperature of 165 degrees Fahrenheit.

The general protocol for sensory evaluation is as follows:

1. The lead researcher invites participants to evaluate a recipe, introduces it, explains the purpose of the research, informs participants that participation is voluntary, and lists the ingredients in case of participant allergies.
2. Samples, kits, and optional incentive item are passed out to interested participants.
3. Participants are instructed to write their name and the date in the space provided at the top of the ballot or fill out anonymous demographic information.
4. The researcher reads the instructions aloud and explains the verbal scale anchors. Other researchers remain on stand-by to assist with filling out ballots as needed.
5. Participants are instructed to take a sip of the provided water before tasting the recipe.
6. Participants are instructed to take the lid off their sample (if in a sample cup) and use the silverware to take a bite of the recipe.
7. Participants are instructed to answer the first question on the ballot, which asks about their overall liking of the recipe. The researcher leading the session should read this question aloud and repeat the verbal scale anchors.
8. Participants are instructed to take another bite of the sample, rinsing as needed.
9. Researcher asks participants to rate their liking of the recipe's attributes listed on the ballot (researcher allows for time between each attribute before reading the next).
10. Participants are instructed to answer any remaining questions of interest to the researchers, such as their likelihood of preparing the recipe at home or purchase intent of ingredients from the recipe(s).
11. Participants are instructed to check their ballots for missed questions and answer all questions.

12. Researchers collect ballots and trash as participants complete the ballots.
13. Demographic questionnaires may be in a separate form. If this is the case, the demographic questionnaire is handed out and the lead researcher asks participants to complete the demographic questionnaire.
14. Researchers collect demographic questionnaires, if applicable.
15. Ballots are consolidated and stored securely for transportation.

Study-Specific Design Considerations

EFNEP Design

To reach the desired participant count, adults (18 years of age or older) of the EFNEP *Food Talk* program were included across 12 counties in Georgia. Researchers collected data over the course of 9 months during standard EFNEP programming, and the sensory evaluation sessions occurred at the end of scheduled lessons.

During each sensory evaluation session, participants were provided with two recipes from the existing *Food Talk* curriculum. Sixteen recipes were evaluated in all, but a limit of two sessions per person was enforced to minimize participant burden and respondent fatigue. The recipes contained no additions, omissions, or substitutions in ingredients, and the educators responsible for demonstrating the recipes changed no preparation methods to ensure recipe standardization across all sessions and locations. Participants received their two samples consistently portioned in a sample cup or uniform paper plates, as well as the evaluation kit and ballot printed into booklet form (**Figure 3.1**).

Participants answered questions about their overall liking (OL) of each recipe and their liking of specific attributes (recipe title, appearance, flavor, and texture). After going through the

sensory evaluation for both recipes, participants were asked a series of 3-5 purchasing and food preparation questions specific to the recipes. Sessions were observed by at least one trained EFNEP supervising staff member, and a protocol checklist completed by EFNEP staff verified that each session was run correctly with consistently prepared recipes. All study data were shipped to a central UGA EFNEP office for data entry and secure storage.

SNAP-Ed Design

This study consisted of adult participants of the SNAP-Ed *Food Talk: Farmer's Market* (FTFM) summer program, an 8-week program at various locations in Fulton County, Georgia. To reach the desired participant count, researchers attended two sessions per week to test seven newly developed recipes inspired by the cuisine of the Southeastern United States. The sensory evaluation sessions were planned so that participants had the opportunity to try up to two different recipes, but no participants evaluated the same recipe twice. All recipes were standardized for quantity and consistency of preparation and serving with no additions, substitutions, or omissions to the ingredients or preparation method.

The evaluation of one recipe occurred at the end of the scheduled FTFM nutrition education lessons and took the place of the usual food demonstrations. Participants received one consistently portioned sample in a lidded cup, as well as their evaluation kit and a ballot printed double-sided and folded in half (**Figure 3.2**). To encourage participation, all study participants received an "extender" kitchen tool, such as a vegetable brush.

Researchers walked participants through a series of questions similar to the EFNEP study: OL of the recipe and liking of the recipe's attributes (appearance, flavor, texture, and sweetness/saltiness depending on the recipe characteristics). This ballot did not include a question about the recipe title due to space constraints, but the inclusion of this question is

recommended by the research team. After participants completed the sensory evaluation, they answered a question about their likelihood of preparing the recipe at home. All data were collected at a central UGA SNAP-Ed location for data entry and secure storage.

Statistical Analysis

Data were collected by a researcher and transported to a UGA EFNEP or SNAP-Ed State office, where the ballots were stored in a secure filing cabinet. Data were entered separately onto a secure Qualtrics XM account or encrypted document by two research assistants and crosschecked for data congruency. Researchers analyzed all data using IBM SPSS Statistics for Windows. Descriptive statistics provided researchers with demographic information (age, gender, race, ethnicity), average ratings of consumer acceptance (OL and sensory attributes), and additional preparation/purchase intent questions. Nonparametric versions of analyses were used to better fit the nature of the results. Spearman's Rank correlations were used to evaluate the relationships between each recipe's OL and liking of its sensory attributes. Significance was established at the $p = .05$ level with strength of correlation coefficients evaluated using the following cutoffs: Negligible (0.0-0.3), Low (0.3-0.5), Moderate (0.5-0.7), High (0.7-0.9), and Very High (0.9-1.0) [95]. To compare the performance of all recipes, researchers followed up with interpretation of Spearman correlations to compare OL and recipe characteristics among recipes. More advanced statistical analyses can be conducted, such as a mixed effects model, to better visualize the data "as if" each recipe was tested with the same group of participants. Additional details on all analyses conducted can be found in their respective studies [15, 93].

RESULTS

Specific results for each study can be found in their respective articles, Moore, Lindke, and Cox [15] and Ng et al. [93]. The researchers chose to visualize the data using tables due to

the numerical values that explain the results, but ratings of overall and attribute liking can be visualized using bar charts of recipe averages. The authors recommend considering how participant demographics may differ from the broader target audience in the county or state of interest.

DISCUSSION

Sensory evaluation methodology is a useful tool for examining recipes intended for low-income audiences. The ability to dissect a recipe into its characteristics can inform how researchers approach recipe modification or the introduction of new recipes containing desirable characteristics.

Lessons learned

The research team has compiled "lessons learned" to guide others who wish to conduct sensory evaluation with their programs. First, it should be noted that different populations may vary in their responses to recipes. Factors of influence may include the participants' regional location, race/ethnicity, or age, though the UGA EFNEP and UGA SNAP-Ed studies did not note many significant differences based on these demographics. While a convenience sample of a specific county, program, or otherwise is easier for data collection, the study design can be developed to include a more diverse population, as seen in the UGA EFNEP study design. Second, it became apparent during data analysis that familiarity may play a role in recipe ratings. Affective tests are often conducted with specific populations, such as typical users of the product being evaluated [41]; however, recruitment in the community nutrition education setting is unique, as the target population is already present, regardless of their experiences with the recipes being presented. The recipes evaluated with UGA EFNEP participants had been in circulation for a decade at the time of the study, and both programs allow eligible participants to

attend *Food Talk* once every fiscal year. This may have influenced results, as 13 out of the 16 *Food Talk* recipes were rated highly acceptable by UGA EFNEP participants, while only two of the seven newly developed recipes tested with the UGA SNAP-Ed audience were deemed highly acceptable. Repeated exposure to recipes may influence the results of a sensory evaluation [96]. Third and finally, the research team acknowledges that the inclusion of "gold standard" recipes containing traditional levels of nutrients to limit (sodium, saturated fat, and added sugars) would strengthen the findings of the recipes inspired by regional or cultural cuisine. The ability to compare a gold standard recipe with a modified recipe of interest would allow recipe developers to directly compare modified recipe attribute acceptance to the less healthful, but more widely accepted, version.

Implications for future research

Sensory evaluation can provide a nutrition education program with insights regarding their target audience's most and least liked recipes, areas for recipe improvement, and how to update programming to meet the changing needs of participants. Additional questions using the same 9-point scale format, such as likelihood to purchase an ingredient or prepare a recipe, allow researchers to better understand barriers to behavior change when focus groups are not feasible. Implementation of sensory evaluation over multiple years has the potential to provide recipe developers with a "profile" of the target audience's preferences. This knowledge can be used to guide future recipe development, including modification of existing recipes or inclusion of ingredients and flavors in new recipes that are realistic and well accepted by the population. The participant "profile" may help to update curricula to educate participants on new or unfamiliar foods that offer health benefits. For example, do participants dislike meat alternatives as protein sources (as evidenced by a low rating of the recipe), or are they just unfamiliar with meat

alternatives and thus not willing to use them in place of meat (as evidenced by a low rating of purchase intent or likelihood of preparing the recipe)? This deeper understanding of the target audience's preferences can fill the gaps within curricula and expand educational opportunities.

CONCLUSIONS

Sensory evaluation in the Federal nutrition education setting can be accomplished with a modified methodology to account for the unique nature of the population and program formats. The introduction of sensory evaluation in this non-traditional setting is beneficial to those who wish to forge a relationship with their state extension programs and to program developers who wish to encourage behavior change through direct nutrition education, recipe demonstrations, and recipe tastings.

ACKNOWLEDGEMENTS

The authors would like to thank the many UGA Extension staff members who assisted with sensory evaluation studies in their communities.

FIGURES

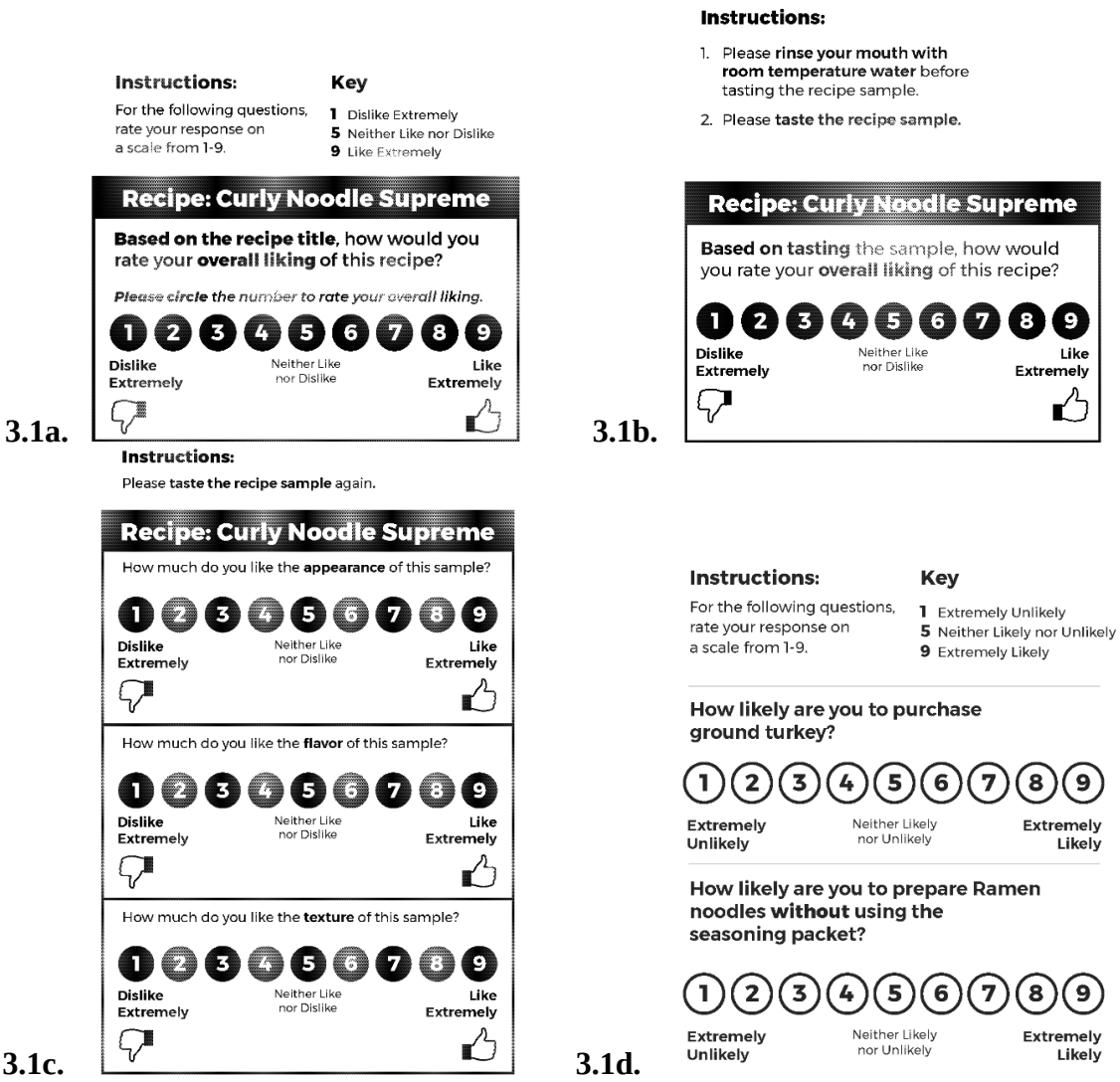

Figure 3.1a-d. UGA EFNEP Sensory Evaluation study ballot excerpt for the Curly Noodle Supreme recipe. The ballots were printed in a booklet to include sensory (1a-c) and purchase intent (1d). Consideration should be made for how participants will mark their desired ratings. Booklets were assigned unique participant identification codes.

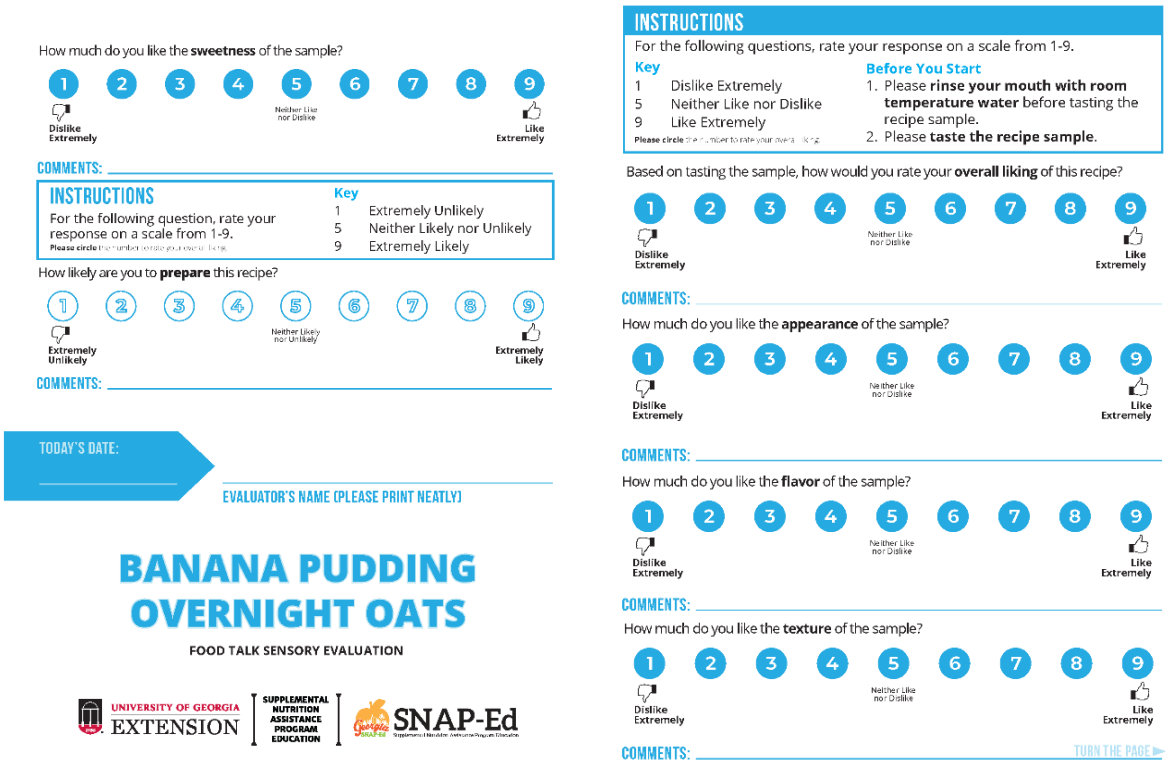

Figure 3.2. UGA SNAP-Ed Sensory Evaluation study ballot example for the Banana Pudding Overnight Oats recipe. The ballots were printed double-sided in color on 8.5" x 11" printer paper. The ballots were folded in half across the middle to create a front panel that displayed the recipe title and allow the participant to write in the date and their name before opening the ballot and flipping to the back panel to complete the ballot. Consideration should be made for how participants will mark their desired ratings. Ballots were matched with a separate demographic information form using participant names.

CHAPTER 4

SENSORY EVALUATION FEEDBACK FROM PEER EDUCATORS OFFERS PERSPECTIVE ON RECIPES FOR FEDERAL NUTRITION EDUCATION PROGRAMS [3]

[3] Ng, M.K., Adhikari, K., Andress, E.L., Henes, S., Lee, J.S., & Cox, G.O. To be submitted to the *Journal of Nutrition Education and Behavior* as an original research article.

ABSTRACT

Objectives: Determine how peer educators perceive the recipes of their curriculum using sensory evaluation methodology.

Design: Eight online surveys were created to rate 16 recipes on a 9-point hedonic or categorical scale for questions related to overall liking, sensory attribute (appearance, flavor, texture, saltiness or sweetness) liking, and preparation behaviors. Participants also rated recipes based on perceived participant experiences. Space for comments was available after each section.

Setting: Online.

Participants: Peer educators from EFNEP and SNAP-Ed at the University of Georgia.

Main Outcome Measures: Overall liking and ratings of recipe attributes related to program involvement and preparation behaviors.

Analysis: Descriptive statistics, Kruskal-Wallis, Mann-Whitney, Spearman's Rank correlations, and Wilcoxon Signed Rank Tests to explore relationships between recipe overall liking, attributes, and how program involvement influenced acceptability.

Results: Thirteen out of 16 recipes received highly acceptable overall liking ratings ≥7 out of 9. Correlations for recipe attributes ranged from moderately to very highly correlated with overall liking ratings, indicating that attributes work synergistically to impact overall liking. Comments allowed for better interpretation of findings related to preparation and liking.

Conclusions and Implications: Sensory-informed surveys of familiar recipes can provide valuable information about key stakeholder perspectives in a cost-effective, safe, and uncomplicated way.

INTRODUCTION

Federal nutrition education programs, such as the Supplemental Nutrition Assistance Program-Education (SNAP-Ed) and the Expanded Food and Nutrition Education Program (EFNEP), utilize an indigenous peer educator/paraprofessional learning model [34, 35] to disseminate education to low-income communities and elicit health promoting behavior change [9, 10]. As part of the core competencies set forth by these programs and the National Institute of Food and Agriculture (NIFA) of the U.S. Department of Agriculture (USDA), peer educators are charged with "[establishing] respect and rapport with participants," "[demonstrating] [active] listening, [asking] open-ended questions, and [providing] positive feedback," and "[encouraging] participants to apply new information and skills to set goals," among many other competencies revolved around the participant relationship [36]. As a result of their connections with their participants, peer educators serve as role models to their participants and offer state and national programs valuable insights into the participant experience and their own experiences as peer educators [37, 38].

Recipe demonstrations and in-class tastings are a critical component of nutrition education, as they provide recipe and ingredient exposure that may initiate behavior change [96, 97]. Hands-on cooking interventions have clearly demonstrated improved dietary related behavior change, such as fruit and vegetable intake [24-26]. Conversely, the impact of recipe demonstrations and tasting sessions without hands-on cooking components are under-researched areas of dietary related behaviors. Behavior change, however, may depend on the acceptability of the offered recipes, as there is some evidence to show that recipes that are well-liked in a classroom setting will influence food preparation and eating behaviors in the home, even among youth participants [32]. Studies have reported that repeated exposure to fruits and vegetables,

although not full recipes, alongside nutrition education can improve health promoting dietary behaviors [29-31]. Hence, it can be assumed that recipes used in nutrition education can impact dietary related behavior change, but the recipes must be well liked by the intended audience to assist with the desired dietary changes. Peer educators are positioned perfectly to offer feedback on recipes for multiple reasons: their hands-on experience as recipe demonstrators, service to their own communities, and established rapport with their participants.

The *Food Talk* program was created in 2008 by Dr. Gail Hanula as an approach for the University of Georgia (UGA) EFNEP to promote fruit, vegetable, and low-fat dairy foods while addressing the rising incidence of hypertension in the state of Georgia [16]. Overall, the *Food Talk* program teaches low-income EFNEP and SNAP-Ed eligible participants about healthy eating, food resource management, food safety practices, and physical activity. There have been many iterations of Food Talk over the years [13, 98], but this research focuses on the most up-to-date curriculum. Within *Food Talk*, a specific set of recipes is demonstrated and offered up to participants to taste at the end of each lesson. Dr. Hanula worked with the UGA EFNEP Team to create the recipes still used in the current *Food Talk* curriculum. She emphasized the inclusion of three food groups—one being a vegetable—in each main dish, and a fruit paired with a low-fat dairy product for the dessert recipes. Criteria for the development of recipes targeted for limited resource consumers were informed by Miller, Burgess, and Mason [20]. They proposed that recipes for this audience need to be easy to prepare, use low-cost ingredients, and be nutritious and tasty. Dr. Hanula ensured recipes could be demonstrated in fifteen minutes or less to showcase the ease of preparation for participants, and minimal equipment was required to make the dishes. Recipes were analyzed for nutrient content, informally tested for appealing taste and texture, and then sampled by the local County Extension staff. Recipes were included in the

curriculum if rated “excellent” by the Extension staff for “practicality, ease of demonstration, and food safety hazards” [16].

The same recipes tested during the development of the *Food Talk* program have been staples to the curriculum for over ten years, but they were not formally evaluated until 2018 [15]. A sensory evaluation study was conducted among *Food Talk* participants of UGA EFNEP, which allowed for systematic feedback of recipes with special focus given to overall liking and liking of specific recipe sensory attributes (title, appearance, flavor, and texture) on a 9-point hedonic scale. Participants tasted the recipes demonstrated in class and completed a sensory evaluation ballot containing overall liking, liking of recipe attributes, and likelihood to purchase or use certain ingredients found in the recipes. The study determined that three of the 16 recipes (Curly Noodle Supreme, Ranch Sauce, and Easy Cheesy Broccoli Soup) demonstrated through *Food Talk* did not meet the highly acceptable threshold [62] ratings by participants, prompting either consideration of recipe modification or replacement for those three recipes. It also provided valuable information about how attribute performance or purchase intent of ingredients found in the recipes influenced overall liking [15]. The authors of this present study, however, became interested in the peer educator perspective, given that they are more intimately familiar with recipes than state staff and may have additional insights through conversations with participants that occur during the recipe demonstrations and tastings. The authors hypothesized that peer educators would have comparable sensory evaluation responses as their participants, and that their input would offer a more holistic view of how recipes fit into the *Food Talk* program. This study utilized the sensory evaluation methodology from similar studies conducted through this research group [15, 93], but the ballot questions were tailored to an online survey without recipe sampling due to the COVID-19 pandemic and resulting public health concerns

surrounding large crowds and in-person evaluation of food in a shared space. As a result, this study also aimed to determine how a sensory evaluation informed ballot given to untrained panelists would perform in an online format.

METHODS

Participants

Peer educators employed through the UGA EFNEP and SNAP-Ed programs and trained to teach the *Food Talk* direct education program were included in this online survey study. There was no incentive for completing the surveys; however, the surveys were presented as a way for EFNEP and SNAP-Ed state staff to provide feedback on recipes that they regularly demonstrated. Informed consent was collected from the peer educators before the beginning of each survey. This study was approved by the UGA Institutional Review Board for human subjects research (ID: PROJECT00002146) prior to the start of the study.

Sensory Evaluation Surveys

Eight online surveys (Qualtrics XM, Seattle, WA, 2021) were sent via email to peer educators. Each survey contained sensory evaluation questions about two *Food Talk* recipes for a total of 16 recipes. These recipes are currently used in the *Food Talk* curriculum and are familiar to peer educators. Peer educators were provided with a single document that contained the survey links, and weekly reminders were sent out via email to complete two surveys per week for a four-week data collection period. Survey questions can be found in **Supplementary Table 4.1**. The surveys included demographic information about the participant's gender, age, and race/ethnicity, in addition to questions about program employment (EFNEP or SNAP-Ed), position in the program (Program Assistant or Supervisor), length of employment (Less than 1 year; 1-2 years; 3 or more years), and quadrant district in Georgia (Northeast, Northwest,

Southeast, Southwest). Race and ethnicity were collected to estimate how the peer educator make-up related to state and national statistics, as taste perception and food preferences may differ across ethnic groups [99]. Following the demographic information, an instruction page explained the format of the survey and reiterated the importance of the peer educator's input. Participants were asked to answer questions based on a recipe photo and knowledge of that recipe from personal experience as a peer educator who had prepared and/or demonstrated the recipe. The surveys requested that peer educators answer questions with their own opinions unless otherwise noted in the question, as some questions asked about how they perceived their *Food Talk* class participants responded to the recipes.

The surveys then presented participants with the title and photo of the first recipe. Two options were presented: "I do not/have not demonstrate(d) this recipe" or "I do/have demonstrate(d) this recipe." This allowed researchers to ensure that only peer educators with experience making the recipe during a *Food Talk* lesson would answer the questions related to that recipe. If the participants indicated that they did not demonstrate the recipe, they were redirected to a question asking what they demonstrated in its place. These participants moved to the second recipe of the survey and were presented with the same demonstration options about a second recipe. If the participant did not demonstrate the second recipe, the survey was terminated with a thank you message. If participants indicated that they had experience demonstrating either recipe, they were directed to a survey page of sensory evaluation informed questions about that recipe.

Participants were asked to rate their liking of the following recipe attributes on a 9-point hedonic scale (1=dislike extremely; 5=neither like nor dislike; 9=like extremely): overall liking, title, appearance, flavor, texture, saltiness or sweetness, and preparation to make the recipe. They

were then asked to rate their likelihood to prepare the recipe at home on a similar, 9-point categorical scale (1=extremely unlikely; 5=neither likely nor unlikely; 9=extremely likely). The next three questions asked the peer educators to answer from the perspective of their usual class participants. The questions included rating class participants' overall liking, liking of recipe preparation, and the likelihood that their class participants would prepare the recipe at home. A space for open-ended comments was made available after each set of questions.

Statistical Analysis

Data were collected on a secure Qualtrics (XM, Seattle, WA, 2021) account through UGA. No identifying information was collected from participants. All analyses were conducted in IBM SPSS Statistics (version 26.0, Armonk, NY). Significance was established at the $\alpha = .05$ level. General descriptive statistics for sensory attributes, sociodemographic information, and preparation behaviors were conducted. Nonparametric analyses were chosen to analyze the data. Spearman's Rank Correlations were conducted to determine the relationships between recipe overall liking and sensory attributes. Kruskal-Wallis tests (nonparametric ANOVA) and Mann-Whitney correlations were conducted to determine differences, if any, between program employment, length of employment, and quadrant district on overall liking, sensory attributes, and preparation behaviors. Any significance noted in a Kruskal-Wallis was followed up with a Mann-Whitney to determine which relationships were significant. Wilcoxon Signed Rank Tests were conducted to determine significance between reported preparation behaviors/intent of peer educators. Comments were compiled into a single document and reviewed for relationships with quantitative data and general themes.

RESULTS

Data collection was extended to six weeks to accommodate additional responses. Only responses from peer educators were included in the data analysis. Demographics for each recipe can be found in **Table 4.1a and 4.1b**. Depending on the survey, responses from peer educators ranged between 14-28. Across all surveys, 303 responses were received. Overall, the respondents were 100-percent (%) female (*N*=303), 46% (n=139) African American, and 75% (n=236) were employed through EFNEP. Around 54% (n=164) of peer educators reported their employment with their respective program for more than three years, with 22% (n=68) and 23% (n=71) reporting employment of 1-2 years or less than a year, respectively. Most peer educators were from the northern districts in the state of Georgia, with 36% (n=109) working in the Northeast district and 38% (n=113) in the Northwest district. A smaller percentage of peer educators were from the Southeast and Southwest districts (7%, n=25, and 19%, n=56, respectively).

Overall Liking and Liking of Attributes/Preparation

Thirteen out of 16 recipes in the current *Food Talk* curriculum received acceptable overall liking ratings of at least 7 out of 9 (**Table 4.2**). This threshold is based on existing research wherein a rating of seven in consumer-targeted sensory studies is deemed highly acceptable [62]. Three recipes—Curly Noodles Supreme (5.1, SD 2.8), Ranch Sauce (6.5, SD 2.8), and Easy Cheesy Broccoli Soup (6.6, SD 2.4)—fell below the threshold for high acceptance of overall liking. Conversely, 4-Fruit Smoothie received the highest overall liking rating with an 8.9 (SD 0.4) out of 9 (**Table 4.2**).

Similar trends in liking across recipes were seen for most attributes, where a lower overall liking corresponded with lower ratings of the appearance, flavor, texture, and saltiness or sweetness, as seen in **Table 4.2**. Most recipes received ratings where the overall liking of the

recipes was strongly correlated with the recipe attributes; however, there were no specific trends in attributes that most influenced overall liking. Instead, correlations ranged from "moderately" to "very highly" correlated with overall liking ratings, indicating that these recipes' attributes work synergistically to impact overall liking (**Table 4.3a and 4.3b**).

The peer educators' liking of recipe preparation was among the highest ratings across all recipes. For overall lower rated recipes, the difference between liking of preparation ratings and likelihood of preparing the recipe at home was greater—the peer educators rated their liking of the preparation significantly higher than their likelihood to prepare the recipe in their own homes for these recipes (**Figure 4.1**). As the recipes ratings increased in overall liking, their likelihood to prepare the recipe at home also appeared to be more like the other attribute and preparation ratings for that recipe, too, with fewer significant differences between liking of preparation and likelihood to prepare the recipe at home (**Figure 4.1**).The addition of the comment boxes beneath each set of questions allowed for peer educators to elaborate on their various ratings despite the inability to host focus groups during the study period. Comments indicated that the peer educators liked the ease and speed of the preparation of these lower-rated recipes, but they had various reasons to not prepare the recipes in their own homes. For example, Curly Noodles Supreme received an average liking of preparation rating of 7.1 but a significantly lower rating for likelihood to prepare at home (5.0, $p = .002$). One peer educator rated their liking of the preparation as a 9 with a comment that they "like that the preparation of the recipe is so easy." Their likelihood of preparing the recipe at home, however, was rated as a 2. Their written feedback indicated that their family would not consume it, given that the peer educator "makes this recipe so often at work and used to have to clean up at home, so my family can't stand the smell!" Another peer educator noted, about the same recipe, that they "personally do not eat nor

buy ramen noodles," but they offered useful suggestions for improving the recipe based on their experiences.

Comments were insightful even for recipes that were well liked. In the case of the Skillet Spaghetti recipe, it was a highly rated recipe with all preparation behavior and perceived participant preparation behavior questions rated above a 7 out of 9 on average. One peer educator rated their likelihood to prepare the recipe at home as a 9, commenting that it is "Easy. Quick. Filling." Despite this high rating, this same peer educator rated the recipe a 7 when asked if they thought their participants would prepare the dish at home. Although a 7 is considered acceptable, this peer educator had valuable feedback pertaining to their score that helped researchers learn more about what may be successful to the target audience. This peer educator commented, "[Participants] will have to prepare it 'out of sight' of family members. [Family members] can't wrap their minds around whole wheat spaghetti or soy crumbles." Further, another peer educator rated their own overall liking of the Skillet Spaghetti recipe as a 1, but their liking of the preparation as an 8. Their reasoning being, "This is one of my least favorite recipes. I personally don't like it because of the soy crumbles. But overall, it is a quick dish to make."

Participant Perceived Overall Liking and Preparation Behaviors

When asked about their participants' perceived liking of the recipes, the peer educators rated the same three recipes (Curly Noodles Supreme, Ranch Sauce, and Easy Cheesy Broccoli Soup) below the highly acceptable threshold of at least a 7 out of 9. They believed their participants would strongly like the other 13 recipes with ratings above 7. When their overall liking ratings were compared to their participants' perceived overall liking, there was one significant difference wherein the Creamy Pineapple Pudding received a 7.1 (SD 2.2) from the peer educators and a 7.7 (SD 1.3, $p = .014$) for their participants perceived overall liking.

Similarly, the peer educators rated their participants' perceived ratings for preparation parallel to their own (**Table 4.1a and 4.1b**), with one exception being the 4-Fruit Smoothie, where a Wilcoxon Signed Ranks test revealed they perceived their participants were significantly less likely to prepare this recipe at home ($p = .034$) (**Table 4.2**).

The comments allowed peer educators to provide feedback about what they experience with participants during recipe demonstrations of the study recipes. Using the Curly Noodles Supreme recipe again, one peer educator provided neutral ratings on behalf of their participants, noting that the more diverse (specifically Hispanic) communities may not try the recipe. Another peer educator rated the participants' perceived liking of the preparation as a 7, commenting that "some participants actually get upset when we throw the seasoning packet away." The same peer educator rated their participants' likelihood to prepare the recipe at home as a 9, citing ease of preparation and that "they probably already have the ingredients at home."

Peer educators also provided insights into how participants respond to certain recipe ingredients. A peer educator rating the Easy Cheesy Broccoli Soup recipe rated their participants' perceived liking of the recipe and its preparation as an 8; however, their comment stated, "Most participant love this recipe. The idea of using dry milk does not sit well with them. The younger generation don't [sic] use dry milk." When asked about participants' liking of the Garden Fresh Tortizza, which received ratings exceeding 7 across all questions, one peer educator noted that the participants were likely to prepare the recipe because they were familiar with the ingredients used in the recipe, informing state programmers of what ingredients are commonly used among the target audience. Another highly rated recipe, 4-Fruit Smoothie, was benefited by the inclusion of comments to inform cooking equipment usage and familiarity. Multiple peer educators reported that it is a well-liked recipe, but many participants do not have

access to or knowledge of using a blender. This explains the significant difference between peer educators' preparation behaviors and perceived participants' preparation of the recipe (average ratings can be found in **Table 4.2**).

Correlations between Overall Liking and Attribute Ratings

Specific correlations between overall liking and recipe attributes for each recipe can be found in **Table 4.3a and 4.3b**. Overall, recipe attributes were moderately to very highly positively correlated with the recipe's overall liking. There were no clear trends in correlation strengths and overall liking ratings when considering the most and least acceptable recipes.

Correlations between Program Demographics and Preparation Behaviors

Few significant relationships were found between peer educators' employment demographics (program, length of time employed, and district) and recipe attributes, preparation intent, and program participants' perceived acceptability (**Supplementary Table 4.2**). No clear trends in like/dislike appeared across the recipes regarding included food groups (fruits, vegetables, dairy, meat/meat alternatives), food form (frozen, instant, canned, fresh), or preparation method (e.g., one pan/bowl, serving temperature, etc.). More qualitative data collection by means of focus groups is likely necessary to reveal the true nature of any potential connections, as comments on these recipes did not inform the researchers on whether these associations were related to the ratings.

DISCUSSION

Through this study, it was determined that most *Food Talk* program recipes used in UGA SNAP-Ed and EFNEP direct education are acceptable to peer educators, but there may be room for improvements. This is especially true for the three recipes that did not meet the highly acceptable rating threshold. Comments related to their ratings provide researchers with salient

information regarding ingredients and equipment usage among the target audience. In addition to learning more about why the three unacceptable recipes received their lower scores, the written feedback offered suggestions and potential directions for recipes. The quantitative data provided by a standard sensory ballot provided important and useful data that isolated the specific characteristics of each recipe, such as flavor and saltiness acceptability, and how these attributes correlated with overall liking ratings. Although the attributes most strongly and positively correlated with OL may be a result of the halo effect, wherein a consumer attempts to match their ratings across attributes when asked about them together on a single ballot [41], these attributes can be the foci of future recipe modification, which may influence overall liking accordingly. The halo-dumping effect may also contribute to the ratings across attributes, as product attributes may enhance or suppress the detection of another attribute [100, 101], Regardless of the reason for the positive correlations with OL, comments from peer educators containing ingredient suggestions can help guide attribute-specific improvements.

Liking of the preparation was among the higher ratings across all recipes, possibly due to the simplicity of the recipes (as noted in many comments) and the fact that they are frequently prepared by these peer educators. Although the authors were unable to locate research related to how peer educators or consumers rate recipe acceptance based on preparation frequency or familiarity with a recipe, it is well understood that cooking and culinary interventions increase self-efficacy of meal preparation and cooking, and thus health behaviors [24, 96, 102-104]. Additionally, repeated exposure to foods or mixed dishes may influence consumer liking and acceptance in both children and adults, although increased acceptability occurs more readily in children and not as readily in foods already rated favorably [96, 97, 105-107]. Knowing this information, it is possible that peer educators who regularly prepare recipes may come to

increasingly accept those recipes. Conversely, habituation or sensory-specific satiety may play a role in like or dislike, though this phenomenon is typically observed when unlimited food is offered in one sitting [108, 109].

Asking about what peer educators perceived their participants would rate the recipes ensured that peer educators had an opportunity to share information about the recipes beyond their personal experiences. The findings of this study support the hypothesis that peer educators can represent their participants by proxy when asked about recipes. Thirteen out of 16 study recipes were deemed highly acceptable by peer educators. Previous work done with EFNEP participants by members of this research team found that EFNEP *Food Talk* program participants rated the same three recipes below 7 in overall liking [15]. Without being informed of the previous study's results, the peer educators determined that the same three recipes would be the lowest rated recipes when responding on behalf of their participants (**Table 4.2**, participant overall liking). The one significant difference ($p < .05$) between peer educator overall liking and participant perceived overall liking was the Creamy Pineapple Pudding, where the peer educators rated their participants' liking of the recipe significantly higher than their own. This is also reflected in the 2019 study where Creamy Pineapple Pudding was among the higher rated recipes of EFNEP participants. The three highest rated recipes by participants in the 2019 study also appeared in the top half of the recipes as rated on behalf of the peer educators [15]. This is of interest to the direct education programmers because it supports using the county staff as the voice of their participants without interfering of actual food demonstrations or time constraints of program sessions to conduct in-person sensory evaluation tests. More robust research is needed to understand the relationship between peer educators and recipes (sensory acceptance, preparation acceptance, preparation and purchasing behaviors, etc.), as compared to participants

and recipes, but sensory-informed data collection of the county staff allows the state programmers in SNAP-Ed and EFNEP to make more informed decisions about the recipes used in curricula.

Furthermore, in the community setting, the inclusion of written feedback allows for a better interpretation of the ratings when focus groups are not feasible. The comments informed researchers about what works well in the current recipe demonstrations and identified pain points for the peer educators, whether about their own experiences demonstrating the recipes or their participants' shared comments. This information is crucial for future curricula and corresponding recipe development.

As a result of the COVID-19 pandemic, the authors pivoted this sensory evaluation of *Food Talk* program recipes to an online format; thus, the limitations of the present study should be noted. The surveys were electronically distributed out to 58 peer educators, and 14-28 peer educators were included in the final analysis depending on the recipe. As such, the small sample size may have influenced the nonparametric correlations. Additionally, due to the inability to meet in-person and work in their offices, no recipe tastings were conducted to support the online survey responses. The authors accounted for the possibility that peer educators may not be familiar with every recipe by incorporating the survey question that asked whether they demonstrated the recipe. If a peer educator responded that they did not have experience with that recipe, the survey automatically skipped it. Finally, specific county information from the peer educators would have allowed the authors to conduct analyses related to urban and rural demographic responses—that information was not included to ensure the peer educators felt comfortable responding honestly to the surveys. Instead, state quadrant district information was collected to garner a general idea of how location may influence recipe ratings.

CONCLUSIONS AND IMPLICATIONS

Although in-person, controlled sensory evaluations would provide the most accurate data for sensory liking attributes when prepared in a standardized recipe, the use of a sensory evaluation-informed survey of familiar recipes can provide valuable information about a key stakeholder's perspective in a cost-effective, safe, and uncomplicated way for the study participants. Sensory evaluation should include this level of stakeholders to improve statewide or Federal recipes in evidence-based nutrition education curricula. Despite the lack of in-person recipe tasting, the authors concluded that online sensory evaluation surveys can still provide important data to inform the next steps of a recipe within the curriculum, including integration in the curriculum as-is, reintegration after modifications, or removal and replacement with a recipe that is better accepted among the target audience and peer educators.

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TABLES AND FIGURES

Table 4.1a. Descriptive statistics for the demographic information of recipes. Demographics include age, identification of Hispanic/Latino, race or ethnicity, program employment, length of employment, and quadrant district in Georgia. NR=No Response. 100% of participants identified as female (data not shown). Percentages may exceed 100-percent due to rounding.

Demographics	All Recipes (*N*, %)	Curly Noodles Supreme (*N*, %)	Ranch Sauce (*N*, %)	Easy Cheesy Broccoli Soup (*N*, %)	Creamy Pineapple Pudding (*N*, %)	Cinnamon Dip (*N*, %)	Skillet Spaghetti (*N*, %)	Chicken Divan (*N*, %)	Famous Fried Rice (*N*, %)
Age									
18-59 years	208 (69)	19 (68)	12 (75)	10 (71)	12 (67)	14 (61)	10 (67)	11 (55)	11 (65)
60+ years	93 (69)	9 (32)	4 (25)	4 (29)	6 (33)	8 (35)	5 (33)	8 (40)	6 (35)
NR	2 (<1)	0 (0)	0 (0)	0 (0)	0 (0)	1 (4)	0 (0)	1 (5)	0 (0)
Hispanic/Latino									
Yes	118 (39)	12 (43)	7 (44)	6 (43)	7 (39)	9 (39)	6 (40)	9 (45)	7 (41)
No	183 (60)	16 (57)	9 (56)	8 (57)	11 (61)	13 (57)	9 (60)	10 (50)	10 (59)
NR	2 (<1)	0 (0)	0 (0)	0 (0)	0 (0)	1 (4)	0 (0)	1 (5)	0 (0)
Race/Ethnicity[a]									
American Indian/Alaska Native	8 (3)	1 (4)	1 (6)	1 (7)	0 (0)	1 (4)	0 (0)	1 (5)	0 (0)
Black/African American	139 (46)	13 (47)	6 (38)	5 (36)	8 (45)	10 (43)	6 (40)	7 (35)	7 (41)
White	144 (48)	12 (43)	9 (56)	8 (57)	9 (50)	11 (48)	6 (40)	11 (55)	9 (53)
NR	34 (11)	3 (11)	1 (6)	1 (7)	2 (11)	2 (9)	4 (27)	2 (10)	2 (12)
Program									
EFNEP	236 (78)	20 (71)	14 (88)	13 (93)	13 (72)	18 (78)	11 (73)	15 (75)	12 (71)
SNAP-Ed	65 (22)	8 (29)	1 (6)	0 (0)	5 (28)	5 (22)	4 (27)	5 (25)	5 (29)
NR	2 (<1)	0 (0)	1 (6)	1 (7)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Employment Length									
<1 year	71 (23)	7 (25)	4 (25)	4 (29)	4 (22)	5 (22)	3 (20)	5 (25)	4 (24)
1-2 years	68 (22)	7 (25)	3 (19)	1 (7)	5 (28)	5 (22)	3 (20)	3 (15)	4 (24)
3+ years	164 (54)	14 (50)	9 (56)	9 (64)	9 (50)	13 (57)	9 (60)	12 (60)	9 (53)
District									
Northeast	109 (36)	8 (29)	7 (44)	6 (43)	6 (33)	8 (35)	5 (33)	7 (35)	6 (35)
Northwest	113 (37)	12 (43)	4 (25)	4 (29)	7 (39)	7 (30)	8 (53)	7 (35)	7 (41)
Southeast	25 (8)	2 (7)	2 (13)	2 (14)	1 (6)	2 (9)	1 (7)	2 (10)	1 (6)
Southwest	56 (19)	6 (21)	3 (19)	2 (14)	4 (22)	6 (26)	1 (7)	4 (20)	3 (18)

[a]Race/Ethnicity included to compare with state and national demographics, as there may be a difference in flavor perception and preference among different ethnicities. Totals and percentages may exceed 100% due to participants checking multiple options for this category.

Table 4.1b. Descriptive statistics for the demographic information of recipes. Demographics include age, identification of Hispanic/Latino, race or ethnicity, program employment, length of employment, and quadrant district in Georgia. NR=No Response. 100% of participants identified as female (data not shown). Percentages may exceed 100-percent due to rounding.

Demographics	Fiesta Quesadilla (*N*, %)	Peach Crumble (*N*, %)	Harvest Muffins (*N*, %)	Crunchy Apple Salad (*N*, %)	Breakfast Burrito (*N*, %)	Fruity Parfait (*N*, %)	Garden Fresh Tortizza (*N*, %)	4-Fruit Smoothie (*N*, %)
Age								
18-59 years	14 (74)	15 (75)	19 (73)	13 (65)	14 (74)	14 (78)	10 (67)	10 (67)
60+ years	5 (26)	5 (25)	7 (27)	7 (35)	5 (26)	4 (22)	5 (33)	5 (33)
NR	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Hispanic/Latino								
Yes	7 (37)	7 (35)	11 (42)	7 (35)	6 (32)	6 (33)	5 (33)	6 (40)
No	12 (63)	13 (65)	15 (58)	13 (65)	13 (68)	12 (67)	10 (67)	9 (60)
NR	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Race/Ethnicity[a]								
American Indian/Alaska Native	0 (0)	0 (0)	1 (4)	0 (0)	1 (5)	1 (6)	0 (0)	0 (0)
Black/African American	9 (47)	10 (50)	13 (50)	8 (40)	10 (53)	9 (50)	7 (47)	7 (47)
White	8 (42)	9 (45)	12 (46)	9 (45)	7 (37)	7 (39)	7 (47)	7 (47)
NR	2 (11)	2 (10)	1 (4)	4 (20)	2 (11)	2 (11)	2 (13)	2 (13)
Program								
EFNEP	15 (79)	16 (80)	19 (73)	14 (70)	14 (74)	14 (78)	14 (93)	14 (93)
SNAP-Ed	4 (21)	4 (20)	7 (27)	6 (30)	5 (26)	4 (22)	1 (7)	1 (7)
NR	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Employment Length								
<1 year	5 (26)	5 (25)	7 (27)	5 (25)	4 (21)	4 (22)	3 (20)	2 (13)
1-2 years	4 (21)	5 (25)	6 (23)	5 (25)	5 (26)	5 (28)	3 (20)	4 (27)
3+ years	10 (53)	10 (50)	13 (50)	10 (50)	10 (53)	9 (50)	9 (60)	9 (60)
District								
Northeast	7 (37)	7 (35)	9 (35)	7 (35)	7 (37)	7 (39)	6 (40)	6 (40)
Northwest	8 (42)	8 (40)	10 (39)	8 (40)	7 (37)	6 (33)	5 (33)	5 (33)
Southeast	2 (11)	2 (10)	1 (4)	1 (5)	2 (11)	2 (11)	1 (7)	1 (7)
Southwest	2 (11)	3 (15)	6 (23)	4 (20)	3 (16)	3 (17)	3 (20)	2 (20)

[a]Race/Ethnicity included to compare with state and national demographics, as there may be a difference in flavor perception and preference among different ethnicities. Totals and percentages may exceed 100% due to participants checking multiple options for this category.

Table 4.2. Mean ratings and standard deviations for overall liking (OL), organized by lowest to highest OL score; attributes of appearance, flavor, texture, saltiness or sweetness; preparation behaviors of preparation liking (prep. Liking) and likelihood to prepare (LtP) at home; and perceived participant OL and preparation behaviors. Ratings on a scale of 1-9, with 9 indicating the greatest acceptance. A score ≥7 out of 9 is deemed highly acceptable.

Recipe	*N*	OL	Title	Appearance	Flavor	Texture	Saltiness/ Sweetness	Prep. liking	LtP at home	Participant OL	Participant prep liking	Participant LtP at home
Curly Noodles Supreme	28	5.1 ± 2.8	6.2 ± 2.4	5.3 ± 2.7	5.0 ± 3.0	5.7 ± 3.0	5.6 ± 2.7	7.1 ± 2.6	5.0 ± 3.4	5.4 ± 2.4	6.9 ± 2.4	5.9 ± 2.6
Ranch Sauce	16	6.5 ± 2.8	6.7 ± 2.0	6.9 ± 2.5	6.2 ± 2.8	6.7 ± 2.6	6.2 ± 2.3	7.5 ± 2.2	6.5 ± 2.5	6.5 ± 2.2	7.0 ± 2.2	6.2 ± 2.1
Easy Cheesy Broccoli Soup	14	6.6 ± 2.4	6.9 ± 2.4	6.9 ± 2.0	6.5 ± 2.7	7.5 ± 1.6	6.7 ± 2.2	6.7 ± 2.5	5.3 ± 3.3	6.6 ± 1.9	6.5 ± 2.0	6.4 ± 2.1
Creamy Pineapple Pudding	18	7.1 ± 2.2	7.7 ± 2.0	7.5 ± 1.8	7.1 ± 2.3	7.1 ± 1.7	7.2 ± 2.2	7.8 ± 1.9	6.6 ± 2.8	7.7 ± 1.3	7.7 ± 1.6	6.9 ± 2.2
Cinnamon Dip	23	7.2 ± 2.1	8.1 ± 1.6	7.8 ± 1.9	7.3 ± 2.4	7.7 ± 1.9	6.6 ± 2.8	8.3 ± 1.3	6.9 ± 2.7	7.6 ± 1.7	7.9 ± 1.7	7.5 ± 2.4
Skillet Spaghetti	15	7.2 ± 2.4	7.8 ± 1.6	7.5 ± 1.9	7.3 ± 2.1	7.4 ± 1.6	6.9 ± 2.1	8.2 ± 1.0	7.1 ± 2.5	7.7 ± 1.2	7.9 ± 1.1	7.2 ± 1.9
Chicken Divan	21	7.4 ± 1.5	7.5 ± 1.7	7.6 ± 1.6	7.5 ± 1.6	7.5 ± 1.9	7.2 ± 2.3	7.8 ± 1.7	7.2 ± 2.2	7.8 ± 1.1	7.9 ± 1.3	7.1 ± 1.9
Famous Fried Rice	17	7.5 ± 1.7	8.3 ± 1.1	7.9 ± 1.9	7.4 ± 2.2	7.4 ± 2.2	7.7 ± 1.4	8.1 ± 1.9	6.9 ± 2.6	7.8 ± 1.8	8.2 ± 1.1	7.5 ± 1.9
Fiesta Quesadilla	19	7.7 ± 1.9	8.5 ± 1.1	8.6 ± 0.8	7.7 ± 2.1	7.5 ± 2.1	6.9 ± 2.1	7.5 ± 1.9	7.4 ± 2.5	7.4 ± 2.2	7.3 ± 1.5	7.0 ± 2.1
Peach Crumble	20	7.9 ± 2.4	8.7 ± 0.8	8.7 ± 0.8	7.9 ± 2.4	8.1 ± 2.1	7.9 ± 2.1	8.5 ± 1.0	7.9 ± 2.4	8.4 ± 1.3	8.4 ± 1.2	8.2 ± 1.4
Harvest Muffins	26	8.1 ± 1.8	8.0 ± 1.5	8.4 ± 1.0	7.8 ± 2.2	8.0 ± 1.9	7.3 ± 2.6	7.8 ± 1.9	7.8 ± 2.4	8.2 ± 1.6	7.6 ± 1.7	7.3 ± 1.7
Crunchy Apple Salad	18	8.2 ± 1.3	8.5 ± 1.0	8.1 ± 1.9	8.1 ± 1.8	8.1 ± 1.4	8.2 ± 1.3	8.0 ± 1.5	7.7 ± 2.2	7.8 ± 1.4	7.7 ± 1.5	7.3 ± 1.7
Breakfast Burrito	19	8.4 ± 1.2	8.5 ± 1.0	8.4 ± 1.2	8.3 ± 1.2	8.3 ± 1.4	7.7 ± 1.4	8.4 ± 1.0	7.8 ± 2.4	8.2 ± 1.0	8.0 ± 1.3	7.5 ± 1.6
Fruity Parfait	18	8.5 ± 1.6	8.7 ± 0.9	8.8 ± 0.5	8.5 ± 1.8	8.5 ± 1.6	8.5 ± 1.6	8.9 ± 0.3	7.6 ± 2.7	8.6 ± 1.2	8.6 ± 1.0	8.2 ± 1.5
Garden Fresh Tortizza	15	8.5 ± 1.0	8.1 ± 1.4	8.2 ± 1.3	8.5 ± 0.8	8.5 ± 0.8	8.1 ± 1.5	7.6 ± 1.8	8.0 ± 1.3	8.4 ± 0.9	7.3 ± 2.0	7.9 ± 1.5
4 Fruit Smoothie	14	8.9 ± 0.4	8.9 ± 0.3	8.9 ± 0.3	8.7 ± 0.8	8.4 ± 2.1	8.7 ± 0.8	8.9 ± 0.3	8.9 ± 0.3	8.8 ± 0.6	8.5 ± 0.9	8.5 ± 0.8

Table 4.3a. Bivariate Spearman's Rank correlations (Spearman's ρ) and correlation strengths of overall liking and liking of Recipe Title, Appearance, Flavor, Texture, and Saltiness or Sweetness across recipes. Correlation strengths are defined as Very High (0.9−1.0), High (0.7−0.9), Moderate (0.5−0.7), Low (0.3−0.5), or Negligible (0.0−0.3) per previously published guidelines in sensory analysis [62].

Recipe		Curly Noodles Supreme	Ranch Sauce	Easy Cheesy Broccoli Soup	Creamy Pineapple Pudding	Cinnamon Dip	Skillet Spaghetti	Chicken Divan	Famous Fried Rice
Overall Liking and Liking of Title	*Spearman's ρ*	.620	.360	.824	.532	.306	.361	.189	.696
	Correlation Strength	Moderate	-	High	Moderate	-	-	-	Moderate
	P value	.001	.171	.000	.023	.166	.186	.426	.002
Overall Liking and Liking of Appearance	*Spearman's ρ*	.808	.711	.708	.822	.457	.981	.629	.891
	Correlation Strength	High	High	High	High	Low	Very High	Moderate	High
	P value	.000	.002	.005	.000	.033	.000	.003	.000
Overall Liking and Liking of Flavor	*Spearman's ρ*	.940	.823	.808	.934	.697	.919	.798	.831
	Correlation Strength	Very High	High	High	Very High	Moderate	Very High	High	High
	P value	.000	.000	.001	.000	.000	.000	.000	.000
Overall Liking and Liking of Texture	*Spearman's ρ*	.872	.619	.421	.944	.509	.853	.685	.918
	Correlation Strength	High	Moderate	-	Very High	Moderate	High	Moderate	Very High
	P value	.000	.011	.152	.000	.016	.000	.001	.000
Overall Liking and Liking of Saltiness/Sweetness	*Spearman's ρ*	0.722	0.741	0.633	0.972	0.91	0.701	0.599	0.813
	Correlation Strength	High	High	Moderate	Very High	Very High	High	Moderate	High
	P value	.000	.001	.015	.000	.000	.004	.005	.000

Table 4.3b. Bivariate Spearman's Rank correlations (Spearman's ρ) and correlation strengths of overall liking and liking of Recipe Title, Appearance, Flavor, Texture, and Saltiness or Sweetness across recipes. Correlation strengths are defined as Very High (0.9−1.0), High (0.7−0.9), Moderate (0.5−0.7), Low (0.3−0.5), or Negligible (0.0−0.3) per previously published guidelines in sensory analysis [62].

Recipe		Fiesta Quesadilla	Peach Crumble	Harvest Muffins	Crunchy Apple Salad	Breakfast Burrito	Fruity Parfait	Garden Fresh Tortizza	4 Fruit Smoothie
Overall Liking and Liking of Title	*Spearman's ρ*	.434	.493	.631	.621	.646	.708	.760	.679
	Correlation Strength	-	Low	Moderate	Moderate	Moderate	High	High	Moderate
	P value	.063	.027	.001	.005	.003	.001	.001	.008
Overall Liking and Liking of Appearance	*Spearman's ρ*	.484	.721	.634	.813	.566	.857	.696	.679
	Correlation Strength	Low	High	Moderate	High	Moderate	High	Moderate	Moderate
	P value	.036	.000	.001	.000	.012	.000	.004	.008
Overall Liking and Liking of Flavor	*Spearman's ρ*	.865	.931	.930	.881	.890	.857	.888	.997
	Correlation Strength	High	Very High	Very High	High	High	High	High	Very High
	P value	.000	.000	.000	.000	.000	.000	.000	.000
Overall Liking and Liking of Texture	*Spearman's ρ*	.839	.755	.984	.864	.897	1.00	.888	.679
	Correlation Strength	High	High	Very High	High	High	Very High	High	Moderate
	P value	.000	.000	.000	.000	.000	-	.000	.008
Overall Liking and Liking of Saltiness/Sweetness	*Spearman's ρ*	0.495	0.822	0.685	0.876	.306	.540	.762	.997
	Correlation Strength	Low	High	Moderate	High	-	Moderate	High	Very High
	P value	.031	.000	.000	.000	.203	.021	.001	.000

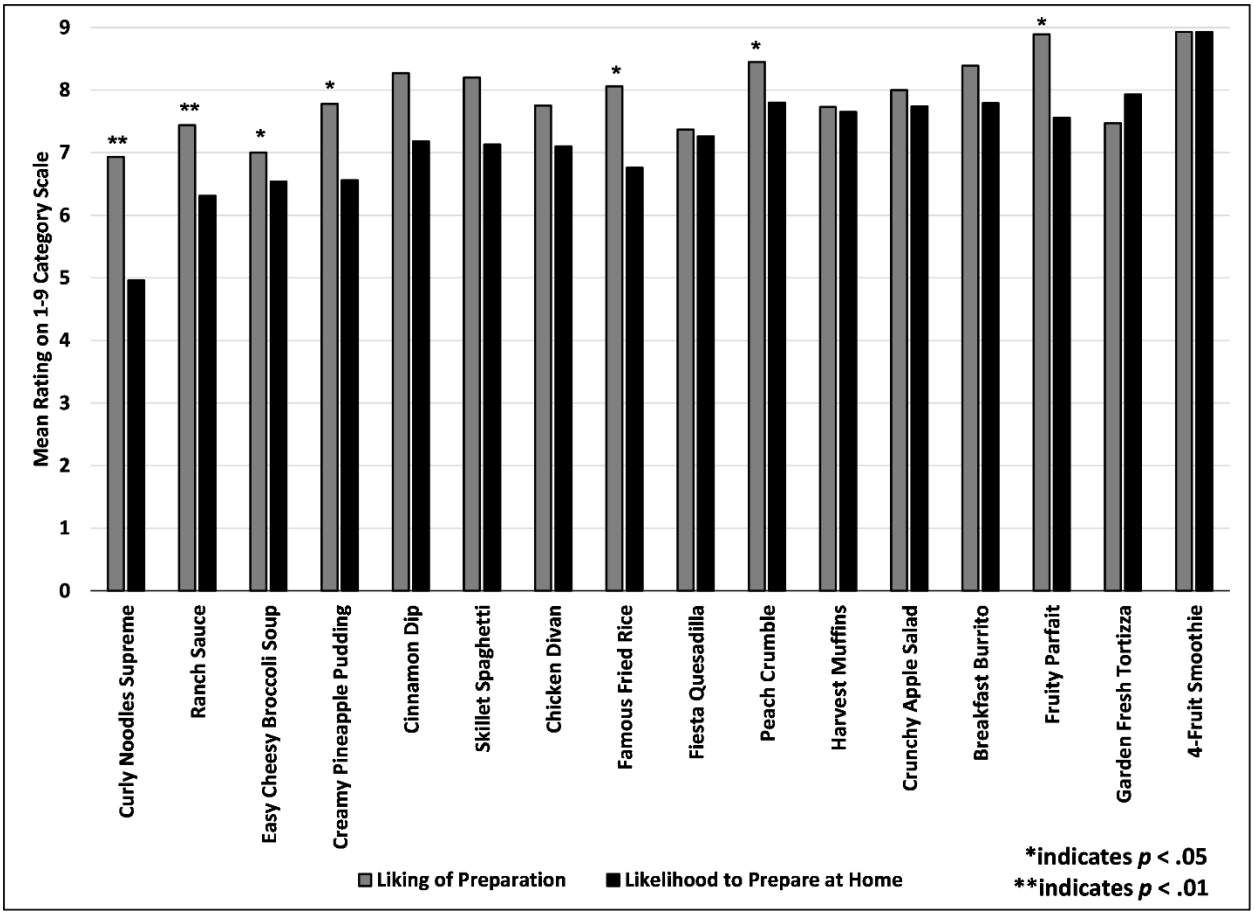

Figure 4.1. Mean scores for liking of recipe preparation and likelihood to prepare the recipe at home for the 16 *Food Talk* recipes, ordered from the lowest (left) overall liking rating to the highest (right). Significant differences between liking of recipe preparation and likelihood to prepare the recipe at home are denoted with asterisks.

Supplementary Table 4.1. Online survey questions for the sixteen existing *Food Talk* recipes.

Instructions/Questions	Responses offered	Space for Comments
Demographic Questions		
Q1. What is your gender?	"Male" OR "Female"	No
Q2. What is your age?	"Under 18 years old," "18-59 years old," OR "60+ years old"	No
Q3. Do you consider yourself Hispanic or Latino?	"Yes" OR "No"	No
Q4. What is your race? (Check all that apply)	"Black or African American," "White," "American Indian or Alaska Native," "Asian," AND/OR "Native Hawaiian or Other Pacific Islander"	No
Q5. What program do you work with?	"EFNEP" OR "SNAP-Ed"	No
Q6. What is your position in this program?	"Supervisor" OR "Program Assistant"	No
Q7. How long have you worked with the EFNEP or SNAP-Ed program?	"Less than 1 year," "1-2 years," OR "More than 3 years"	No
Q8. What district do you work within?	"Northeast," "Northwest," "Southeast," OR "Southwest"	No
Demonstration Confirmation		
Q10a. If you demonstrate this recipe, check the first box. If you do not demonstrate this recipe OR if you have never tried this recipe, please check the second box.	"I do/have demonstrate(d) this recipe" OR "I do not/have not demonstrate(d) this recipe"	No
Q10b. (If second box is checked) What recipe do you prepare as an alternate recipe? New employees enter "N/A"	Open-ended free response	No
Sensory-Informed Questions		
Q11. How would you rate your overall liking of this recipe?	Hedonic scale of 1-9 with verbal anchors at 1 (Dislike Extremely), 5 (Neither Like nor Dislike), and 9 (Like Extremely)	Yes
Q12. How much do you like the title of this recipe?	Hedonic scale of 1-9 with verbal anchors at 1 (Dislike Extremely), 5 (Neither Like nor Dislike), and 9 (Like Extremely)	Yes
Q13. How much do you like the appearance of this recipe?	Hedonic scale of 1-9 with verbal anchors at 1 (Dislike Extremely), 5 (Neither Like nor Dislike), and 9 (Like Extremely)	Yes

Q14. How much do you like the flavor of this recipe?	Hedonic scale of 1-9 with verbal anchors at 1 (Dislike Extremely), 5 (Neither Like nor Dislike), and 9 (Like Extremely)	Yes
Q15. How much do you like the texture of this recipe?	Hedonic scale of 1-9 with verbal anchors at 1 (Dislike Extremely), 5 (Neither Like nor Dislike), and 9 (Like Extremely)	Yes
Q16. How much do you like the saltiness [or sweetness] of this recipe?	Hedonic scale of 1-9 with verbal anchors at 1 (Dislike Extremely), 5 (Neither Like nor Dislike), and 9 (Like Extremely)	Yes
Q17. How much do you like the preparation required to make this recipe?	Hedonic scale of 1-9 with verbal anchors at 1 (Dislike Extremely), 5 (Neither Like nor Dislike), and 9 (Like Extremely)	Yes
Preparation Intent Question		
Q18. How likely are you to prepare this recipe at home?	Categorical scale of 1-9 with verbal anchors at 1 (Extremely Unlikely), 5 (Neither Likely nor Unlikely), and 9 (Extremely Likely)	Yes
Participant Perception Questions		
Q19. How do you think your participants would rate their overall liking of this recipe?	Hedonic scale of 1-9 with verbal anchors at 1 (Dislike Extremely), 5 (Neither Like nor Dislike), and 9 (Like Extremely)	Yes
Q20. How much do you think your participants like the preparation required to make this recipe?	Hedonic scale of 1-9 with verbal anchors at 1 (Dislike Extremely), 5 (Neither Like nor Dislike), and 9 (Like Extremely)	Yes
Q21. How likely do you think your participants are to prepare this recipe at home?	Categorical scale of 1-9 with verbal anchors at 1 (Extremely Unlikely), 5 (Neither Likely nor Unlikely), and 9 (Extremely Likely)	Yes

Supplementary Table 4.2. Selected Kruskal-Wallis and Mann-Whitney U tests of significant ($p < .05$) associations between demographic information and sensory liking attributes/ preparation of recipes by peer educators. Interpretations provide the mean ranks. Recipes and attributes not shown did not garner significant associations with demographic information.

	Overall Liking (OL)	Liking of Texture	Liking of Flavor	Likelihood to Prepare at Home	Participant OL (perceived)	Participant Liking of Preparation (perceived)	Participant Likelihood to Prepare at Home (perceived)
Curly Noodles Supreme							
Statistic	-	-	-	-	$U = 43.50, z = -1.99, p = .046$	-	-
Interpretation	-	-	-	-	SNAP-Ed peer educators (mean rank=20.06) rated perceived participant OL higher than EFNEP peer educators (mean rank=13.07)	-	-
Harvest Muffins							
Statistic	-	-	-	-	-	$H(2) = 7.99, p = .018$	-
Interpretation	-	-	-	-	-	Peer educators employed <1 year (mean rank= 17.86) and those employed 3+ years (mean rank=15.25) rated perceived participant liking of preparation higher than those employed 1-2 years (mean rank=6.58)	-
Chicken Divan							
Statistic	$H(2) = 9.56, p = .008$	-	-	-	$H(2) = 6.85, p = .033$	$H(2) = 7.29, p = .026$	-
Interpretation	Peer educators employed for 1-2 years (mean rank=18.0) and 3+ years (mean rank=11.77) rated their OL higher than those who were employed <1 year (mean rank=4.80)	-	-	-	Peer educators employed for 1-2 years (mean rank=18.0) and 3+ years (mean rank=11.08) rated their perceived participant OL higher than those who were employed <1 year (mean rank=6.60)	Peer educators employed for 1-2 years (mean rank=17.50) and 3+ years (mean rank=11.42) rated their perceived participant liking of preparation higher than those employed	-

						<1 year (mean rank=6.0)	
Cinnamon Dip							
Statistic	-	$H(3) = 9.56, p = .023$	-	-	-	-	-
Interpretation	-	Peer educators from the Northeast (mean rank=17.0) and Southeast (mean rank=19.0) districts rated their liking of texture higher than those who work in the Northwest (mean rank=8.44) and Southwest (mean rank=9.75) districts	-	-	-	-	-
Easy Cheesy Broccoli Soup							
Statistic	-	$H(3) = 8.58, p = .035$	-	-	-	-	-
Interpretation	-	Peer educators from the Northeast district (mean rank=11.20) rated their liking of texture higher than those who work in the Northwest (mean rank=3.8), Southeast (mean rank=8.5), and Southwest (mean rank=6.5) districts	-	-	-	-	-
Fruity Parfait							
Statistic	-	-	-	$H(3) = 15.42, p = .001$	$H(3) = 7.90, p = .048$	-	$H(3) = 10.98, p = .012$
Interpretation	-	-	-	Peer educators from the Northeast (mean rank=13.0) and Northwest (mean rank=11.93) rated their own likelihood to prepare the Parfait at home higher than those who work in the Southeast (mean rank=4.25) and Southwest (mean rank=2.33) districts	Peer educators from the Northeast (mean rank=11.5), Northwest (mean rank=10.29), and Southeast (mean rank=11.5) districts rated their perceived participant OL higher than those who work in the Southwest (mean rank=4.83) district	-	Peer educators from the Northeast (mean rank=11.93) and Northwest (mean rank=11.93) districts rated their perceived participant likelihood to prepare the Parfait at home higher than the Southeast (mean rank=8.0) and Southwest (mean rank=2.33) districts

Creamy Pineapple Pudding							
Statistic	$H(2) = 6.05, p = .049$	-	$U = 10.50, z = -2.28, p = .023$	-	$U = 10.00, z = 02.31, p = .021$	-	$H(2) = 6.21, p = .045$
Interpretation	Peer educators employed for 3+ years (mean rank=12.5) rated their OL higher than those employed for <1 year (mean rank=6.88) and 1-2 years (mean rank=6.2)	-	Peer educators of EFNEP (mean rank=11.19) rated their liking of the flavor higher than SNAP-Ed peer educators (mean rank=5.10)	-	Peer educators of EFNEP (mean rank=11.23) rated their perceived participant OL higher than SNAP-Ed peer educators (mean rank=5.0)	-	Peer educators employed for 3+ years (mean rank=12.22) rated their perceived participant likelihood to prepare the Pudding at home higher than those employed <1 year (mean rank=9.0) and 1-2 years (mean rank=5.0)
Skillet Spaghetti							
Statistic	-	-	-	$H(3) = 7.81, p = .050$	-	-	$H(3) = 7.84, p = .049$
Interpretation	-	-	-	Peer educators working in the Northwest (mean rank=10.5) district rated their likelihood to prepare the Spaghetti at home higher than those who work in the Northeast (mean rank=6.6), Southeast (mean rank=2.0), and Southwest (mean rank=1.0) districts	-	-	Peer educators working in the Northwest (mean rank=10.75) district rated their perceived participant likelihood to prepare the Spaghetti at home higher than those who work in the Northeast (mean rank=5.4), Southeast (mean rank=1.0), and Southwest (mean rank=6.0) districts

CHAPTER 5

A SENSORY-INFORMED BALLOT OFFERS TIMELY INSIGHTS ON NEW RECIPES TESTED BY PEER EDUCATORS OF DIRECT NUTRITION EDUCATION PROGRAMS [4]

[4] Ng, M.K., Adhikari, K., Andress, E.L., Henes, S., Lee, J.S., & Cox, G.O. To be submitted to the *Journal of Nutrition Education and Behavior* as an original research article.

ABSTRACT

Objectives: Determine performance of unfamiliar recipes and investigate the functionality of a hybrid online/remote method to evaluate recipe acceptance.

Design: Eight new recipes were evaluated online in a pre- and post-survey format for perceived overall liking (OL), attribute liking (recipe title, appearance, flavor, texture, saltiness/sweetness), and preparation behaviors using recipe information. These same recipes were re-evaluated after preparing and tasting them.

Setting: Online and state Extension offices.

Participants: Peer educators for the University of Georgia EFNEP and SNAP-Ed programs.

Main Outcome Measures: Differences in OL of pre- to post-surveys, attributes contributing to acceptance, and preparation behaviors.

Analysis: General descriptive statistics and non-parametric analyses (Kruskal-Wallis with Bonferroni correction, Wilcoxon Signed Rank, Spearman's Rank).

Results: No significant differences ($P > 0.05$) found in pre- to post-survey OL or preparation behaviors. Flavor, texture, and appearance were most strongly correlated with post-survey OL. Liking of recipe preparation exceeded 7 out of 9 for all recipes, but ratings decreased for willingness to prepare recipes and perceived participant reactions.

Conclusions and Implications: While tasting new recipes is necessary to determine specific recipe modifications, OL and preparation behaviors can be inferred through recipe information in an online survey. A hybrid recipe evaluation and testing format is practical for introducing new recipes to peer educators when time is limited.

INTRODUCTION

Cooking and recipe demonstrations are commonly integrated into the framework of Federal nutrition education programs such as EFNEP (Expanded Food and Nutrition Education Program) and SNAP-Ed (Supplemental Nutrition Assistance Program-Education) to encourage healthy eating and expose participants to foods unfamiliar to them [110, 111]. These demonstrations help to model healthy cooking methods with new or desirable ingredients to low-income participants, and the recipes support the health-promoting behaviors taught in the direct education lessons [24]. The use of engaging recipes in class demonstrations has the potential to create lasting benefits in the target audience if the recipes are made at home and replace meals higher in sodium, saturated fat, and added sugars [27, 28, 32, 33]. Even when participants are unable to participate in the recipe preparation, such as with an online class format, they report willingness to try new foods, pay attention to fruit and vegetable intake [27], and may even make the recipes at home despite having not tried the dish before [28].

SNAP-Ed at the University of Georgia (UGA) and EFNEP, nationally, both utilize a peer educator or paraprofessional-led model for their community nutrition programming. These peer educators are commonly from the communities they serve and obtain a level of trust among the low-income audiences they teach [34, 35]. Peer educators are tasked with teaching evidence-based nutrition curricula, demonstrating recipes, and building rapport with participants. As such, they are vital in influencing participant acceptance of recipes, and conversely are privy to the food-related likes, dislikes, struggles, and successes of participants. Because of their close relationships with the target audience and their involvement with recipe demonstrations, peer educators are key stakeholders of the recipe development process. Their own acceptability of recipes provides a benchmark for programmers to follow during recipe development, and this

approach has been utilized to select recipes for programming both informally (i.e., "word of mouth" from peer educators to state staff) and formally in the literature by means of survey feedback [16, 22, 39]; however, there has been no standard method of evaluating recipes and their acceptance across studies.

Sensory evaluation utilizes a set of established methods to provide information about the sensory properties (e.g., appearance, aroma, taste, and flavor) of a product [41]. It is a critical component of research and development in many food companies [40]. While a laboratory setting is considered the gold standard of sensory evaluation due to its controlled environment, consistent preparation and presentation of food samples, and thus minimal variability, sensory evaluation can also be utilized in non-traditional settings. The central location test (CLT) is often used for consumer testing, as it increases the potential sample size and convenience of testing for participants [41]. In the nutrition education realm, studies conducted by the University of Georgia (UGA) EFNEP and SNAP-Ed teams have evaluated recipes using central location testing at community nutrition education sites. The CLT approach allowed limited-resource consumers of their *Food Talk* program to participate without traveling to additional locations [15, 93].

Due to the COVID-19 pandemic and public health concerns surrounding communal eating spaces, in-person CLT sensory evaluations were not feasible. This provided the research group with the opportunity to explore a new avenue of evaluation in the community nutrition setting: online sensory-informed ballots and the modified in-home-use test (IHUT/iHUT, more commonly abbreviated to HUT) hybrid method. The HUT brings a product of interest into the typical consumer environment of that product (usually a home) to see how the product performs

when used in the everyday setting [41]. The research group modified the HUT method to be more applicable to the participants in the present study.

Previous work by Ng and colleagues [93] evaluated seven newly developed recipes for use with the UGA EFNEP and SNAP-Ed's direct, evidence-based *Food Talk* programs. These newly developed recipes were modified, re-standardized, and with the addition of an eighth modified recipe from *Food Talk* curricula, ready to be evaluated again. The eight recipes used in the present study—Breakfast Tacos, Creamy Banana Overnight Oats, Chicken Chili with White Beans, Homemade Salsa, Kale and Orange Salad, Rustic Rotini with Tomatoes and Beans, Vegetarian Tacos, and Whole Wheat Berry Bake—are not currently used in any direct education curricula and were unfamiliar to most peer educators, but versions of the recipes can be found on the UGA SNAP-Ed website at FoodTalk.org. The objective of this study was two-fold: first, to determine how peer educators rate these modified, but largely unfamiliar, recipes of interest before tasting a recipe and while tasting a recipe. Second, to determine whether the hybrid method of testing recipe performance is practical for use among peer educators of these Federal nutrition education programs.

METHODS

Participants

Peer educators of the UGA EFNEP and SNAP-Ed programs participated in this study. All peer educators had experience teaching the *Food Talk* curriculum, which is used in both programs in the state of Georgia. Supervisors were not included in the study due to their lack of involvement with the recipe demonstration portion of nutrition education sessions. Peer educators were recruited through an individually addressed invitation to participate in the study, and they were later emailed a sign-up sheet. They were asked to sign up for as few or as many

recipes as they were willing to test within the study period. Participation was voluntary, but it was noted in the recruitment materials that their participation would help to improve the *Food Talk* program and future recipe offerings. Peer educators were provided with a 1/8 teaspoon measuring spoon as a tangible incentive to participate in the study. Informed consent was collected from participants. The study design and all supporting materials were approved by the UGA Institutional Review Board for human subjects research (ID: PROJECT00002146) prior to the start of the study.

Study Design

This two-part, hybrid study combined an online, sensory-informed ballot with a modified HUT and online sensory evaluation of eight new recipes. These recipes were unfamiliar to most participants, as they were not yet included in any UGA EFNEP or SNAP-Ed curricula at the time of the study. For a four-week study period, peer educators were given access to a shared, online folder that contained study materials unique to each recipe. Each recipe folder contained two sub-folders and an instructions document to prevent the educators from skipping steps. Peer educators completed two surveys per recipe, and they physically prepared the recipe between the surveys. The first survey ("pre-survey") was taken before preparing and tasting the recipe. It was included to collect initial thoughts and perceptions about the recipe based on recipe information and visual media (a still photo and step-by-step preparation video set to music). The second survey ("post-survey") was taken while tasting the dish, and it allowed for actual sensory evaluation and feedback of the recipe.

A shopping list and standardized recipe were included in each online recipe folder, and peer educators were asked to prepare the recipes in their county extension office kitchens. To address cost and food waste concerns, peer educators who worked at the same county offices

prepared recipes together and were instructed to complete their post-surveys separately. Peer educators were provided with the necessary nonperishable ingredients for the recipes they selected, which were mailed to each participating county office. The peer educators purchased perishable groceries to allow them to complete the study recipes at their convenience throughout the study period. Grocery and travel costs were reimbursed by the study group to reduce participant burden.

Sensory Evaluation

All surveys were anonymous and collected demographic information (gender, age, race/ethnicity, program employment [EFNEP or SNAP-Ed], program role [program assistant or other peer educator], length of time as an employee [less than 1 year, 1-2 years, 3 or more years], and quadrant district location [Northeast, Northwest, Southeast, or Southwest] in Georgia) and informed consent. Because there may be differences in taste perception and preference among different ethnicities, race and ethnicity were included to compare the peer educator make-up to state and national demographics [99]. The surveys also included instructions for working through each survey.

The pre-surveys consisted of written recipe information (serving size and amount; ingredients; instructions) and visual media (still photo and step-by-step recipe video). Peer educators were then asked questions about their perceived acceptance of that recipe based on the provided information and media (perceived overall liking [OL], perceived liking of the recipe title, appearance, flavor, texture, saltiness or sweetness, and preparation of the recipe); likelihood of preparing the recipe at home or as a food demonstration for *Food Talk*; which *Food Talk* session they saw the recipe fitting in; and how their participants may perceive these recipes (OL, liking of preparation, and likelihood of preparing at home) based on their experiences with

participants. The *Food Talk* session fit question was asked to inform internal recipe recommendations during curriculum updates. Space for optional comments was made available after each section. All questions, apart from the session fit, were evaluated on a 9-point scale. A hedonic scale (1=dislike extremely; 5=neither like nor dislike; 9=like extremely) was used for questions related to OL and recipe attributes. A categorical scale (1=extremely unlikely; 5=neither likely nor unlikely; 9=extremely likely) was used for the remaining preparation behavior questions.

The post-surveys contained the recipe title and a still photo to ensure the peer educator was taking the correct survey for the recipe they were testing. Peer educators indicated whether any substitutions were made to the recipe during preparation. This survey mimicked a printed sensory evaluation ballot with instructions for cleansing the palate with room temperature water before the first bite and between each consecutive bite of the recipe sample. Peer educators first answered their actual OL of the recipe, followed by liking of recipe title, appearance, flavor, texture, saltiness/sweetness, and recipe preparation on the 9-point hedonic scale. Then, they answered the same preparation intent, session fit, and participant perception questions as the pre-survey. Space for optional comments was made available after each section.

Statistical Analysis

Data were stored on a secure Qualtrics XM (Seattle, WA) account and analyzed using IBM SPSS Statistics (version 27.0, Armonk, NY). General descriptive statistics were calculated for participant demographics and pre- and post-survey ratings. Frequencies were calculated to evaluate *Food Talk* session fit of each recipe, according to educators. A Kruskal-Wallis test was conducted to determine if the OL of recipes differed within the pre- or post-surveys. Pairwise comparisons using the Bonferroni correction were used to determine where significant

differences in OL, if any, occurred between recipes. To account for familywise error, significance was adjusted to $p = 0.0018$. Wilcoxon Signed Rank tests were conducted between each recipe's pre- and post-survey OL and preparation behaviors to determine how tasting the recipe impacted ratings. Spearman's Rank correlations were analyzed to determine the relationship between recipe OL and its attributes. Kruskal-Wallis and Mann-Whitney tests were used to evaluate relationships, if any, between selected demographics and overall liking or preparation behaviors. With the exception of the Bonferroni comparisons, significance was evaluated at the $\alpha = 0.05$ level. Comments were compiled into a single spreadsheet to support the quantitative results.

RESULTS

Data collection occurred over the span of four weeks. Incomplete responses were removed only if they did not include responses to any of the recipe related questions. Demographic information for the pre- and post-surveys can be found in **Table 5.1a** and **Table 5.1b**. Although the results across each recipe's surveys can be considered within groups, some educators did not complete both surveys. Additionally, no identifying information was collected to connect the pre- and post-surveys. As a result, differences exist in the sample size and demographics from pre- to post-surveys.

Overall, pre-surveys garnered 137 responses ranging from 14-21 peer educators depending on the recipe. Ninety seven percent were female (n=133), a majority of participants were between the ages of 18-59 (88%, n=120), and 12% considered themselves Hispanic or Latino (n=17). Fifty two percent of participants identified as Black or African American (n=71), while nearly 45% identified as White (n=61) and less than 2% identified as American Indian or Alaska Native (n=2). Both UGA EFNEP and SNAP-Ed had similar representation across the pre-

survey responses with a total of 58% from EFNEP (n=79) and 42% from SNAP-Ed (n=57). Fifty four percent had been employed with their program for three or more years (n=74), while 29% and 18% had been with UGA EFNEP or SNAP-Ed for 1-2 years (n=39) or less than a year (n=24), respectively. A majority were from the northern districts of Georgia (27%, n=37, from the Northeast District and 60%, n=82, from the Northwest District). The post-surveys received 129 responses from 13-19 peer educators and had similar, but not the same, demographic information as the pre-surveys. Post-survey demographic information can be found in **Table 5.1a** and **Table 5.1b**.

Overall Liking Ratings and Recipe Acceptability

Overall liking and attribute ratings before tasting (pre-surveys) and while tasting (post-surveys) the recipes are shown in **Table 5.2**. Five out of eight recipes in the pre-surveys received ratings exceeding 7 out of 9 for perceived overall liking (OL), which may indicate a high acceptability[62] based on the recipe information that was provided. When differences in pre-survey perceived OL ratings were analyzed using an independent samples Kruskal-Wallis test, significance was noted ($H(7) = 21.097, p = .004$). A post-hoc Bonferroni comparison (significance adjusted to $p < .0018$ to account for familywise error) determined that the Breakfast Tacos and Rustic Rotini with Tomatoes and Beans ("Rustic Rotini") were the only pair that differed significantly in perceived OL ($p = .001$). The Breakfast Tacos received a 5.6 (SD 1.7) and Rustic Rotini a 7.7 (SD 1.5) before tasting the recipes. Written feedback about the Breakfast Taco included at least three comments regarding perceived lack of texture and flavor and the use of beans in a breakfast option. Conversely, the Rustic Rotini garnered at least two positive comments about the inclusion of beans in this lunch or dinner pasta dish.

In the post-surveys, one recipe, Homemade Salsa, reached the cutoff for high acceptability with an OL of 7.0 (SD 2.4). Most other recipes approached this cutoff, and four recipes—Chicken Chili with White Beans ("Chicken Chili"), Kale and Orange Salad ("Kale Salad"), Rustic Rotini, and Whole Wheat Berry Bake ("Berry Bake")—exceeded 6.5 but did not reach 7.0 in OL. The post-survey OL ratings of all recipes while tasting them were not significantly different from one another ($H(7) = 8.019, p = .331$).

When the pre- and post-survey OL ratings for each recipe were compared, there were no significant differences between these ratings; however, 1–2-point differences in OL ratings before and while tasting the Rustic Rotini (pre-survey OL: 7.7, SD 1.5; post-survey OL: 6.7, SD 1.9) and Vegetarian Tacos (pre-survey OL: 7.1, SD 2.1; post-survey OL: 5.0, SD 2.8) were noted. Written feedback indicated a lack of flavor in both recipes once they were tasted in the post-survey. The Rustic Rotini received three separate comments about the tough texture of the overall dish because of the beans used (great northern beans) and unappealing ratio of pasta to sauce. At least five comments on the Vegetarian Tacos post-survey suggested the inclusion of fresh vegetables and more herbs to improve the poor texture and flavor ratings. These concerns were not anticipated by peer educators in their pre-survey responses. Additionally, with the exception of the Creamy Banana Overnight Oats ("Banana Oats") and Kale Salad, OL ratings decreased once the peer educators prepared and tasted the recipes (**Figure 5.1**).

Attribute and Preparation Intent Ratings and Relationships in Post-Surveys

The pre-survey responses provided valuable insights into the perceptions surrounding each recipe prior to preparing and tasting it; however, the post-surveys were of interest to the research group because the ratings were based on physically tasting recipe samples. Attribute and OL Spearman's Rank correlation coefficients can be found in **Table 5.3**. Correlation coefficient

strengths were evaluated using previously published cutoffs [95]. As expected, attribute acceptance (liking of the recipe title, appearance, flavor, texture, saltiness/sweetness) was strongly and positively correlated with overall liking in many recipes. The relationship between OL and flavor was the strongest with all recipes' flavor acceptability "very highly" (Banana Oats, $r(10) = .98$, and Berry Bake, $r(17) = .94$), "highly" (Chicken Chili, $r(17) = .85$; Homemade Salsa, $r(17) = .88$; Kale Salad, $r(14) = .84$; Rustic Rotini, $r(13) = .89$; and Vegetarian Tacos, $r(11) = .88$), or "moderately" (Breakfast Tacos, $r(11) = .93$) correlated with their OL ratings. Peer educators provided many written suggestions in the open-ended comment boxes for improving the flavor acceptability of the recipes, such as those in the above section regarding the Vegetarian Tacos. OL and texture were also significantly correlated across all recipes. Liking of texture was "very highly" correlated with OL in one recipe (Banana Oats, $r(10) = .96$), "highly" correlated with four recipes (Chicken Chili, $r(17) = .70$; Kale Salad, $r(14) = .73$; Vegetarian Tacos, $r(11) = .85$; and Berry Bake, $r(17) = .89$), and "moderately" correlated with the remaining three recipes (Breakfast Tacos, $r(11) = .66$; Homemade Salsa, $r(17) = .63$; and Rustic Rotini, $r(13) = .63$). Appearance was significantly correlated with OL for six recipes (Chicken Chili, $r(17) = .67$; Banana Oats, $r(10) = .81$; Homemade Salsa,$r(17) = .69$; Kale Salad, $r(14) = .73$; Vegetarian Tacos, $r(11) = .62$; and Berry Bake, $r(17) = .67$). Written feedback included the importance of a well-accepted appearance, and a peer educator rating the Banana Oats wrote, "I think, like me, if they tasted it, they would like it, but the appearance would keep a lot of people from trying it." Liking of saltiness or sweetness of the recipes was not as consistently correlated with the recipe OL. **Table 5.3** also shows that the peer educators' OL of each recipe was moderately to very highly correlated with their

participants' perceived OL, signifying a potential relationship between the individual opinions of peer educators and those of their participants.

Preparation liking and behavior intent ratings can be found in **Table 5.4**. All recipes exceeded or approached a 7 out of 9 in liking of preparation, indicating the recipes are appropriate for demonstration in their preparation, but the acceptability dropped when peer educators were asked about their personal likelihood to prepare the recipes at home, which is an indicator of food preparation behavior change. In the comments that followed these questions, the mean drop in ratings from preparation liking to intent could be explained primarily due to a dislike of an ingredient (e.g., raw kale in the Kale Salad; oatmeal in the Banana Oats; inclusion of dairy in recipes but living in a lactose-intolerant household). Ratings approached or exceeded 7 for many recipes when asked about their likelihood of preparing the recipe for a *Food Talk* session. One peer educator rated their personal likelihood of preparing the Chicken Chili recipe at home as a 4, but their likelihood of preparing it for a Food Talk session a 9. They wrote, "I would not personally make this at home, but a warm filling meal like this are the ones [sic] participants seem to enjoy a lot." This peer educator went on to rate their participants perceived likelihood of preparing the recipe at home as an 8. When preparation liking and behaviors were compared from pre- to post-survey, there were no significant differences within each recipe's ratings.

Overall Liking and Preparation Behaviors based on Selected Demographic Information

Mann-Whitney and Kruskal-Wallis tests were conducted to determine how the peer educators' program involvement (program employment; years employed—experience; and quadrant district in Georgia) and race or ethnicity were related to their ratings. These demographics were selected in an attempt to better understand how geographic location,

experience as a peer educator, and lived experience may be involved in recipe acceptance. There were no significant ($p > .05$) differences between how these demographic groups rated OL across all recipes. Of the other relationships analyzed for each recipe, only two recipes garnered significant differences: Chicken Chili and Vegetarian Tacos. Mann-Whitney U tests for the Chicken Chili revealed that SNAP-Ed peer educators were significantly ($U = 20.00, p = .043$) more likely to prepare the Chicken Chili at a *Food Talk* session. Those who indicated their race as White were also significantly ($U = 20.50, p = .041$) more likely to prepare Chicken Chili in a *Food Talk* session, and this same subcategory of race also rated their perceived participant OL significantly ($U = 14.50, p = .018$) higher than those who indicated being Black or African American. When analyzing the Vegetarian Tacos recipe and demographic information, EFNEP peer educators were significantly ($U = 5.50, p = .045$) more likely to prepare the recipe during a *Food Talk* session, but this may have been influenced by the small sample size of SNAP-Ed peer educators who answered this question.

DISCUSSION

In this study, peer educators for the UGA EFNEP and SNAP-Ed Federal nutrition education programs provided feedback on eight recipes modified from a previous study with *Food Talk* participants [93]. A range of 13-21 peer educators participated in this study, which represents about half of the employees invited to participate (40 peer educators). Although it appeared there was an underrepresentation of the southern districts (southeast and southwest) with 87% of peer educators reporting their district being in northern Georgia (northeast and northwest), only 30% of the UGA EFNEP and SNAP-Ed *Food Talk* peer educators serve southern districts. Thus, the authors are hopeful that the southern Georgia perspectives are adequately represented in the results. There is some evidence that ethnicity impacts taste

perception, specifically in sweetness [99] and sour [112] intensity perception, and that flavor preferences may differ [113]; however, the data of this study did not provide any clear delineation among reported ethnic groups and recipe attribute acceptance. It is possible that this moderate sample size may have influenced the chosen analyses, but district information did not result in significant differences between OL or preparation ratings. Furthermore, there were few relationships between the participant demographic information and the recipe acceptance ratings. This may indicate that the recipes being tested were not different in perception across Georgia, regardless of their program, district, or employment length.

The use of pre- and post- measures of acceptance in unfamiliar recipes offer an under-explored method of evaluating recipes in the community nutrition setting. To the authors' knowledge, this remote approach to recipe testing and preliminary evaluation using recipe information (prior to tasting) has rarely been conducted with peer educators, though nutrition education staff in Georgia have historically been included in the recipe testing stage and offered suggestions to state staff [16, 22]. Additionally, work done by Robinson and colleagues [39] included Texas Extension agents and peer educators in the recipe selection process of soy-based recipes. They were asked to provide attitudinal, hedonic, and educational application feedback about the recipes before and after tasting them (in person). This study determined that the peer educator's involvement in the process appeared to encourage use of the new recipes among these employees, and they were more willing to promote the recipes to their participants; however, no information was provided regarding attitudinal changes before and after tasting the recipes. Because peer educators are influential in their communities, it is crucial to include them in the development and testing process, and this may subsequently result in greater buy-in from peer educators. In the present study, there were no significant differences in OL or preparation intent

behaviors from the pre- to post-survey responses. This finding may indicate that an online sensory-informed ballot can be used to predict some areas of recipe performance without the need for formal testing in a central location or the home/work setting. The results of this study and its design are promising for inferring overall recipe acceptance among trained peer educators and their perceptions of the participant experience.

Regarding recipe attributes, sensory evaluation that includes multiple attributes offers a more insightful view of recipe acceptance. It has been well-established that flavor, texture, and appearance are all strong drivers of product liking [42, 46-48]. In line with existing literature, the post-survey results also noted significant and moderate to very highly correlated relationships between OL and flavor, texture, and appearance across the recipes. It should be noted that the pre-surveys likely did not accurately portray educator acceptance of specific sensory attributes based on the change in mean ratings from pre- to post-surveys (**Table 5.2**); however, the authors stand by the inclusion of these attributes in the pre-surveys, as they prompted the peer educators to closely review the recipe information and note issues with ingredients as they pertained to participant likes and dislikes. For example, a peer educator responding to the Breakfast Tacos pre-survey commented that they would prefer to use corn tortillas for their Hispanic population. Another peer educator taking the Homemade Salsa pre-survey commented, “I have noticed that participants tend to struggle with low salt levels on the tomato heavy recipes.” Knowing this ingredient information from those most close to the target population, recipe developers can respond by creating more inclusive recipes or modifications in recipe demonstration scripts, particularly if the goal is to cater recipes to a specific demographic.

In the post-surveys, individual attribute questions guided peer educator-suggested recipe improvements and solicited specific modifications that would not have been detected in a recipe

photo or video. For instance, Chicken Chili received multiple comments in the post-survey pertaining to the thin texture of the recipe, which made it "more like a soup," according to one peer educator, and thus not likely to be recognizable as a "chili" to the Hispanic community. Although this recipe received a 6.6 (SD 2.3) in OL and a 7.0 (SD 2.1) rating for liking of texture, this feedback can assist recipe developers with either ingredient modifications or in the selection of a recipe name to avoid confusion. Recipes that received ratings below a 7 for liking of title before tasting the recipes—Breakfast Tacos, Banana Oats, Vegetarian Tacos, and Berry Bake—may benefit from name changes to influence sensory acceptability and recipe expectations [114], and suggestions were provided by educators. The preparation liking and likelihood of preparing these recipes also allowed peer educators to offer advice that would make the recipe more feasible for a *Food Talk* lesson. In the case of the Berry Bake, peer educators were concerned that the recipe took too long to cook as a cake, but usage of a muffin tin would resolve this issue.

Limitations

The authors note a few limitations with the present study: first, the inability to run a traditional CLT resulted in less control over the final recipes. To account for this, the authors included a place for peer educators to mention their recipe substitutions (rarely utilized), and a specific, standardized recipe was presented to the peer educators to follow. Unfortunately, there was no way to ensure the recipe was made correctly in the HUT setting. This became a potential concern while reading comments in peer educator responses that did not align with the standardized recipes. For example, the Berry Bake was a consistently moist and soft baked product during internal recipe testing, but there was a single comment from a peer educator that noted, "The recipe is very easy, it is a little dry for my taste, and on the next day drier," while other comments included that "it was moist, not dry" and "it was somewhat gooey/too moist."

Thus, it is possible that the recipe was not prepared as written by the educator who considered the recipe dry, and the final ratings from that peer educator are inaccurate. Although this may be a weakness from a sensory evaluation standpoint, the authors also feel this is "real-life" with nutrition education programs and the peer educator model, as peer educators would be independently making the recipes like the HUT approach used in this study. Second, verbal discussion after the study revealed that some peer educators refrained from completing the post-surveys because they knew they would not enjoy certain recipes based on the ingredients. It should be emphasized at the start of any future studies that the research group is interested in the "good" and the "bad" ratings.

CONCLUSIONS AND IMPLICATIONS

In the wake of the COVID-19 pandemic, a new avenue of sensory evaluation in non-traditional settings was explored. A hybrid method of an online survey followed up by a modified HUT of eight unfamiliar recipes was helpful in collecting timely feedback from UGA EFNEP and SNAP-Ed peer educators. This study allowed peer educators to be involved in the recipe development and modification process as key stakeholders of the *Food Talk* program. It also provided an opportunity to involve trained staff members who are not centrally located to the state offices, and in turn, they provided the research group with valuable insights into the typical *Food Talk* participants' likes and dislikes.

The results support the use of sensory-informed online surveys to introduce recipes to educators, even when in-person or remote preparation of recipes is not feasible. Although specific attribute acceptance will undoubtedly become more accurate when recipes are tasted, this study demonstrates that it is possible to provide trained educators with new recipes (including the name, ingredients, preparation instructions, a still photo, and a step-by-step video

to orient the peer educators) via an online survey and receive feedback pertaining to overall acceptance and preparation behaviors. State staff of nutrition education programs can be confident that including peer educators, the employees who interact directly with the target population and best understand their needs, in the recipe development process will benefit the final recipes. This study's data collection method, as an addition to the recipe development process, appears to be efficient, convenient, and ensures that new recipe offerings are participant-centered to create the desired dietary behavior changes.

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TABLES AND FIGURES

Table 5.1a. General descriptive statistics for the demographic information of peer educators (*n*, (%)) taking the pre- ("pre") and post- ("post") surveys evaluating eight modified recipes. Demographics include gender, age, identification of Hispanic or Latino heritage, race or ethnicity, program, position within the program, employment length, and regional quadrant district in Georgia. NR=No Response. Percentages may deviate from 100% due to rounding or multiple checked answers (in the case of race/ethnicity).

	All Recipes, N (%)		**Breakfast Tacos, n, (%)**		**Chicken Chili, n, (%)**		**Banana Oats, n, (%)**	
Demographics	*Pre*	*Post*	*Pre*	*Post*	*Pre*	*Post*	*Pre*	*Post*
N	137	129	14	13	21	19	18	13
Gender								
Male	4 (3)	3 (2)	0 (0)	0 (0)	1 (5)	1 (5)	1 (6)	0 (0)
Female	133 (97)	126 (98)	14 (100)	13 (100)	20 (95)	18 (95)	17 (94)	13 (100)
Age								
<18 years	0 (0)	1 (<1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
18-59 years	120 (88)	103 (80)	12 (86)	10 (77)	17 (81)	15 (79)	14 (78)	10 (77)
60+ years	17 (12)	25 (19)	2 (14)	3 (23)	4 (19)	4 (21)	4 (22)	3 (23)
Hispanic or Latino								
Yes	17 (12)	28 (22)	1 (7)	3 (23)	2 (10)	4 (21)	2 (11)	5 (39)
No	119 (87)	101 (78)	13 (93)	10 (77)	19 (91)	15 (79)	16 (89)	8 (62)
No response	1 (<1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Race/Ethnicity								
American Indian/Alaska Native	2 (1)	2 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Black/African American	71 (52)	56 (43)	10 (71)	5 (38)	11 (52)	9 (47)	9 (50)	6 (46)
White	61 (45)	71 (55)	4 (29)	8 (62)	10 (48)	10 (53)	9 (50)	7 (54)
No response	3 (2)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Program								
EFNEP	79 (58)	69 (54)	8 (57)	6 (46)	12 (57)	6 (46)	9 (50)	8 (62)
SNAP-Ed	57 (42)	60 (46)	6 (43)	7 (54)	9 (43)	7 (54)	9 (50)	5 (39)
No response	1 (<1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Position								
Program Assistant	123 (90)	116 (90)	12 (86)	11 (85)	19 (91)	11 (85)	16 (89)	12 (92)
Other educator	13 (9)	12 (9)	2 (14)	2 (15)	2 (10)	2 (15)	2 (11)	1 (8)
No response	1 (<1)	1 (1)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Employment Length								
<1 year	24 (18)	17 (13)	3 (21)	2 (15)	3 (14)	2 (15)	3 (17)	2 (15)
1-2 years	39 (29)	37 (29)	3 (21)	3 (23)	6 (29)	3 (23)	5 (28)	2 (15)
3+ years	74 (54)	75 (58)	8 (57)	8 (62)	12 (57)	8 (62)	10 (56)	9 (69)
District								
Northeast	37 (27)	28 (22)	3 (21)	5 (39)	5 (24)	5 (39)	5 (28)	3 (23)
Northwest	82 (60)	83 (64)	9 (64)	6 (46)	13 (62)	6 (46)	11 (61)	8 (62)
Southeast	10 (7)	10 (8)	1 (7)	1 (8)	2 (10)	1 (8)	1 (6)	1 (8)
Southwest	8 (6)	8 (6)	1 (7)	1 (8)	1 (5)	1 (8)	1 (6)	1 (8)

Table 5.1b. General descriptive statistics for the demographic information of peer educators (*n*, (%)) taking the pre- ("pre") and post- ("post") surveys evaluating eight modified recipes. Demographics include gender, age, identification of Hispanic or Latino heritage, race or ethnicity, program, position within the program, employment length, and regional quadrant district in Georgia. NR=No Response. Percentages may deviate from 100% due to rounding or multiple checked answers (in the case of race/ethnicity).

	Homemade Salsa, *n* (%)		**Kale Salad, *n* (%)**		**Rustic Rotini, *n* (%)**		**Vegetarian Tacos, *n* (%)**		**Berry Bake, *n* (%)**	
Demographics	*Pre*	*Post*	*Pre*	*Post*	*Pre*	*Post*	*Pre*	*Post*	*Pre*	*Post*
N	19	19	15	17	16	16	17	13	17	19
Gender										
Male	1 (5)	1 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (6)	1 (5)
Female	18 (95)	18 (95)	15 (100)	17 (100)	16 (100)	16 (100)	17 (100)	13 (100)	16 (94)	18 (95)
Age										
<18 years	0 (0)	1 (5)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
18-59 years	19 (100)	15 (79)	13 (87)	13 (77)	14 (88)	13 (81)	16 (94)	11 (85)	15 (88)	16 (84)
60+ years	0 (0)	3 (16)	2 (13)	4 (24)	2 (13)	3 (19)	1 (6)	2 (15)	2 (12)	3 (16)
Hispanic or Latino										
Yes	3 (16)	3 (16)	3 (20)	4 (24)	1 (6)	2 (13)	4 (24)	3 (23)	1 (6)	4 (21)
No	16 (84)	16 (84)	12 (90)	13 (77)	15 (94)	14 (88)	13 (77)	10 (77)	15 (88)	15 (79)
No response	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (6)	0 (0)
Race/Ethnicity										
American Indian/Alaska Native	0 (0)	0 (0)	1 (4)	1 (6)	0 (0)	0 (0)	0 (0)	0 (0)	1 (6)	1 (4)
Black/African American	9 (47)	8 (42)	7 (27)	7 (41)	9 (56)	7 (44)	9 (53)	7 (54)	8 (47)	7 (29)
White	10 (53)	11 (58)	7 (27)	9 (53)	8 (50)	9 (56)	7 (41)	6 (46)	7 (41)	11 (46)
No response	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (6)	0 (0)	1 (6)	0 (0)
Program										
EFNEP	11 (58)	10 (53)	10 (67)	9 (53)	9 (56)	8 (50)	13 (77)	9 (69)	7 (41)	8 (42)
SNAP-Ed	8 (42)	9 (47)	5 (33)	8 (47)	7 (44)	8 (50)	4 (24)	4 (31)	9 (53)	11 (58)
No response	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	1 (6)	0 (0)
Position										
Program Assistant	17 (90)	17 (90)	14 (93)	15 (94)	15 (94)	15 (94)	16 (94)	12 (92)	14 (88)	17 (90)
Other educator	2 (11)	2 (11)	1 (7)	1 (6)	1 (6)	1 (6)	1 (6)	1 (8)	2 (13)	2 (11)
No response	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)	0 (0)
Employment Length										
<1 year	2 (11)	2 (11)	3 (20)	2 (12)	3 (19)	3 (19)	4 (24)	2 (15)	3 (18)	2 (11)
1-2 years	7 (37)	7 (37)	5 (33)	6 (35)	4 (25)	5 (31)	5 (29)	3 (23)	4 (24)	5 (26)
3+ years	10 (53)	10 (53)	7 (47)	9 (53)	9 (56)	8 (50)	8 (47)	8 (62)	10 (59)	12 (63)
District										
Northeast	5 (26)	3 (16)	5 (33)	5 (29)	4 (25)	3 (19)	7 (41)	2 (15)	3 (18)	4 (21)
Northwest	11 (58)	13 (68)	8 (53)	10 (59)	10 (63)	11 (69)	8 (47)	9 (69)	12 (71)	13 (68)
Southeast	2 (11)	2 (11)	1 (7)	1 (6)	1 (6)	1 (6)	1 (6)	1 (8)	1 (6)	1 (5)

Table 5.2. Mean ± SD for overall liking (OL) and attribute ratings of eight modified recipes based on an initial pre-survey impression ("Before tasting") of the recipe (recipe written out and video of preparation) and post-survey while preparing/while tasting ("While tasting") the recipe. There were no significant differences between the pre- and post-survey overall liking ratings.

Recipes	N	Overall Liking	Title	Appearance	Flavor	Texture	Saltiness or Sweetness
Breakfast Tacos							
Before tasting	14	5.6 ± 1.7	6.9 ± 1.3	6.1 ± 2.1	5.5 ± 1.5	5.4 ± 2.0	5.6 ± 1.8
While tasting	13	5.3 ± 2.8	6.4 ± 2.6	6.5 ± 2.3	4.5 ± 2.8	5.2 ± 3.0	4.7 ± 2.8
Chicken Chili							
Before tasting	21	7.6 ± 1.0	7.0 ± 1.6	6.7 ± 1.6	7.1 ± 1.2	7.4 ± 1.4	6.9 ± 1.6
While tasting	19	6.6 ± 2.3	7.2 ± 2.2	6.6 ± 2.4	6.3 ± 2.3	7.0 ± 2.1	6.9 ± 2.1
Banana Oats							
Before tasting	18	5.9 ± 2.0	6.7 ± 1.8	5.9 ± 2.2	6.0 ± 2.1	5.7 ± 2.2	5.7 ± 2.2
While tasting	13	6.3 ± 2.6	7.0 ± 2.2	5.9 ± 2.6	5.9 ± 2.7	6.3 ± 2.9	6.7 ± 2.8
Homemade Salsa							
Before tasting	19	7.4 ± 1.7	7.7 ± 1.7	7.7 ± 1.3	7.3 ± 1.6	7.1 ± 1.9	6.5 ± 2.0
While tasting	19	7.0 ± 2.4	7.6 ± 1.7	7.5 ± 2.0	6.4 ± 2.7	7.0 ± 2.8	6.5 ± 3.0
Kale Salad							
Before tasting	15	6.6 ± 2.0	7.1 ± 1.8	7.3 ± 1.8	6.3 ± 2.5	6.7 ± 2.3	7.4 ± 2.0
While tasting	16	6.8 ± 1.9	7.5 ± 2.0	7.8 ± 1.6	6.7 ± 2.3	6.8 ± 2.1	7.8 ± 1.6
Rustic Rotini							
Before tasting	16	7.7 ± 1.5	7.8 ± 1.5	7.6 ± 1.8	7.4 ± 1.5	7.3 ± 1.6	7.1 ± 1.9
While tasting	15	6.7 ± 1.9	7.7 ± 2.3	7.3 ± 2.2	6.8 ± 2.1	7.4 ± 2.1	6.7 ± 2.5
Vegetarian Tacos							
Before tasting	17	7.1 ± 2.1	7.5 ± 2.2	7.7 ± 2.0	7.4 ± 1.9	7.3 ± 1.9	7.0 ± 2.1
While tasting	13	5.0 ± 2.8	6.0 ± 2.9	5.7 ± 3.1	4.5 ± 3.2	6.1 ± 2.4	5.6 ± 2.7
Berry Bake							
Before tasting	17	7.1 ± 2.3	6.8 ± 2.5	7.3 ± 2.5	6.6 ± 2.7	6.4 ± 2.9	6.7 ± 2.5
While tasting	19	6.7 ± 2.7	7.1 ± 2.8	6.8 ± 2.5	6.8 ± 2.6	6.7 ± 2.5	6.4 ± 2.8

Table 5.3. Bivariate Spearman's Rank correlation coefficients (Spearman's ρ) and correlation strengths for the relationship between overall liking and perceived participant OL and recipe attributes (title, appearance, flavor, texture, saltiness/sweetness) while tasting (post-survey) eight modified recipes. Correlation strengths are defined as Very High (0.9–1.0), High (0.7–0.9), Moderate (0.5–0.7), Low (0.3–0.5), or Negligible (0.0–0.3) per previously published categories [95].

	Recipes	**Breakfast Tacos**	**Chicken Chili**	**Banana Oats**	**Homemade Salsa**	**Kale Salad**	**Rustic Rotini**	**Vegetarian Tacos**	**Berry Bake**
Overall Liking and Title	Spearman's ρ	-0.119	0.627	0.866	0.518	0.757	0.445	0.321	0.553
	Correlation strength	-	Moderate	High	Moderate	High	-	-	Moderate
	P value	0.669	0.004	0.000	0.023	0.001	0.097	0.309	0.014
Overall Liking and Appearance	Spearman's ρ	0.412	.667	.806	.689	.729	0.169	.619	.672
	Correlation strength	-	Moderate	High	Moderate	High	-	Moderate	Moderate
	P value	0.162	0.002	0.002	0.001	0.001	0.548	0.024	0.002
Overall Liking and Flavor	Spearman's ρ	.633	.853	.980	.877	.835	.889	.882	.936
	Correlation Strength	Moderate	High	Very High	High	High	High	High	Very High
	P value	0.020	0.000	0.000	0.000	0.000	0.000	0.000	0.000
Overall Liking and Texture	Spearman's ρ	.658	.703	.957	.625	.728	.632	.846	.888
	Correlation Strength	Moderate	High	Very High	Moderate	High	Moderate	High	High
	P value	0.015	0.001	0.000	0.006	0.001	0.012	0.000	0.000
Overall Liking and Saltiness/ Sweetness	Spearman's ρ	0.204	0.417	.829	.778	0.266	0.49	.743	.793
	Correlation Strength	-	-	High	High	-	-	High	High
	P value	0.504	0.076	0.001	0.000	0.319	0.064	0.004	0.000
Overall Liking and perceived participant OL	Spearman's ρ	.682	.772	.949	.824	.860	.693	.910	.851
	Correlation Strength	Moderate	High	Very High	High	High	Moderate	Very High	High
	P value	0.01	0.000	0.000	0.000	0.000	0.004	0.000	0.000

Table 5.4. Mean ± SD for preparation liking and behavior ratings of eight modified recipes based on an initial pre-survey impression ("Before tasting") of the recipe (recipe written out and video of preparation) and post-survey while preparing/while tasting ("While tasting") the recipe. There were no significant differences between the pre- and post-survey preparation liking and behavior ratings within each recipe.

Recipes	N	Liking of Preparation	Likelihood of Preparing at Home	Likelihood of Preparing during a *Food Talk* Session	Participant Liking of Preparation (perceived)	Participant Likelihood of Preparing at home (perceived)
Breakfast Tacos						
Before tasting	14	6.2 ± 1.3	4.9 ± 2.3	6.4 ± 2.5	5.8 ± 2.3	5.1 ± 2.8
While tasting	13	6.8 ± 1.8	4.8 ± 3.2	5.1 ± 3.1	5.8 ± 2.4	5.4 ± 2.7
Chicken Chili						
Before tasting	21	7.1 ± 1.9	6.4 ± 2.4	7.1 ± 2.4	6.7 ± 2.1	6.8 ± 1.7
While tasting	19	7.8 ± 1.3	5.9 ± 2.7	6.5 ± 2.6	7.1 ± 1.5	6.4 ± 1.8
Banana Oats						
Before tasting	18	6.3 ± 2.4	5.3 ± 2.9	5.3 ± 2.9	6.3 ± 2.4	5.0 ± 2.5
While tasting	13	6.8 ± 2.9	5.6 ± 3.1	5.0 ± 3.5	6.2 ± 3.0	5.6 ± 2.8
Homemade Salsa						
Before tasting	19	7.7 ± 1.2	6.8 ± 2.3	7.5 ± 1.7	7.4 ± 1.5	7.0 ± 1.9
While tasting	19	7.8 ± 1.9	6.1 ± 3.3	7.0 ± 3.1	6.8 ± 2.8	6.5 ± 2.8
Kale Salad						
Before tasting	15	7.9 ± 1.3	6.0 ± 3.3	7.3 ± 2.2	7.0 ± 2.0	6.2 ± 2.4
While tasting	16	7.6 ± 1.8	6.4 ± 2.8	6.9 ± 2.7	6.9 ± 2.4	5.8 ± 2.5
Rustic Rotini						
Before tasting	16	7.4 ± 1.7	7.1 ± 2.1	7.3 ± 2.2	6.7 ± 2.0	6.6 ± 1.9
While tasting	15	7.5 ± 2.1	6.5 ± 2.6	7.3 ± 2.7	7.0 ± 2.2	6.2 ± 2.5
Vegetarian Tacos						
Before tasting	17	7.6 ± 1.4	6.8 ± 2.4	7.3 ± 2.3	7.0 ± 1.6	6.1 ± 2.1
While tasting	13	8.0 ± 1.2	5.1 ± 3.5	5.6 ± 3.6	7.1 ± 2.4	5.5 ± 3.0
Berry Bake						
Before tasting	17	6.5 ± 2.5	6.4 ± 3.1	6.8 ± 2.7	6.9 ± 2.5	6.5 ± 2.6
While tasting	19	6.5 ± 2.4	6.0 ± 3.0	7.0 ± 2.9	6.3 ± 2.7	6.1 ± 2.6

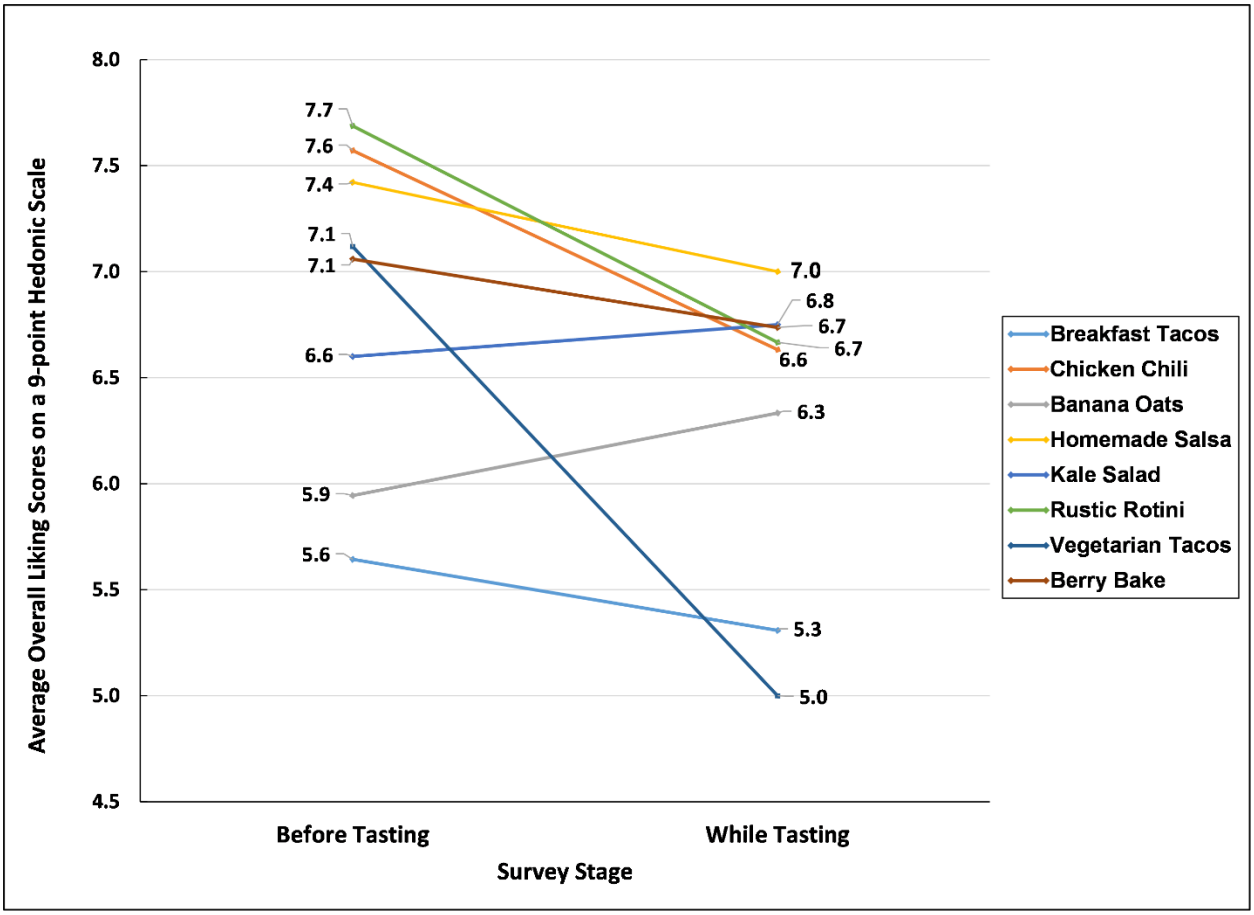

Figure 5.1. Slope graph of the pre- to post-survey average overall liking (OL) of the eight modified recipes. The Kale and Orange Salad ("Kale Salad") and Creamy Banana Overnight Oats ("Banana Oats") increased in OL after the recipes were tasted in the post-survey. The remaining six recipes decreased in OL after tasting. There were no significant differences ($P > 0.05$) between pre- and post-survey OL ratings.

CHAPTER 6

DISCUSSION AND CONCLUSIONS [5]

[5] Portions have been adapted from Ng, M. K., Lee, J. S., Sanville, L. M., Cotta-Rivera, E., Dallas, J., Pencek, A., Powell, A., Williams, B., Moore, C. J., & Cox, G. O. 2021. Sensory evaluation of new recipes for Supplemental Nutrition Assistance Program Education (SNAP-Ed) informs consumer acceptance and recipe development needs. *Journal of Sensory Studies*. e12730. Reprinted here with permission from the publisher.

SUMMARY OF FINDINGS

This research expanded upon the traditional uses of sensory evaluation in the food product research and development space. Instead of the commonly utilized laboratory or central location testing among frequent users of a product, low-income audiences enrolled in Federal nutrition education programs and their peer educators evaluated recipes in non-traditional community settings. This approach created a novel application of sensory evaluation in an often-under-represented population, and later this methodology was adapted for surveying peer educators to collect recipe feedback formally and systematically on recipes of interest.

In the first study of this dissertation (Chapter 2), low-income participants sampled and rated recipes developed for their cultural relevance to the Southern United States palate—the first of its kind to involve SNAP-Ed participants in a sensory evaluation during the recipe development process. It was determined that two out of seven recipes presented were rated highly enough to support their inclusion in the SNAP-Ed *Food Talk* curriculum following minor modifications to address participant concerns. More notably, the feedback from current SNAP-Ed participants offered more than acceptability ratings to UGA SNAP-Ed; this became a unique opportunity to alter recipes based on target audience feedback prior to adding them to the existing programming. In the future, the feedback collected in this study may be useful during formative evaluation of new curricula as the program builds a "participant profile" of their target audience's likes and dislikes. Overall, this study determined that the SNAP-Ed program's recipe development would benefit from formal participant input on overall acceptability and sensory liking attributes (e.g., tastes, flavor, texture, etc.) to guide the final recipes included in curricula.

Chapter 3, which outlined the sensory evaluation methodology used in Chapter 2 and previously published work by the UGA EFNEP and SNAP-Ed research group, concluded that

sensory evaluation is a useful tool for examining recipes intended for low-income audiences. The ability to dissect a recipe into its characteristics can inform how researchers approach recipe modification or the introduction of new recipes containing desirable characteristics. What's more, the creation of this methodology for purposes of implementing sensory evaluation in non-traditional, community nutrition education settings, has the potential to be used by state Extension researchers nationwide. The methodology also encourages collaboration among state Extension programs, universities, or industry partners that specialize in affective sensory testing, and the final relationship will subsequently promote the inclusion of scientifically backed, well-liked recipes that have the capacity to change dietary behaviors in our nation's most vulnerable populations.

Once it became established that a sensory evaluation methodology was successful in revealing important information about recipes, participant acceptance, and areas for improvement or barriers to change, the research shifted to peer educator perspectives in an online format, the latter due do the global COVID-19 pandemic. The next study (Chapter 4) leveraged existing peer educator knowledge to collect their perspectives of the 16 recipes being used in the *Food Talk* programs in an effort to better understand recipe performance in the lessons. Given that peer educators are typically from the communities they serve and more intimately familiar with the recipes and their class participants than state staff, the hypotheses were that peer educators would have comparable sensory evaluation responses as their participants, and that their input would offer a more holistic view of how recipes fit into the *Food Talk* program. As expected, both of these hypotheses were confirmed when most *Food Talk* program recipes used in UGA SNAP-Ed and UGA EFNEP direct education were deemed acceptable, but written feedback offered suggestions and potential directions for recipe improvements. The quantitative

data also presented important and useful data that isolated the specific characteristics of each recipe, such as flavor and saltiness acceptability, and how these attributes correlated with overall liking ratings. The recipes that fell below 7 in overall liking among peer educators were the same recipes that were rated poorly by EFNEP *Food Talk* participants in a previous study. Without being informed of that study's results, the peer educators likewise determined that the same three recipes would be the lowest rated recipes when responding on behalf of their participants, indicating that they may be able to rate recipes for their participants when time and funding are limited.

In the final study of this dissertation (Chapter 5), the impacts of the COVID-19 pandemic waned, but conducting in-person sensory evaluation with large groups of peer educators was not feasible. As a result, a similar online survey format was used, but with the desire to test unfamiliar recipes among peer educators, an additional component was added to allow for recipe preparation, sampling, and evaluation in a modified Home-Use Test format. There were no significant differences in overall liking or preparation intent behaviors from the pre- to post-survey responses, which may indicate that an online sensory-informed ballot can be used to predict some areas of recipe performance without the need for formal, centralized testing. The results of this study and its design are promising for inferring overall recipe acceptance among trained peer educators and their perceptions of the participant experience. It supported the use of sensory-informed online surveys to introduce recipes to peer educators, even when in-person or remote preparation of recipes is not feasible. The addition of recipe preparation in state Extension offices supplied additional information regarding attributes, preparation behaviors, and recipe contents. Although specific attribute acceptance undoubtedly becomes more accurate when recipes are tasted, it is possible to provide trained peer educators with new recipes via an

online survey and receive quick feedback pertaining to overall acceptance and preparation behaviors.

Upon the completion of this research, summarized findings and recommendations were provided to the UGA SNAP-Ed and EFNEP teams as they worked to harmonize the *Food Talk* curricula in Spring 2022. While these specific details were not appropriate to include in the manuscripts, these informal recommendations may serve as companions to those presented in Chapters 2 through 5:

- Dairy is a concern among peer educators and their participants—recipes that add dairy at the end of preparation are deemed as more accessible to those who are nervous about dairy-containing foods (regardless of the lactose content). It may benefit the programs to include information in curricula about dairy foods, lactose intolerance, and options for those with manageable lactose intolerance.
- Ingredients lists should be carefully monitored for length (total number of ingredients), accessibility (ingredient selection), and familiarity. The recipes presented in Chapter 2 and modified for work in Chapter 5 have longer ingredient lists, which may be perceived as a barrier to preparation. Selected ingredients should be realistic for what an EFNEP or SNAP participant may purchase (i.e., sweetened cereal options in the Fruity Parfait). Although not all ingredients will be the most health-promoting, the recipes may be more likely to be incorporated into their snacks and meals.
- Meat alternatives, like soy crumbles, appear to be well-liked in terms of ingredient exposure, but peer educators noted that they may be expensive and difficult to find. According to peer educators, ground turkey appears to be the preferred protein option,

or beans of the participant's choice. This may be another opportunity for education in curricula surrounding meat alternatives and non-meat protein sources.

- Inclusion of variations written into recipes and/or demonstration scripts was widely requested by peer educators, as it helps them explain to participants how they can personalize the dish. In return, participants may feel more empowered to make the SNAP-Ed and EFNEP recipes in ways that work for their families and cultures. Peer educators shared that they often provide suggestions when asked, so writing these details into the recipes and scripts would ensure accurate information is written into curricula. For example, one peer educator suggested honey instead of granulated white sugar in the Harvest Muffins recipe, citing it has "so much sugar"; both types of sweetener count towards added sugars with no benefit of one over the other. This may be another opportunity to introduce unfamiliar or new ingredients with an evidence-based lens.
- Equipment access for this generation should be considered (i.e., blender, skillet, microwave, multiple preparation or microwaveable bowls, apple corer). A recipe can be considered well accepted according to sensory evaluation, but equipment restrictions may keep a participant from making it at home (i.e., unable to make the 4-Fruit Smoothie due to lack of a blender), regardless of how much they liked it.
- "Crowdsourcing" recipe names and ingredient inclusions beyond state staff can ensure the recipes are meeting expectations while still being enticing. For instance, the Chicken Chili with White Beans received feedback from peer educators that it is a soup-like consistency and would alienate their Hispanic participants, while the

Homemade Salsa title did not seem accurate to peer educators since canned tomatoes were used.

Overall, the sensory evaluation approach helps researchers identify and understand the many factors that go into the success of a recipe. It may not always be a quick process to maximize attributes and factors that contribute to overall liking and preparation when utilizing in-person testing, but inclusion of these methods during recipe development will result in more intentional recipe selection that has a higher chance of contributing to dietary behavior changes.

LIMITATIONS AND STRENGTHS

While the results of this work are promising and relevant to the future of recipe development among nutrition education programs, limitations are unavoidable in any work.

First, because recipes in Chapter 2 (newly developed, inherently Southern recipes) were developed following the UGA SNAP-Ed nutrition guidelines and USDA Dietary Guidelines for Americans, researchers did not create control, gold standard recipes containing traditional levels of sodium, saturated fat, and added sugars. Testing a gold standard recipe would have provided researchers with an understanding of how the recipes would perform regardless of modifications to the recipe. Similarly, the recipes currently used in *Food Talk* (Chapter 4) were also developed specifically for the purpose of being used in EFNEP programming. Consequently, no baseline measures exist for either set of recipes; however, given the objectives of the studies, the study designs were appropriate for the desired outcomes (overall recipe acceptability, acceptability of attributes, and preparation/purchase intent).

Second, it is preferred to obtain a sample size of 75-100 participants for central location testing among consumers, but due to class sizes, this number was not always feasible, and interaction was inevitable among participants because of their familiarity with one another.

Third, the lack of in-person testing opportunities among peer educators created obstacles that required creative solutions (including detailed recipe information and development of visual media), and later the implementation of a modified home-use test provided a workaround. Despite the challenges of conducting sensory evaluation in community settings, the inclusion of these limited-resource consumers and peer educators is crucial to understanding the likes and dislikes of generally under-represented populations, and the results still provide unique information to inform future recipe development and modifications of recipes for this audience.

Fourth, a moderately simplified 9-point hedonic/categorical scale sensory ballot was utilized to accommodate the study time constraints and lower literacy levels of consumers. This ballot format was then used for the remaining studies to be consistent across the work, but consequently, no other affective scales were tested. Future studies should determine whether a 5-, 7-, or 9-point hedonic scale is the optimal length to retain validity for untrained, lower literacy participants in community settings where time is limited, or if other scales should be considered (i.e., Just-About-Right scale, which typically has five points with verbal anchors). It is also uncertain whether the use of a bipolar scale with a labeled, neutral point (neither like nor dislike; neither likely nor unlikely) contributes to participant bias through the idea of satisficing or overuse due to confusion by the participant.

Fifth and finally, space for comments allowed for participants to expand upon their quantitative responses, but these comments often did not provide further insight into the ratings. Ideally, focus groups would allow researchers to ask targeted questions about outcomes of interest that did not fit on the simplified ballots. Regardless, the open-ended feedback offered insights with less burden on participants and time required from both parties, in addition to straightforward compilation and analysis of these comments. Written feedback from the peer

educators was more insightful, as they provided suggestions for actionable change within recipe offerings and overall state programming. In all, this work introduced sensory evaluation to two new audiences within Federal nutrition education programs and opens the door to new opportunities for researchers and program developers to include stakeholders in the recipe development process.

IMPLICATIONS FOR PRACTICE AND RESEARCH

The use of formal sensory science techniques in the community nutrition field is just emerging, and the incorporation of sensory evaluation is beneficial in understanding the likes and dislikes of a target audience. Evaluations from current EFNEP and SNAP-Ed participants through sensory evaluation ballots provides programmers with a unique opportunity to alter recipes based on target audience feedback prior to adding them to the existing programming or during formative evaluation of new programs. Furthermore, the inclusion of EFNEP and SNAP-Ed peer educators provides further understanding of the participant and peer educator experiences. With a goal to improve dietary choices of limited-resource participants, it is necessary that recipes presented through any curricula are realistic and appealing to the target audience while meeting national nutrition standards. As such, these programs can continue to support target audiences' likes/dislikes while abiding by the *Dietary Guidelines* recommendations. In doing so, the consumers at a heightened risk of dietary-related diseases may replace one or more of their meals with the well-accepted EFNEP and SNAP-Ed options that consequently reduce their overall intakes of sodium, added sugars, and saturated fat.

Further research should focus on additional approaches to sensory evaluation in this new population and behavior changes that may follow sampling or testing a recipe. For instance, including participants in the recipe development process (i.e., sensory evaluation) can be

conducted to then determine a participant's willingness to try a modified recipe again after their previous experience(s) with the recipe. Ultimately, researchers can evaluate whether participants are preparing the recipes or using new ingredients at home after attending recipe demonstrations and tasting sessions. Many participants and peer educators in the studies of this dissertation demonstrated that they already know how they intend to improve a recipe or make it more appealing to their family members, (e.g., comments that they "would add more" of an ingredient, or "swap" an ingredient with something they prefer more), suggesting that they are 1) potentially willing to make the recipe if able to make their suggested changes, and 2) developing independence regarding cooking or food preparation. It is possible that the action of providing feedback on a recipe or being asked to think analytically about a specific sensory attribute could be a way to motivate a participant to lean into what they like or dislike about a product/set of products. This could, in turn, help them become more adventurous eaters because they feel they have valuable feedback and can parse through a recipe for modifications. In fact, they might even feel they can make those improvements on the recipe and cook it themselves to find out. As of now, there is minimal research on the effects of recipe tastings alone on cooking behavior/attitude changes. Studies utilizing qualitative methods like focus groups or interviews may also elucidate a deeper understanding of this audience's recipe needs and those factors related to recipe preparation. Other directions of research may focus on the presentation of recipe cost and/or nutrition information of key nutrients in a recipe to determine how providing this information impacts consumer liking and preparation behaviors.

When in-person recipe tasting is not feasible, online sensory evaluation surveys—currently tested only among peer educators—can still provide important data to inform the next steps of a recipe, including integration into a curriculum as-is, reintegration after modifications

to improve acceptability, or removal and replacement with a recipe that is better accepted among the target audience and peer educators. Sensory-informed surveys of familiar recipes offers valuable information about key stakeholder perspectives in a cost-effective, safe, and uncomplicated way. For new programs, sensory evaluation can be included in formative evaluation when recipes are still being chosen; this provides a solid rationale for the inclusion of evidence-based recipes, and reformulation or selection of new recipes can be influenced by the results of the initial evaluation. Then, the target audience can evaluate recipes as needed throughout program revisions. The peer educator perspective is crucial to creating successful recipes, as these employees are the ones who interact directly with the target population and best understand the needs of their participants; state staff should be mindful of including these employees in the development process. It is my opinion that sensory evaluation methodology be included as a "best practice" in nutrition education for low-income audiences, such as the existing guidelines by Baker and colleagues [111], and thus be used across nutrition education programs nationwide.

In summary, the integration of food science-forward methods, such as sensory evaluation, in the Federal nutrition education program framework will benefit both fields and provide valuable information about recipes that have the potential to improve the diets of limited-resource consumers. The addition of a sensory evaluation step during curriculum development will foster collaboration between experts in Federal nutrition education and sensory science and bring nutritionally beneficial recipes to curricula while ensuring they are highly acceptable among their target audiences.

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APPENDIX A

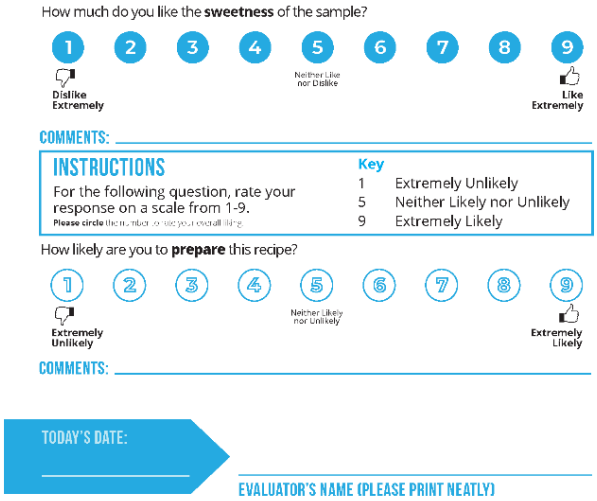
SENSORY EVALUATION BALLOTS FOR NEW RECIPES (CHAPTER 2)

Sensory evaluation questions asked during the evaluation of seven new recipes among UGA SNAP-Ed participants (Chapter 2). Ballots were folded in half height-wise and presented to participants with section 1 and the title facing the front.

A.1 Sensory evaluation ballot questions asked in list form.

Question/Instructions	**Responses offered**	**Comment boxes**
Section 1: Personal Information		
Q1. Today's Date	Open-ended	N/A
Q2. Evaluator's Name	Open-ended	N/A
Section 2: Sensory Evaluation Instructions For the following questions, rate your response on a scale from 1-9. Key 1: Dislike Extremely 5: Neither Like nor Dislike 9: Like Extremely	Before You Start 1. Please **rinse your mouth with room temperature water** before tasting the recipe sample. 2. Please **taste the recipe sample**.	
Q3. Based on tasting the sample, how would you rate your **overall liking** of this recipe?	Hedonic scale of 1-9 with verbal anchors	Yes, open ended
Q4. How much do you like the **appearance** of the sample?	Hedonic scale of 1-9 with verbal anchors	Yes, open ended
Q5. How much do you like the **flavor** of the sample?	Hedonic scale of 1-9 with verbal anchors	Yes, open ended
Q6. How much do you like the **texture** of the sample?	Hedonic scale of 1-9 with verbal anchors	Yes, open ended
Q7. How much do you like the **saltiness** [or **sweetness**] of the sample?	Hedonic scale of 1-9 with verbal anchors	Yes, open ended
Section 3: Preparation Intent Instructions For the following question, rate your response on a scale from 1-9.	Key 1: Extremely Unlikely 5: Neither Likely nor Unlikely 9: Extremely Likely	
Q8. How likely are you to **prepare** this recipe?	Categorical scale of 1-9 with verbal anchors	Yes, open ended

A.2 Digital mock-ups of the seven sensory evaluation ballots.


How much do you like the **sweetness** of the sample?

1 2 3 4 5 6 7 8 9

1 Dislike Extremely · 5 Neither Like nor Dislike · 9 Like Extremely

COMMENTS: _____

INSTRUCTIONS

For the following question, rate your response on a scale from 1-9.

Please circle the number to rate your overall liking.

Key

1 Extremely Unlikely
5 Neither Likely nor Unlikely
9 Extremely Likely

How likely are you to **prepare** this recipe?

1 2 3 4 5 6 7 8 9

1 Extremely Unlikely · 5 Neither Likely nor Unlikely · 9 Extremely Likely

COMMENTS: _____

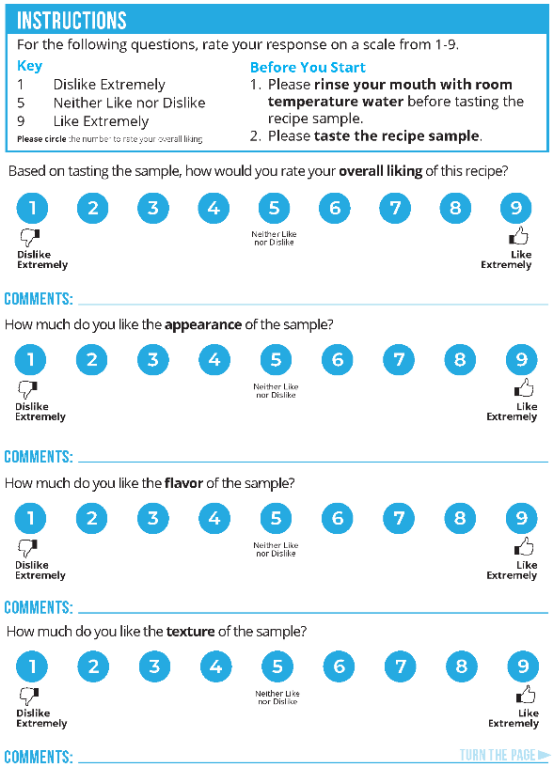
TODAY'S DATE: _____

EVALUATOR'S NAME (PLEASE PRINT NEATLY) _____

BANANA PUDDING OVERNIGHT OATS

FOOD TALK SENSORY EVALUATION

UNIVERSITY OF GEORGIA EXTENSION | SUPPLEMENTAL NUTRITION ASSISTANCE PROGRAM EDUCATION | Georgia SNAP-Ed


INSTRUCTIONS

For the following questions, rate your response on a scale from 1-9.

Key

1 Dislike Extremely
5 Neither Like nor Dislike
9 Like Extremely

Please circle the number to rate your overall liking.

Before You Start

1. Please **rinse your mouth with room temperature water** before tasting the recipe sample.
2. Please **taste the recipe sample.**

Based on tasting the sample, how would you rate your **overall liking** of this recipe?

1 2 3 4 5 6 7 8 9

1 Dislike Extremely · 5 Neither Like nor Dislike · 9 Like Extremely

COMMENTS: _____

How much do you like the **appearance** of the sample?

1 2 3 4 5 6 7 8 9

1 Dislike Extremely · 5 Neither Like nor Dislike · 9 Like Extremely

COMMENTS: _____

How much do you like the **flavor** of the sample?

1 2 3 4 5 6 7 8 9

1 Dislike Extremely · 5 Neither Like nor Dislike · 9 Like Extremely

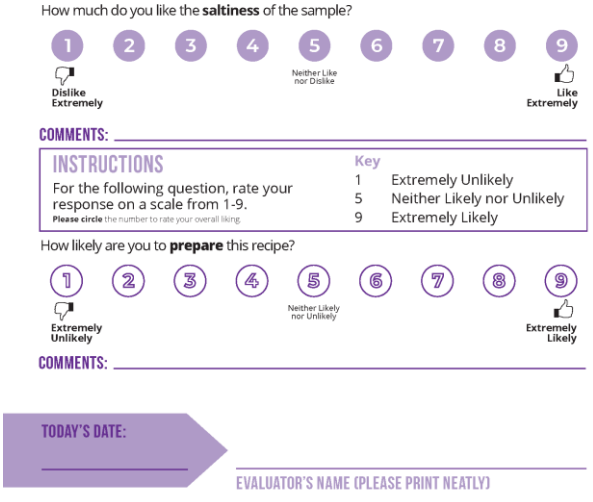
COMMENTS: _____

How much do you like the **texture** of the sample?

1 2 3 4 5 6 7 8 9

1 Dislike Extremely · 5 Neither Like nor Dislike · 9 Like Extremely

COMMENTS: _____ TURN THE PAGE ►


How much do you like the **saltiness** of the sample?

1 2 3 4 5 6 7 8 9

1 Dislike Extremely · 5 Neither Like nor Dislike · 9 Like Extremely

COMMENTS: _____

INSTRUCTIONS

For the following question, rate your response on a scale from 1-9.

Please circle the number to rate your overall liking.

Key

1 Extremely Unlikely
5 Neither Likely nor Unlikely
9 Extremely Likely

How likely are you to **prepare** this recipe?

1 2 3 4 5 6 7 8 9

1 Extremely Unlikely · 5 Neither Likely nor Unlikely · 9 Extremely Likely

COMMENTS: _____

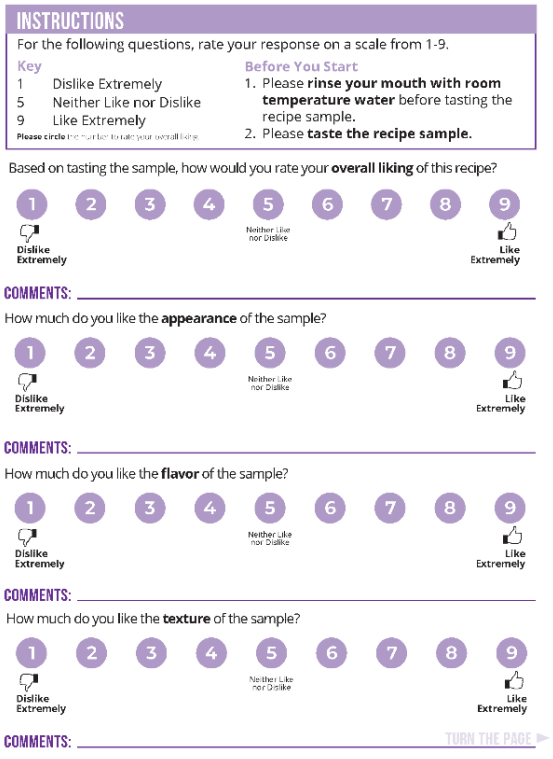
TODAY'S DATE: _____

EVALUATOR'S NAME (PLEASE PRINT NEATLY) _____

CHICKEN CHILI WITH WHITE BEANS

FOOD TALK SENSORY EVALUATION

UNIVERSITY OF GEORGIA EXTENSION | SUPPLEMENTAL NUTRITION ASSISTANCE PROGRAM EDUCATION | Georgia SNAP-Ed


INSTRUCTIONS

For the following questions, rate your response on a scale from 1-9.

Key

1 Dislike Extremely
5 Neither Like nor Dislike
9 Like Extremely

Please circle the number to rate your overall liking.

Before You Start

1. Please **rinse your mouth with room temperature water** before tasting the recipe sample.
2. Please **taste the recipe sample.**

Based on tasting the sample, how would you rate your **overall liking** of this recipe?

1 2 3 4 5 6 7 8 9

1 Dislike Extremely · 5 Neither Like nor Dislike · 9 Like Extremely

COMMENTS: _____

How much do you like the **appearance** of the sample?

1 2 3 4 5 6 7 8 9

1 Dislike Extremely · 5 Neither Like nor Dislike · 9 Like Extremely

COMMENTS: _____

How much do you like the **flavor** of the sample?

1 2 3 4 5 6 7 8 9

1 Dislike Extremely · 5 Neither Like nor Dislike · 9 Like Extremely

COMMENTS: _____

How much do you like the **texture** of the sample?

1 2 3 4 5 6 7 8 9

1 Dislike Extremely · 5 Neither Like nor Dislike · 9 Like Extremely

COMMENTS: _____ TURN THE PAGE ►

How much do you like the **saltiness** of the sample?

1 2 3 4 5 6 7 8 9

Dislike Extremely — Neither Like nor Dislike — Like Extremely

COMMENTS: _____

INSTRUCTIONS

For the following question, rate your response on a scale from 1-9.

Please circle the number to rate your overall liking.

Key
1 Extremely Unlikely
5 Neither Likely nor Unlikely
9 Extremely Likely

How likely are you to **prepare** this recipe?

1 2 3 4 5 6 7 8 9

Extremely Unlikely — Neither Likely nor Unlikely — Extremely Likely

COMMENTS: _____

TODAY'S DATE: _____

EVALUATOR'S NAME (PLEASE PRINT NEATLY) _____

HOMEMADE SALSA

FOOD TALK SENSORY EVALUATION

UNIVERSITY OF GEORGIA EXTENSION | SUPPLEMENTAL NUTRITION ASSISTANCE PROGRAM EDUCATION | Georgia SNAP-Ed

INSTRUCTIONS

For the following questions, rate your response on a scale from 1-9.

Key
1 Dislike Extremely
5 Neither Like nor Dislike
9 Like Extremely

Please circle the number to rate your overall liking.

Before You Start
1. Please **rinse your mouth with room temperature water** before tasting the recipe sample.
2. Please **taste the recipe sample**.

Based on tasting the sample, how would you rate your **overall liking** of this recipe?

1 2 3 4 5 6 7 8 9

Dislike Extremely — Neither Like nor Dislike — Like Extremely

COMMENTS: _____

How much do you like the **appearance** of the sample?

1 2 3 4 5 6 7 8 9

Dislike Extremely — Neither Like nor Dislike — Like Extremely

COMMENTS: _____

How much do you like the **flavor** of the sample?

1 2 3 4 5 6 7 8 9

Dislike Extremely — Neither Like nor Dislike — Like Extremely

COMMENTS: _____

How much do you like the **texture** of the sample?

1 2 3 4 5 6 7 8 9

Dislike Extremely — Neither Like nor Dislike — Like Extremely

COMMENTS: _____

TURN THE PAGE ►

How much do you like the **saltiness** of the sample?

1 2 3 4 5 6 7 8 9

Dislike Extremely — Neither Like nor Dislike — Like Extremely

COMMENTS: _____

INSTRUCTIONS

For the following question, rate your response on a scale from 1-9.

Please circle the number to rate your overall liking.

Key
1 Extremely Unlikely
5 Neither Likely nor Unlikely
9 Extremely Likely

How likely are you to **prepare** this recipe?

1 2 3 4 5 6 7 8 9

Extremely Unlikely — Neither Likely nor Unlikely — Extremely Likely

COMMENTS: _____

TODAY'S DATE: _____

EVALUATOR'S NAME (PLEASE PRINT NEATLY) _____

KALE AND ORANGE SALAD

FOOD TALK SENSORY EVALUATION

UNIVERSITY OF GEORGIA EXTENSION | SUPPLEMENTAL NUTRITION ASSISTANCE PROGRAM EDUCATION | Georgia SNAP-Ed

INSTRUCTIONS

For the following questions, rate your response on a scale from 1-9.

Key
1 Dislike Extremely
5 Neither Like nor Dislike
9 Like Extremely

Please circle the number to rate your overall liking.

Before You Start
1. Please **rinse your mouth with room temperature water** before tasting the recipe sample.
2. Please **taste the recipe sample**.

Based on tasting the sample, how would you rate your **overall liking** of this recipe?

1 2 3 4 5 6 7 8 9

Dislike Extremely — Neither Like nor Dislike — Like Extremely

COMMENTS: _____

How much do you like the **appearance** of the sample?

1 2 3 4 5 6 7 8 9

Dislike Extremely — Neither Like nor Dislike — Like Extremely

COMMENTS: _____

How much do you like the **flavor** of the sample?

1 2 3 4 5 6 7 8 9

Dislike Extremely — Neither Like nor Dislike — Like Extremely

COMMENTS: _____

How much do you like the **texture** of the sample?

1 2 3 4 5 6 7 8 9

Dislike Extremely — Neither Like nor Dislike — Like Extremely

COMMENTS: _____

TURN THE PAGE ►

How much do you like the **saltiness** of the sample?

1 Dislike Extremely · 2 · 3 · 4 · 5 Neither Like nor Dislike · 6 · 7 · 8 · 9 Like Extremely

COMMENTS: _____

INSTRUCTIONS

For the following question, rate your response on a scale from 1-9.

Please circle the number to rate your overall liking.

Key
1 Extremely Unlikely
5 Neither Likely nor Unlikely
9 Extremely Likely

How likely are you to **prepare** this recipe?

1 Extremely Unlikely · 2 · 3 · 4 · 5 Neither Likely nor Unlikely · 6 · 7 · 8 · 9 Extremely Likely

COMMENTS: _____

TODAY'S DATE: _____

EVALUATOR'S NAME (PLEASE PRINT NEATLY) _____

RUSTIC ROTINI WITH TOMATOES AND BEANS

FOOD TALK SENSORY EVALUATION

UNIVERSITY OF GEORGIA EXTENSION | SUPPLEMENTAL NUTRITION ASSISTANCE PROGRAM EDUCATION | Georgia SNAP-Ed

INSTRUCTIONS

For the following questions, rate your response on a scale from 1-9.

Key
1 Dislike Extremely
5 Neither Like nor Dislike
9 Like Extremely

Please circle the number to rate your overall liking.

Before You Start
1. Please **rinse your mouth with room temperature water** before tasting the recipe sample.
2. Please **taste the recipe sample.**

Based on tasting the sample, how would you rate your **overall liking** of this recipe?

1 Dislike Extremely · 2 · 3 · 4 · 5 Neither Like nor Dislike · 6 · 7 · 8 · 9 Like Extremely

COMMENTS: _____

How much do you like the **appearance** of the sample?

1 Dislike Extremely · 2 · 3 · 4 · 5 Neither Like nor Dislike · 6 · 7 · 8 · 9 Like Extremely

COMMENTS: _____

How much do you like the **flavor** of the sample?

1 Dislike Extremely · 2 · 3 · 4 · 5 Neither Like nor Dislike · 6 · 7 · 8 · 9 Like Extremely

COMMENTS: _____

How much do you like the **texture** of the sample?

1 Dislike Extremely · 2 · 3 · 4 · 5 Neither Like nor Dislike · 6 · 7 · 8 · 9 Like Extremely

COMMENTS: _____

TURN THE PAGE ►

How much do you like the **saltiness** of the sample?

1 Dislike Extremely · 2 · 3 · 4 · 5 Neither Like nor Dislike · 6 · 7 · 8 · 9 Like Extremely

COMMENTS: _____

INSTRUCTIONS

For the following question, rate your response on a scale from 1-9.

Please circle the number to rate your overall liking.

Key
1 Extremely Unlikely
5 Neither Likely nor Unlikely
9 Extremely Likely

How likely are you to **prepare** this recipe?

1 Extremely Unlikely · 2 · 3 · 4 · 5 Neither Likely nor Unlikely · 6 · 7 · 8 · 9 Extremely Likely

COMMENTS: _____

TODAY'S DATE: _____

EVALUATOR'S NAME (PLEASE PRINT NEATLY) _____

VEGETARIAN TACOS

FOOD TALK SENSORY EVALUATION

UNIVERSITY OF GEORGIA EXTENSION | SUPPLEMENTAL NUTRITION ASSISTANCE PROGRAM EDUCATION | Georgia SNAP-Ed

INSTRUCTIONS

For the following questions, rate your response on a scale from 1-9.

Key
1 Dislike Extremely
5 Neither Like nor Dislike
9 Like Extremely

Please circle the number to rate your overall liking.

Before You Start
1. Please **rinse your mouth with room temperature water** before tasting the recipe sample.
2. Please **taste the recipe sample.**

Based on tasting the sample, how would you rate your **overall liking** of this recipe?

1 Dislike Extremely · 2 · 3 · 4 · 5 Neither Like nor Dislike · 6 · 7 · 8 · 9 Like Extremely

COMMENTS: _____

How much do you like the **appearance** of the sample?

1 Dislike Extremely · 2 · 3 · 4 · 5 Neither Like nor Dislike · 6 · 7 · 8 · 9 Like Extremely

COMMENTS: _____

How much do you like the **flavor** of the sample?

1 Dislike Extremely · 2 · 3 · 4 · 5 Neither Like nor Dislike · 6 · 7 · 8 · 9 Like Extremely

COMMENTS: _____

How much do you like the **texture** of the sample?

1 Dislike Extremely · 2 · 3 · 4 · 5 Neither Like nor Dislike · 6 · 7 · 8 · 9 Like Extremely

COMMENTS: _____

TURN THE PAGE ►

How much do you like the **sweetness** of the sample?

1 2 3 4 5 6 7 8 9

1 Dislike Extremely — 5 Neither Like nor Dislike — 9 Like Extremely

COMMENTS: _____

INSTRUCTIONS

For the following question, rate your response on a scale from 1-9.

Please circle the number to rate your overall liking.

Key

1 Extremely Unlikely
5 Neither Likely nor Unlikely
9 Extremely Likely

How likely are you to **prepare** this recipe?

1 2 3 4 5 6 7 8 9

1 Extremely Unlikely — 5 Neither Likely nor Unlikely — 9 Extremely Likely

COMMENTS: _____

TODAY'S DATE: _____

EVALUATOR'S NAME (PLEASE PRINT NEATLY) _____

WHOLE WHEAT BERRY BAKE

FOOD TALK SENSORY EVALUATION

UNIVERSITY OF GEORGIA EXTENSION | SUPPLEMENTAL NUTRITION ASSISTANCE PROGRAM EDUCATION | SNAP-Ed

INSTRUCTIONS

For the following questions, rate your response on a scale from 1-9.

Key

1 Dislike Extremely
5 Neither Like nor Dislike
9 Like Extremely

Please circle the number to rate your overall liking.

Before You Start

1. Please **rinse your mouth with room temperature water** before tasting the recipe sample.
2. Please **taste the recipe sample**.

Based on tasting the sample, how would you rate your **overall liking** of this recipe?

1 2 3 4 5 6 7 8 9

1 Dislike Extremely — 5 Neither Like nor Dislike — 9 Like Extremely

COMMENTS: _____

How much do you like the **appearance** of the sample?

1 2 3 4 5 6 7 8 9

1 Dislike Extremely — 5 Neither Like nor Dislike — 9 Like Extremely

COMMENTS: _____

How much do you like the **flavor** of the sample?

1 2 3 4 5 6 7 8 9

1 Dislike Extremely — 5 Neither Like nor Dislike — 9 Like Extremely

COMMENTS: _____

How much do you like the **texture** of the sample?

1 2 3 4 5 6 7 8 9

1 Dislike Extremely — 5 Neither Like nor Dislike — 9 Like Extremely

COMMENTS: _____

TURN THE PAGE ►

APPENDIX B

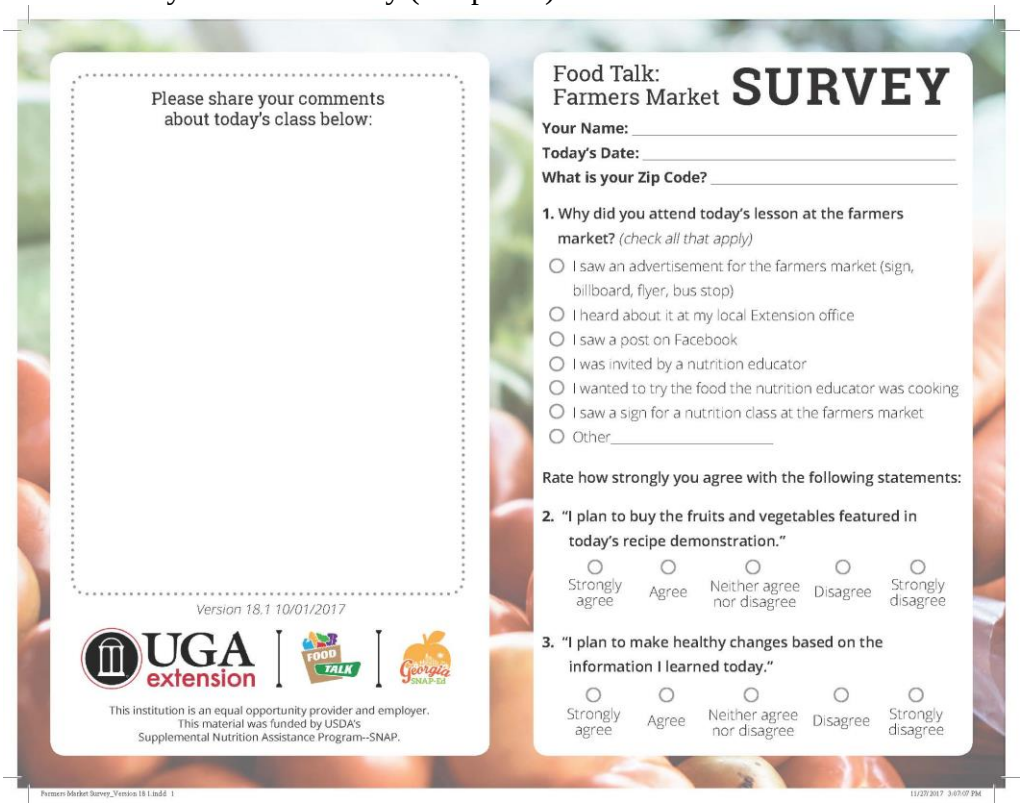
DEMOGRAPHIC QUESTIONNAIRE FOR NEW RECIPES (CHAPTER 2)

Demographic information collected during the sensory evaluation of UGA SNAP-Ed participants (Chapter 2) and handout used. Names printed on the Food Talk: Farmers Market survey questionnaire were used to match demographic information with the sensory evaluation ballots. Only the demographic information outlined below (questions 10-13) were utilized in data analysis.

B.1 Demographic questions asked in list form.

Demographic Question	Responses offered
Q10. What is your gender?	• Male • Female
Q11. What is your age?	• <18 • 18-59 • 60+
Q12. Do you consider yourself Hispanic or Latino?	• Yes • No
Q13. What is your race? (Check all that apply)	• Black or African American • White • American Indian or Alaska Native • Asian • Native Hawaiian or Other Pacific Islander

B.2 Digital mock-up of demographic ballot. Only questions 10-13 were used for the purposes of the sensory evaluation study (Chapter 2).



Please share your comments about today's class below:

Version 18.1 10/01/2017

UGA extension | FOOD TALK | Georgia SNAP-Ed

This institution is an equal opportunity provider and employer.
This material was funded by USDA's Supplemental Nutrition Assistance Program--SNAP.

Food Talk: Farmers Market **SURVEY**

Your Name: _____

Today's Date: _____

What is your Zip Code? _____

1. Why did you attend today's lesson at the farmers market? *(check all that apply)*

- ○ I saw an advertisement for the farmers market (sign, billboard, flyer, bus stop)
- ○ I heard about it at my local Extension office
- ○ I saw a post on Facebook
- ○ I was invited by a nutrition educator
- ○ I wanted to try the food the nutrition educator was cooking
- ○ I saw a sign for a nutrition class at the farmers market
- ○ Other_____

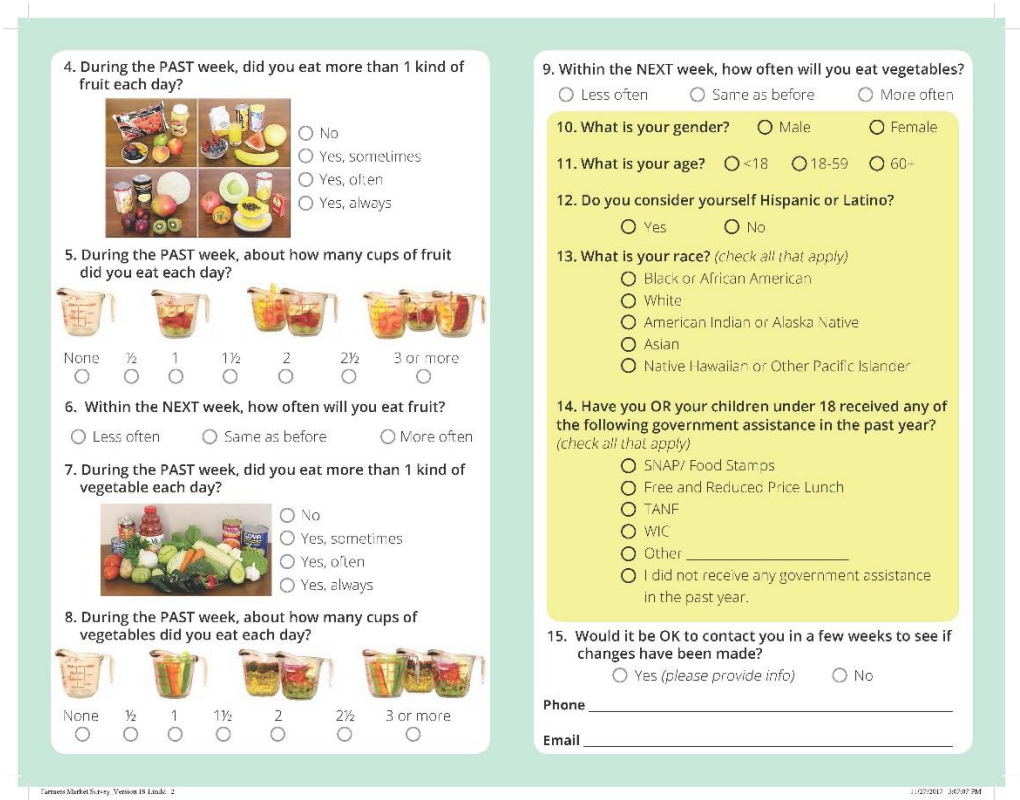
Rate how strongly you agree with the following statements:

2. "I plan to buy the fruits and vegetables featured in today's recipe demonstration."

Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
○	○	○	○	○

3. "I plan to make healthy changes based on the information I learned today."

Strongly agree	Agree	Neither agree nor disagree	Disagree	Strongly disagree
○	○	○	○	○



4. During the PAST week, did you eat more than 1 kind of fruit each day?

- ○ No
- ○ Yes, sometimes
- ○ Yes, often
- ○ Yes, always

5. During the PAST week, about how many cups of fruit did you eat each day?

None	½	1	1½	2	2½	3 or more
○	○	○	○	○	○	○

6. Within the NEXT week, how often will you eat fruit?

○ Less often ○ Same as before ○ More often

7. During the PAST week, did you eat more than 1 kind of vegetable each day?

- ○ No
- ○ Yes, sometimes
- ○ Yes, often
- ○ Yes, always

8. During the PAST week, about how many cups of vegetables did you eat each day?

None	½	1	1½	2	2½	3 or more
○	○	○	○	○	○	○

9. Within the NEXT week, how often will you eat vegetables?

○ Less often ○ Same as before ○ More often

10. What is your gender? ○ Male ○ Female

11. What is your age? ○ <18 ○ 18-59 ○ 60+

12. Do you consider yourself Hispanic or Latino?

○ Yes ○ No

13. What is your race? *(check all that apply)*

- ○ Black or African American
- ○ White
- ○ American Indian or Alaska Native
- ○ Asian
- ○ Native Hawaiian or Other Pacific Islander

14. Have you OR your children under 18 received any of the following government assistance in the past year? *(check all that apply)*

- ○ SNAP/ Food Stamps
- ○ Free and Reduced Price Lunch
- ○ TANF
- ○ WIC
- ○ Other _____
- ○ I did not receive any government assistance in the past year.

15. Would it be OK to contact you in a few weeks to see if changes have been made?

○ Yes *(please provide info)* ○ No

Phone _____

Email _____

APPENDIX C

FULL RECIPES OF SEVEN NEW RECIPES (CHAPTER 2)

(Recipes developed by Rebecca Lang and modified by Laurel Sanville and Ginnefer Cox)

C.1 Banana Pudding Overnight Oats

Ingredients:
9 ripe bananas, divided
2 cups old-fashioned oats
2 cups Greek yogurt
1 ½ cups skim milk
2 tablespoons chia seeds
2 teaspoons cinnamon
2 teaspoons vanilla extract
1 (8-ounce) Mason jar with lid for demonstration
6 (4 section) graham cracker sheet (4”x2”), crumbled ahead (store in re-sealable plastic baggie)

Instructions:
NOTE: this recipe is to be prepared the day before serving.
SPECIAL EQUIPMENT: None

1. In a medium mixing bowl, mash 2 bananas with a fork.
2. Stir in oats, yogurt, skim milk, chia seeds, cinnamon, and vanilla extract.
3. Refrigerate overnight.
4. Fill 8-ounce Mason jar 3/4th full and add banana slices and graham cracker. This will be your demo.
5. Portion remainder by 1 tablespoon quantities into 2 ounce tasting cups.
6. Add 1 (1/4’”) slice banana and ¼ teaspoon crumbled graham cracker crumbs to each tasting cup. Add lids and serve.

C.2 Chicken Chili with White Beans

Ingredients:
2 tablespoons vegetable oil
1 onion, chopped
1 jalapeño, seeded and diced
2 (12.5-ounce) cans white chunk chicken breasts, drained
1/2 teaspoon jarred garlic, minced
2 teaspoons dried oregano
1 teaspoon ground cumin
1 teaspoon chili powder
2 (14.5-ounce) cans reduced sodium chicken broth
2 (15.5-ounce) cans reduced sodium Great Northern beans, rinsed and drained
1 (4-ounce) can diced mild green chilies, undrained
2 tablespoons lime juice

Instructions:
1. Preheat electric skillet to 300 degrees. When indicator light is ready, add oil. After 30 seconds, add onion and jalapeno.
2. Cook, stirring often, for 3 minutes.
3. Add chicken, garlic, oregano, cumin, and chili powder. Sprinkle spices over chicken.
4. Stir for 2 minutes, breaking up chicken chunks.
5. Add the chicken broth, beans, chilies, and lime juice.
6. Simmer with lid off at 350 degrees for 8 minutes.
7. Serve 1 mounded tablespoon in 2 ounce tasting cup.

C.3 Homemade Salsa

Ingredients:
2 (14.5-ounce) cans diced tomatoes, no salt added, drained
½ teaspoon jarred minced garlic
2 green onions, chopped (white and green part)
2 tablespoons chopped cilantro
1 teaspoon cumin
1/2 teaspoon chili powder
2 tablespoons lime juice

Instructions:
NOTE: homemade salsa needs to be made 24 hours in advance of sensory evaluation.
1. Combine all ingredients in a medium mixing bowl.
2. Store in refrigerator until serving.
3. Place 1 Tostitos Scoop into a 3.25 ounce tasting cup.
4. Put 1.5 teaspoons salsa into Tostitos scoop and serve.

C.4 Kale and Orange Salad

Ingredients:
1/2 cup apple cider vinegar
1 cup nonfat plain yogurt
4 tablespoons olive oil, divided use
1 teaspoon crushed red pepper
1/2 teaspoon salt
1/2 teaspoon pepper
16 ounces kale leaves, stems removed, chopped or torn (weigh after removing stems) (PLEASE PURCHASE EXTRA KALE FOR THE DEMO)
8 (4-ounce) cups mandarin oranges in 100% juice
1 cup red onion, peeled, diced

Instructions:
SPECIAL EQUIPMENT: Large salad mixing bucket with lid. Get from Dr. Cox.

1. Whisk together apple cider vinegar, yogurt, 2 tablespoons olive oil, crushed red pepper, salt, and pepper.
2. Put kale leaves in a large salad mixing bucket. Add 2 tablespoons olive oil. With foodservice gloves on, massage leaves for 2 minutes using a kneading motion.
3. Drain mandarin oranges, reserving 4 tablespoons juice.
4. Drizzle reserved juice over kale.
5. Drizzle dressing over kale and toss well.
6. Fill 3.25 ounce tasting cups halfway with salad to serve. Add ¼ teaspoon diced onion and 2 mandarin orange slices.

C.5 Rustic Rotini with Tomatoes and Beans

Ingredients:
2 tablespoons olive oil
1 yellow onion, chopped
1 red bell pepper, seeded and chopped
Non-stick spray
1 (8-ounce) package fresh baby bella mushrooms, stems removed, sliced into 1/4-inch slices
½ teaspoon jarred garlic, minced
1 (28-ounce) can crushed tomatoes, no salt added
1 tablespoon Italian seasoning
1 teaspoon fennel seeds
1/4 teaspoon crushed red pepper flakes
1 (15.5 ounce) can reduced sodium Great Northern, drained
*12 ounces (or 4 ½ cups uncooked) whole grain rotini, cooked according to package instructions
4 tablespoons parmesan cheese, grated

Instructions:
1. Prior to preparing recipe, cook rotini as above. Store in refrigerator until needed.
2. Preheat electric skillet to 300 degrees. When indicator light is ready, add oil. After 30 seconds, add onion and red pepper.
3. Cook for 5 minutes.
4. Remove from the pan and set aside.
5. Spray the electric skillet with 2-1 second bursts of non-stick spray.
6. Add mushrooms and cook for 7 minutes.
7. Stir in garlic.
8. Return pepper mixture to the pan.
9. Add tomatoes, Italian seasoning, fennel, crushed pepper, and beans.
10. Reduce heat to 250 degrees.
11. Put lid on and cook 8 minutes.
12. Add previously prepared rotini. Cook 2 minutes.
13. Serve 1 Tablespoon in 2 ounce tasting cup.
14. Sprinkle with ¼ teaspoon grated parmesan cheese just before serving.

C.6 Vegetarian Tacos

Ingredients:
1 tablespoon vegetable oil
1 onion, chopped
1 (12-ounce) package frozen soy crumbles
1 teaspoon chili powder
1/4 teaspoon garlic powder
1/8 teaspoon onion powder
1/2 teaspoon dried oregano
½ teaspoon jarred minced garlic
Tostitos Scoops

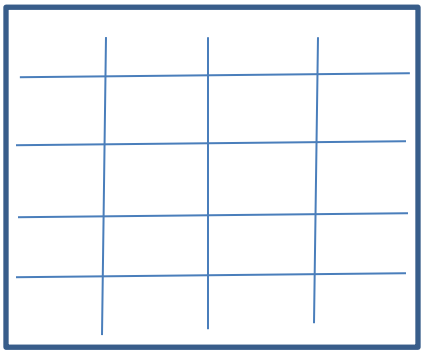
Instructions:
1. Preheat electric skillet to 300 degrees. When indicator light is ready, add oil. After 30 seconds, add onion.
2. Cook for 3 minutes.
3. Before opening bag of soy crumbles, break them up.
4. Add broken up soy crumbles to the skillet. Sprinkle chili powder, garlic powder, onion powder, and oregano over soy crumbles.
5. Stir. Reduce heat to 250 degrees. Cook for 8 minutes.
6. Add garlic, cook 1 minutes.
7. Place 1 Tostitos Scoop into a 3.25 ounce tasting cup.
8. Put 1.5 teaspoon filling into Tostitos scoop and serve.

C.7 Whole Wheat Berry Bake

Ingredients:
2 tablespoons unsalted butter
1 cup whole wheat flour
1/2 cup packed dark brown sugar
1 tablespoon baking powder
1/8 teaspoon salt
1 1/4 cups light buttermilk (1.5% milkfat)
3 tablespoons vegetable oil
1 teaspoon vanilla extract
1 (12-ounce) package frozen blueberries, thawed

Instructions:
SPECIAL INSTRUCTIONS: Complete entire recipe the day before.
SPECIAL EQUIPMENT: 8"x8" baking pans.

1. Preheat the oven to 350˚F.
2. While oven is preheating, whisk together measured flour, brown sugar, baking powder, and salt in a medium mixing bowl.
3. Whisk together buttermilk, oil, and vanilla (if using) in a small mixing bowl.
4. In an 8-inch square baking dish, melt butter in the oven for two minutes.
5. Slowly add the buttermilk mixture to the flour mixture, whisking constantly.
6. Once the butter is melted, remove the baking dish from the oven.
7. Carefully pour the batter over the melted butter in the hot baking dish.
8. Sprinkle the blueberries evenly over the batter.
9. Bake for 50 minutes.
10. Cool. Cover and refrigerate overnight.
11. Remove from refrigerator 1 hour prior to service.
12. Cut into 2 x 1.6-inch rectangles (see diagram below). Serve at room temperature in 2 ounce tasting cups.



APPENDIX D

ONLINE SENSORY SURVEYS OF EXISTING RECIPES (CHAPTER 4)

Sixteen recipes were evaluated using this survey with two recipes per survey for eight total surveys (16 recipes). Surveys were administered via Qualtrics XM. There was no in-person component to these surveys. The consent letter, demographics page, instructions, and end message were included in all eight surveys. For simplicity, all parts of the survey are provided once with "Recipe Name" and [Recipe Photo] in the place of each recipe.

(Recipes developed by Dr. Gail Hanula of UGA EFNEP; photos courtesy of UGA EFNEP)

D.1 Consent Letter

UNIVERSITY OF GEORGIA

CONSENT LETTER

SENSORY EVALUATION OF SNAP-ED AND EFNEP RECIPES

Dear Participant,

The University of Georgia SNAP-Ed team is trying to understand the food preferences and preparation behaviors of low-income SNAP-eligible or EFNEP-participating Georgians.

We would like input from individuals who work with and provide nutrition education to limited-resource audiences, such as those enrolled in SNAP-Ed and EFNEP programs in Georgia. For this reason, we invite you to participate in this research.

As part of this study, you will be asked to fill out eight short online surveys about the recipes offered through Food Talk. You will be asked questions about your role in the program, your liking of each recipe, and how your usual participants feel about the recipe. Each survey

contains two recipes for you to evaluate, and each survey takes no more than 15 minutes to complete.

This research involves the transmission of data over the Internet. Every reasonable effort has been taken to ensure the effective use of available technology; however, confidentiality during online communication cannot be guaranteed.

Participation is voluntary. You can refuse to take part or stop at any time without penalty. Your decision to participate will have no impact in your work with the SNAP-Ed or EFNEP programs.

Your participation in this study will provide us with valuable feedback to ensure we are meeting the needs of the population through appealing and easy to prepare recipes that both you and your participants will enjoy.

Please feel free to ask questions about this research at any time. You can contact the Principal Investigator, Dr. Ginnefer Cox, at gocox@uga.edu. If you have any complaints or questions about your rights as a research volunteer, contact the IRB at 706-542-3199 or by email at IRB@uga.edu.

Thank you for your consideration! If you agree to participate in the above-described research, simply click “I agree" below. After you decide, make sure to click the red arrow in the bottom right corner to continue.

If “I agree,” then proceed

If “I do not agree,” then terminate survey, display thank you screen

D.2 Demographic Information

INSTRUCTIONS: Please answer all questions to the best of your ability.

1. What is your gender?
   ☐ Male ☐ Female

2. What is your age?
   ☐ Under 18 years old ☐ 18-59 years old ☐ 60+ years old

3. Do you consider yourself Hispanic or Latino?
   ☐Yes ☐ No

4. What is your race? *(Check all that apply)*
   ☐ Black or African American
   ☐ White
   ☐ American Indian or Alaska Native
   ☐ Asian
   ☐ Native Hawaiian or Other Pacific Islander

5. What program do you work with?
   ☐ EFNEP ☐ SNAP-Ed

6. What is your position in this program?
   ☐ Supervisor ☐ Program Assistant

7. How long have you worked with the EFNEP or SNAP-Ed program?
   ☐ Less than 1 year ☐ 1-2 years ☐ More than 3 years

8. What district do you work within?
   ☐ Northeast ☐ Northwest ☐ Southeast ☐ Southwest

D.3 Survey Instructions

INSTRUCTIONS FOR THE SURVEY:

As the voice of your community, we want to know your opinion about the Food Talk recipes we currently use for recipe demonstrations. Your feedback is important in helping the EFNEP and SNAP-Ed programs make Food Talk as successful as possible—without your hard work, Georgians across the state would not receive important nutrition education.

This survey will be asking you to rate your liking of two (2) Food Talk recipes. You will answer questions based on a recipe picture and your knowledge of that recipe from personal experience and/or as a demonstrator. Please answer these questions with your own opinions unless otherwise noted in the question. For example, there are some questions that will ask how your participants typically respond to the recipes.

If you are ready to take the survey, please click the arrow at the bottom of the screen to continue.

D.4 Sensory-Informed Survey

"RECIPE NAME" *(See Appendix D.6 for recipe names and photos)*
[Recipe Photo]

INSTRUCTIONS:

1. If you demonstrate this recipe, check the first box, and click the arrow to proceed.
2. If you do not demonstrate this recipe OR if you have never tried this recipe, please select the second box, "I do not/have not demonstrate(d) this recipe" and click the arrow to proceed. You will be directed to enter the alternate recipe you demonstrate and click the arrow to proceed to the next recipe.

☐ I do/have demonstrate(d) this recipe

☐ I do not/have not demonstrate(d) this recipe *(by selecting this box, you will be asked to enter the recipe you do prepare and then automatically directed to the next recipe)*

IF "I do not/have not demonstrate(d) this recipe" is selected, THEN they are directed to the following page:

If you do not demonstrate this recipe, what recipe do you prepare as the alternate recipe? (If you are a new employee and have not demonstrated this recipe OR an alternate recipe, please type "N/A" in the text box.): *(Free response box)*

INSTRUCTIONS:
Use the recipe picture and your knowledge of the recipe to rate your response on a scale of 1-9.

Key:
1 = Dislike Extremely
5 = Neither Like nor Dislike
9 = Like Extremely

How would you rate your **overall liking** of this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

How much do you like the **title** of this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

How much do you like the **appearance** of this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

How much do you like the **flavor** of this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

How much do you like the **texture** of this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

How much do you like the **saltiness [or sweetness]** of this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

How much do you like the **preparation** required to make this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

Comments (Optional: here you can explain our reasoning behind your responses): *(Large paragraph format)*

INSTRUCTIONS:
For the following question, rate your response on a scale of 1-9.

Key:
1 = Extremely Unlikely
5 = Neither Likely nor Unlikely
9 = Extremely Likely

How likely are you to **prepare** this recipe **at home**?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Extremely Unlikely				Neither Likely nor Unlikely				Extremely Likely

Comments (Optional: here you can explain our reasoning behind your responses): *(large paragraph format)*

INSTRUCTIONS:
For the following questions, rate your response on a scale of 1-9. **Please respond based on how you think your usual Food Talk participants would answer the questions**.

Key:
1 = Dislike Extremely
5 = Neither Like nor Dislike
9 = Like Extremely

How do you think your participants would rate their **overall liking** of this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

How much do you think your participants like the **preparation** required to make this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

How likely do you think your participants are to **prepare** this recipe **at home**?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Extremely Unlikely				Neither Likely nor Unlikely				Extremely Likely

Comments (Optional: here you can explain our reasoning behind your responses): *(Large paragraph format)*

D. 5 End Survey Message

Thank you for your participation in this survey. Your input is very valuable to us as we work to constantly improve the Food Talk curriculum.

If you have any questions regarding the survey, please email gocox@uga.edu or melanie.ng25@uga.edu.

Click the arrow below to complete the submission of this survey.

D.6 Recipe Names and Photos

Curly Noodles Supreme

Harvest Muffins

Chicken Divan

Cinnamon Dip

Easy Cheesy Broccoli Soup

Ranch Sauce

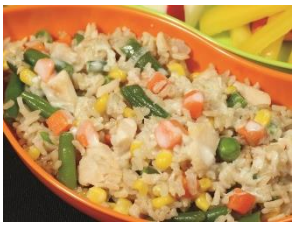
Fiesta Quesadilla

Peach Crumble

Fruity Parfait

Garden Fresh Tortizza

4-Fruit Smoothie



Famous Fried Rice

Creamy Pineapple Pudding

Skillet Spaghetti

Crunchy Apple Salad

Breakfast Burrito

APPENDIX E

RECRUITMENT FLYER FOR TESTING OF EIGHT MODIFIED RECIPES

Sensory evaluation of newly developed, potential *Food Talk* program recipes

We are looking for UGA EFNEP and SNAP-Ed peer educators to provide their honest feedback on up to 8 newly developed recipes. These recipes are not yet used in the *Food Talk* curriculum.

If you choose to participate, you will complete online surveys through Qualtrics and test our recipes, including a sensory evaluation survey that you will complete while sampling a recipe.

Feedback will help UGA EFNEP and SNAP-Ed make sure we are meeting your participants' needs through appealing and easy to prepare recipes that both you and your participants will enjoy!

Location & testing period:

- In your county's extension office and kitchen with your work computer
- Study sign-up sheet will be emailed to you this week
- Complete the study between October 1, 2021 – October 31, 2021

Are you eligible?

- Peer educator for the University of Georgia EFNEP or SNAP-Ed
- Teach the Food Talk curriculum
- Willingness to make a recipe or recipes while adhering to UGA Extension COVID-19 Guidance
- Able to sit for 10-15 minutes and complete online surveys
- All participants will receive a 1/8 teaspoon measuring spoon, which is used in one of the recipes

Questions? Contact the study team:

- Melanie Ng, PhD Candidate, melanie.ng25@uga.edu
- Ginnefer Cox, PhD, RD, gocox@uga.edu

College of Family and Consumer Sciences
Nutritional Sciences
Sensory Evaluation and Product Development Laboratory
UNIVERSITY OF GEORGIA

APPENDIX F

WELCOME FLYER FOR TESTING OF EIGHT MODIFIED RECIPES

Sensory evaluation of newly developed, potential *Food Talk* program recipes

Thank you for signing up to participate in this study! We value your input as key players in EFNEP and SNAP-Ed programming.

We hope that this box of nonperishable ingredients made it to you safely. Please read the official Welcome Email sent to your emails on October 1st before beginning this study. If you have any questions or concerns about the contents of the box, please reach out to Melanie (email below).

As part of this study, the peer educators of your county will participate in three activities, split into two main steps for each recipe you test.

Step 1 of the study:

- Take the online Pre-Survey in your recipe(s) OneDrive folder
- This survey will get your initial thoughts on the recipe BEFORE you prepare or taste the recipe
- Please take this survey individually

Step 2 of the study:

- Collect all ingredients needed to make the recipe(s) and purchase perishable ingredients as needed
- Your box will contain enough nonperishable ingredients to make all the recipes, but you may use the same container of spice, garlic, oil, etc. for multiple recipes
- Plan to have room temperature water with you to go through the sensory evaluation
- Take the sensory evaluation Post-Survey with a sample of your recipe(s)

Questions? Contact us:

- Melanie Ng, PhD Candidate, melanie.ng25@uga.edu
- Ginnefer Cox, PhD, RD, gocox@uga.edu

College of Family and Consumer Sciences
Nutritional Sciences
Sensory Evaluation and Product Development Laboratory
UNIVERSITY OF GEORGIA

APPENDIX G

ONLINE SENSORY PRE-SURVEYS OF EIGHT MODIFIED RECIPES (CHAPTER 5)

Recipes were evaluated in a pre-survey (before preparing or tasting the recipe) on Qualtrics XM. Each survey only contained one recipe. The pre-surveys contain the full recipes as part of orienting peer educators to the recipe preparation and ingredients. The consent letter, demographics page, instructions, and end message were included in all eight surveys. For simplicity, these pages are provided once.

G.1 Consent Letter

UNIVERSITY OF GEORGIA

CONSENT LETTER

SENSORY EVALUATION OF SNAP-ED AND EFNEP RECIPES

Dear Participant,

The University of Georgia SNAP-Ed team is trying to understand the food preferences and preparation behaviors of low-income SNAP-eligible or EFNEP-participating Georgians.

We would like input from individuals who work with and provide nutrition education to limited-resource audiences, such as those enrolled in SNAP-Ed and EFNEP programs in Georgia. For this reason, we invite you to participate in this research.

As part of this study, you will be asked to fill out 2 short online surveys about a newly developed recipe that is not included in Food Talk programming. You will be asked questions about your role in the program, your liking of each recipe based on making and

tasting the recipe, and how your usual participants might feel about the recipe. Each survey takes no more than 15 minutes to complete.

This research involves the transmission of data over the Internet. Every reasonable effort has been taken to ensure the effective use of available technology; however, confidentiality during online communication cannot be guaranteed.

Participation is voluntary. You can refuse to take part or stop at any time without penalty. Your decision to participate will have no impact in your work with the SNAP-Ed or EFNEP programs.

Please feel free to ask questions about this research at any time. You can contact the Principal Investigator, Dr. Ginnefer Cox, at gocox@uga.edu. If you have any complaints or questions about your rights as a research volunteer, contact the IRB at 706-542-3199 or by email at IRB@uga.edu.

If you agree to take part in the above-described research, simply click “I agree" below. After you decide, make sure to click the red arrow in the bottom right corner to continue.

If “I agree,” then proceed.

If “I do not agree,” then terminate survey, display thank you screen

G.2 Demographic Information
INSTRUCTIONS: Please answer all questions to the best of your ability.

1. What is your gender?
   ☐ Male ☐Female

2. What is your age?
   ☐ Under 18 years old ☐ 18-59 years old ☐ 60+ years old

3. Do you consider yourself Hispanic or Latino?
   ☐ Yes ☐ No

4. What is your race? *(Check all that apply)*
   ☐ Black or African American

   ☐ White

   ☐ American Indian or Alaska Native

   ☐ Asian

   ☐ Native Hawaiian or Other Pacific Islander

5. What program do you work with?
   ☐ EFNEP ☐ SNAP-Ed

6. What is your position in this program?
   ☐ Agent/Other Peer Educator ☐ Program Assistant

7. How long have you worked with the EFNEP or SNAP-Ed program?
   ☐ Less than 1 year ☐ 1-2 years ☐ 3 years or more

8. What district do you work within?
   ☐ Northeast ☐ Northwest ☐ Southeast ☐ Southwest

G.3 Survey Instructions

INSTRUCTIONS FOR THE SURVEY:

We are working on developing eight new recipes for the Food Talk curriculum, and we need your input as the voice of your community! These recipes are not yet being used in any Food Talk curriculum, and we are not asking you to implement these recipes at this time.

This survey will be asking you to rate your perceived liking or expectations (what you think you would respond if given the recipe in person) of a recipe. You will answer the questions based on a recipe picture, video, ingredients, and instructions. Please answer these questions with your own opinions unless otherwise noted in the question. For example, there are some questions that will ask how you think your participants would react to the recipe.

Below is an example of each recipe's format:

- Recipe Title
- Photo
- Typical Serving Size and Servings per Recipe
- Ingredients
- Preparation Instructions
- Recipe Slideshow Video
- Questions about Perceived Liking
- Questions about Recipe Preparation
- Questions about Food Talk Participants' Perceived Liking and Preparation

If you are ready to take the survey, please click the arrow at the bottom of the screen to continue.

G.4 Sensory-Informed Pre-Surveys
"RECIPE NAME" *(See Appendix H for Recipes)*
[Recipe Photo]
[Full Recipe, including serving sizes, ingredients, and preparation steps]
Please watch this brief **"Recipe Name"** recipe video:
Video embedded here. See Appendix J for step-by-step storyboard videos.

INSTRUCTIONS:	**Key:**
Use the recipe picture, video, ingredients, and preparation instructions to answer each question. Rate your responses on a scale from 1-9.	1 Dislike Extremely 5 Neither Like nor Dislike 9 Like Extremely

How would you rate your **perceived overall liking** of this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

How would you rate your perceived liking of the **title** of this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

How would you rate your perceived liking of the **appearance** of this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

How would you rate your perceived liking of the **flavor** of this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

How would you rate your perceived liking of the **texture** of this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

How would you rate your perceived liking of the **saltiness [or sweetness]** of this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

How would you rate your perceived liking of the **preparation** required to make this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

Comments (Optional - here you can explain your reasoning behind your responses): *(Large paragraph format)*

INSTRUCTIONS:	**Key:**
For the following questions, use the recipe information and video to rate your responses on a scale of 1-9.	1 Extremely unlikely 5 Neither Likely nor Unlikely 9 Extremely Likely

How likely are you to **prepare** this recipe **at home**?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Extremely Unlikely				Neither Likely nor Unlikely				Extremely Likely

If this recipe was offered as an option for Food Talk, how likely are you to **prepare** this recipe at a **Food Talk session**?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Extremely Unlikely				Neither Likely nor Unlikely				Extremely Likely

Comments (Optional - here you can explain your reasoning behind your responses): *(Large paragraph format)*

Of the existing Food Talk sessions, **which session** do you think this recipe would fit best? (Select one)

☐	☐	☐	☐	☐	☐	☐	☐	☐
Keep Your Pressure in Check	Color Me Healthy	Eat Well on the Go	Keep Yourself Well!	Keep Your Health Out of Jeopardy	Stress Free Mealtimes (SNAP-Ed only)	Become a Nutrition Detective (EFNEP only)	Your Food, Your Choice (EFNEP only)	Save with Smart Shopping (EFNEP only)

Comments (Optional - here you can explain your reasoning behind your responses): *(Large paragraph format)*

INSTRUCTIONS:	**Key:**
For the following questions, **please respond based on how you think your usual Food Talk participants would answer the questions.**	1 Dislike Extremely 5 Neither Like nor Dislike 9 Like Extremely

How do you think your participants would rate their **overall liking** of this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

How much do you think your participants would like the **preparation** required to make this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

Comments (Optional - here you can explain your reasoning behind your responses): *(Large paragraph format)*

INSTRUCTIONS:	**Key:**
For the following questions, **please respond based on how you think your usual Food Talk participants would answer the questions.**	1 Extremely Unlikely 5 Neither Likely nor Unlikely 9 Extremely Likely

How likely do you think your participants are to **prepare** this recipe **at home**?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Extremely Unlikely				Neither Likely nor Unlikely				Extremely Likely

Comments (Optional - here you can explain your reasoning behind your responses): *(Large paragraph format)*

G.5 End Survey Message

Thank you for your participation in this survey. Your input is very valuable to us as we work to constantly improve the Food Talk curriculum.

Next Steps:

- Prepare the recipe
- Taste-test (sample) the recipe while taking the corresponding post-survey

If you have any questions regarding the survey, please email gocox@uga.edu or melanie.ng25@uga.edu.

Click the arrow below to complete the submission of this survey.

APPENDIX H

FULL RECIPES OF EIGHT MODIFIED RECIPES (CHAPTER 5)

H.1 Breakfast Tacos

This recipe is inspired by the Food Talk Breakfast Burritos with changes that improve the sodium content.

6 servings, Serving size: 1 taco

Ingredients:

Zesty Sauce:

1 cup plain, nonfat yogurt
¼ cup salsa*

Tacos:

2 teaspoons oil
3 green onions, chopped, all of white and 3-4 inches of green stem
1 medium red or green bell pepper, diced
1 (15 1/2 ounce) can black beans*, no salt added, drained and rinsed
1 clove garlic, minced or ½ teaspoon jarred
¾ teaspoon cumin
¼ teaspoon ground black pepper
Non-stick spray
6 large eggs or 1 ½ cups liquid pasteurized eggs
6 white corn tortillas* (soft taco size, about 5.5”)
3 ounces shredded Cheddar cheese (sharp if available)
Optional: hot sauce*, chopped fresh cilantro—*rub leaves clean under running water*
*Choose lowest sodium version available

Instructions:

1. *Wash hands with soap and water.*
2. Make Zesty Sauce by mixing yogurt and salsa in small bowl. *Refrigerate at or below 40-degrees Fahrenheit until ready to serve.*
3. *Scrub green onion and bell pepper with a clean vegetable brush under running water.* Chop green onion and bell pepper and set aside.
4. *Rinse top of can of black beans under running water. Open can with a clean can opener,* drain, and rinse beans. Set aside.
5. Preheat electric skillet to 300 degrees. When indicator light is ready, add oil. After 30 seconds add onions and bell pepper. Cook 3 minutes.
6. Add beans, garlic, cumin, and black pepper. Cook another 2-3 minutes. Transfer mixture to a plate. Cover to keep warm.
7. In a small bowl, crack eggs. *Wash hands with soap and water.* Beat eggs lightly with a fork.
8. Turn skillet heat to medium-low. Wipe out skillet and coat skillet with non-stick spray. Add eggs and *place the egg bowl and fork in the sink.*
9. Cook eggs, stirring occasionally until eggs are about one minute away from being cooked.
10. If you'd like, lay 3-4 tortillas on top of the eggs at a time during the last minute of cooking to warm tortillas. *Cook until eggs reach an internal temperature of 160-degrees Fahrenheit on a food thermometer.*
11. Evenly divide eggs, spooning them into the center of each tortilla. Add bean and veggie mix. Sprinkle 1 tablespoon cheese on top each.
12. Fold tortilla over mixture and serve with Zesty Sauce. Add hot sauce and cilantro if using.

H.2 Chicken Chili with White Beans

8 Servings per Recipe, Serving Size: 1 cup

Ingredients:

1 tablespoon vegetable oil
1 onion, chopped into ½-inch pieces
1 jalapeno, seeded and diced
1 (4oz) can diced mild green chilies, undrained
2 (12.5oz) cans white chunk chicken breasts, drained
2 teaspoons jarred, minced garlic
2 teaspoons dried oregano
1 teaspoon ground cumin
1 ½ teaspoon chili powder
2 (14.5oz) cans reduced sodium chicken broth
2 (15.5oz) cans reduced sodium Great Northern Beans, rinsed and drained
2 tablespoon lime juice

Instructions:

1. *Wash hands with soap and water.*
2. Peel onion. *Scrub onion and jalapeno with a vegetable brush under running water. Using a clean cutting board,* dice onions. Cut jalapeno in half, remove seeds, and dice. *Wash hands with soap and water.*
3. *Rinse the tops of the cans of green chilies, chicken breast, chicken broth, and Great Northern Beans. Open cans with a clean can opener*. Drain the green chilies, chicken breast, and beans and set aside.
4. Preheat electric skillet to 300 degrees. When indicator light is ready, add oil. After 30 seconds, add onion, green chilies, and jalapeno.
5. Cook, stirring often, for 3 minutes.
6. Add chicken, garlic, oregano, cumin, and chili powder. Sprinkle spices over chicken.
7. Stir for 2 minutes, breaking up chicken chunks.
8. Add the chicken broth, beans, and lime juice.
9. Simmer with lid off at 350 degrees for 8 minutes. *Cook until internal temperature reaches 165-degrees Fahrenheit as measured with a food thermometer*.

H.3 Creamy Banana Overnight Oats

4 Servings Per Recipe, Serving Size: About 1 ½ Cups

Ingredients:
2 bananas, divided
1 cup old-fashioned oats
1 cup nonfat vanilla yogurt
3/4 cups skim milk
1 tablespoon chia seeds
2 teaspoons cinnamon
1 teaspoon vanilla extract
1 (full 4-piece section) graham cracker sheet, crumbled

Instructions:
1. *Wash hands with soap and water*.
2. In a medium mixing bowl, mash 1 banana with a fork.
3. Stir in oats, yogurt, skim milk, chia seeds, cinnamon, and vanilla extract.
4. *Refrigerate overnight at or below 40-degrees Fahrenheit*. Serve cold with crumbled graham cracker and sliced (¼" pieces) banana on top.

H.4 Homemade Salsa

6 Servings per Recipe, Serving Size: About 2 tablespoons

Ingredients:

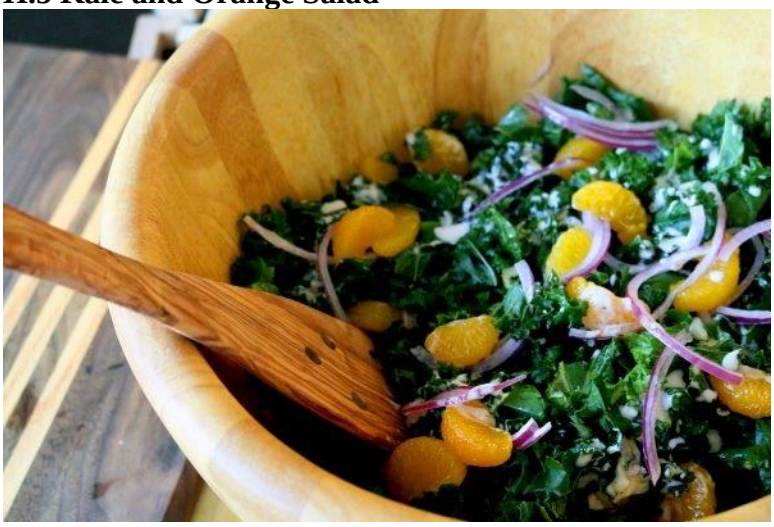
2 (14.5oz) can diced tomatoes, no salt added, drained
1 (4oz) can diced green chilies
1 teaspoon jarred, minced garlic
1/3 cup yellow onion, chopped finely
¼ cup cilantro, chopped
½ teaspoon cumin
½ teaspoon chili powder
2 tablespoons lime juice (optional)
1 bag Tostito scoops tortilla chips

Instructions:

NOTE: homemade salsa needs to be made 24 hours in advance.

1. *Wash hands with soap and water.*
2. *Rinse tops of cans of tomatoes and green chilies under running water. Open cans with a clean can opener*. Drain tomatoes and set aside.
3. Peel onion and *scrub with a clean vegetable brush under running water*. Chop onion and set aside. *Wash hands with soap and water.*
4. *Gently rub cilantro under cold, running water.* Chop cilantro and set aside. *Wash hands with soap and water.*
5. Combine all ingredients in a medium mixing bowl.
6. *Store in refrigerator at or below 40-degrees Fahrenheit until serving*.
7. When ready to eat, serve with tortilla chips.

H.5 Kale and Orange Salad



6 Servings, Serving Size: 2 cups

Ingredients:

¼ cup apple cider vinegar
½ cup nonfat plain yogurt
2 tablespoons olive oil, divided
¼ teaspoon crushed red pepper
¼ teaspoon salt
¼ teaspoon ground black pepper
16 ounces kale, stems removed (buy 16-ounce bag)
8 (4oz) cups mandarin oranges in 100% juice + 2 tablespoons reserved mandarin orange juice
3/4 cup red onion, peeled, chopped

Instructions:

1. *Wash hands with soap and water.*
2. Whisk together apple cider vinegar, yogurt, 1 tablespoon olive oil, crushed red pepper, salt, and pepper to make a dressing. *Store in refrigerator at or below 40-degrees Fahrenheit until ready to serve.*
3. *Rinse kale under cool running water.* Packaged leafy greens labeled “ready-to-eat", “washed” or “triple washed” do not need to be washed. Remove and throw away damaged portions of kale.
4. Use a sharp knife and slow, rocking motion to thinly slice (shred) bunches of kale so they resemble thin strips of paper
5. Put kale leaves in a clean, large salad mixing bucket. Add 1 tablespoon olive oil. *With foodservice gloves on,* massage leaves for one minute using a kneading motion. Arrange kale leaves in a clean, large mixing bowl.
6. Peel red onion and *scrub onion under running water with a vegetable brush*. Chop into ½-inch pieces and set aside.
7. Drain mandarin oranges, reserving 2 tablespoons of juice. Add to kale. Drizzle reserved juice over kale. Add the red onion and toss well.
8. Drizzle salad with dressing before serving. Serve immediately or *refrigerate at or below 40-degrees Fahrenheit* until ready to serve.

H.6 Rustic Rotini with Tomatoes and Beans

6 Servings, Serving Size: About 1/6th of recipe

Ingredients:

12 ounces (4 ½ cups uncooked) whole grain rotini
2 tablespoon olive oil
1 yellow onion, chopped into ½-inch pieces
1 green bell pepper, seeded and chopped
1 (8-ounce) package of white mushrooms, pre-sliced
1 teaspoon jarred, minced garlic
1 (28-ounce) can crushed tomatoes, no salt added
1 (14.5-ounce) can diced or petite diced tomatoes, no salt added
1 ½ tablespoon Italian seasoning
¼ teaspoon crushed red pepper flakes
1 (15.5-ounce) can reduced sodium Great Northern Beans, drained
4 tablespoons parmesan cheese, grated/shredded

Instructions:

1. Before preparing recipe, cook rotini according to box directions. *Store in refrigerator at or below 40-degrees Fahrenheit until needed*.
2. *Wash hands with soap and water*.
3. Peel onion. *Scrub onion and bell pepper with a clean vegetable brush under running water*. Chop onion and bell pepper and set aside. *Wash hands with soap and water*.
4. *Rinse the tops of cans of crushed tomatoes, diced tomatoes, and Great Northern Beans under running water. Open cans using a clean can opener.* Drain the beans and set aside.
5. Preheat electric skillet to 300 degrees. When indicator light is ready, add oil. After 30 seconds, add onion, green bell pepper, and mushrooms.
6. Cook for 5 minutes.
7. Stir in garlic and add both cans of tomatoes, Italian seasoning, crushed pepper, and beans.
8. Reduce heat to 250 degrees. Put lid on and cook 8 minutes.
9. Add previously prepared rotini. Cook 2 minutes. *Cook until internal temperature reaches 165-degrees Fahrenheit as measured with a food thermometer*. Before serving, sprinkle each serving with 1 tablespoon Parmesan cheese.

H.7 Vegetarian Tacos

6 Servings per Recipe, Serving Size: 2 tacos

Ingredients:

1 tablespoon vegetable oil
1 yellow onion, chopped into ½-inch pieces
1 (12oz) package of frozen soy crumbles
1 teaspoon chili powder
1/2 teaspoon dried oregano
1 teaspoon jarred, minced garlic
12 corn tortillas

Instructions:

1. *Wash hands with soap and water.*
2. *Peel onion and scrub with a clean vegetable brush under running water*. Cut onion. *Wash hands with soap and water.*
3. Preheat electric skillet to 300 degrees. When indicator light is ready, add oil. After 30 seconds, add onion. Cook for 3 minutes.
4. Before opening bag of soy crumbles, break them up.
5. Add broken up soy crumbles to the skillet. Sprinkle chili powder and oregano over soy crumbles.
6. Stir. Reduce heat to 250 degrees. Cook for 8 minutes.
7. Add minced garlic, cook 1 minute. *Cook until internal temperature reaches 165-degrees Fahrenheit on a food thermometer.*

H.8 Whole Wheat Berry Bake

9 Servings, Serving Size: About 1/9th of bake

Ingredients:

1 cup and 2 tablespoons whole wheat flour
½ cup packed dark brown sugar
1 teaspoon baking powder
1 teaspoon baking soda
1/8 teaspoon salt
1 ¼ cups light buttermilk (1.5% milkfat)
3 tablespoons vegetable oil
1 teaspoon vanilla extract
2 tablespoons unsalted butter
1 (12-ounce) package of frozen blueberries, thawed and drained

Instructions:

1. *Wash hands with soap and water.*
2. Preheat the oven to 350˚F.
3. While oven is preheating, whisk together flour, brown sugar, baking powder, baking soda, and salt in a medium mixing bowl.
4. Whisk together buttermilk, oil, and vanilla in a small mixing bowl.
5. In an 8-inch square baking dish, melt butter in the oven for two minutes.
6. Slowly add the buttermilk mixture to the flour mixture, whisking constantly.
7. Once the butter is melted, remove the baking dish from the oven using oven mitts.
8. Carefully pour the batter over the melted butter in the hot baking dish.
9. Sprinkle the blueberries evenly over the batter. *Wash hands with soap and water.*
10. Bake for 50 minutes *until the bake reaches an internal temperature of 200-degrees Fahrenheit* or a toothpick stuck in the center of the bake comes out clean.
11. Cool on a clean wire cooling rack for 2 hours. *Cover and refrigerate overnight at or below 40-degrees Fahrenheit.*
12. Remove from refrigerator 1 hour prior to serving.

APPENDIX I

ONLINE SENSORY POST-SURVEYS OF EIGHT MODIFIED RECIPES (CHAPTER 5)

Recipes were evaluated in a post-survey (after preparing and while tasting the recipe) on Qualtrics XM. Each survey only contained one recipe. The post-surveys contained only recipe photos and the recipe title to ensure the peer educator responded to the correct recipe. The consent letter, demographics page, instructions, survey, and end message were included in all eight surveys. For simplicity, these pages are provided once.

I.1 Consent Letter

UNIVERSITY OF GEORGIA

CONSENT LETTER

SENSORY EVALUATION OF SNAP-ED AND EFNEP RECIPES

Dear Participant,

The University of Georgia SNAP-Ed team is trying to understand the food preferences and preparation behaviors of low-income SNAP-eligible or EFNEP-participating Georgians.

We would like input from individuals who work with and provide nutrition education to limited-resource audiences, such as those enrolled in SNAP-Ed and EFNEP programs in Georgia. For this reason, we invite you to participate in this research.

As part of this study, you will be asked to fill out 2 short online surveys about a newly developed recipe that is not included in Food Talk programming. You will be asked questions about your role in the program, your liking of each recipe based on making and

tasting the recipe, and how your usual participants might feel about the recipe. Each survey takes no more than 15 minutes to complete.

This research involves the transmission of data over the Internet. Every reasonable effort has been taken to ensure the effective use of available technology; however, confidentiality during online communication cannot be guaranteed.

Participation is voluntary. You can refuse to take part or stop at any time without penalty. Your decision to participate will have no impact in your work with the SNAP-Ed or EFNEP programs.

Please feel free to ask questions about this research at any time. You can contact the Principal Investigator, Dr. Ginnefer Cox, at gocox@uga.edu. If you have any complaints or questions about your rights as a research volunteer, contact the IRB at 706-542-3199 or by email at IRB@uga.edu.

If you agree to take part in the above-described research, simply click “I agree" below. After you decide, make sure to click the red arrow in the bottom right corner to continue.

If “I agree,” then proceed.

If “I do not agree,” then terminate survey, display thank you screen

I.2 Demographic Information

INSTRUCTIONS: Please answer all questions to the best of your ability.

1. What is your gender?

   ☐ Male ☐ Female

2. What is your age?

   ☐ Under 18 years old ☐ 18-59 years old ☐ 60+ years old

3. Do you consider yourself Hispanic or Latino?

   ☐Yes ☐ No

4. What is your race? *(Check all that apply)*

   ☐ Black or African American

   ☐ White

   ☐ American Indian or Alaska Native

   ☐ Asian

   ☐ Native Hawaiian or Other Pacific Islander

5. What program do you work with?

   ☐ EFNEP ☐ SNAP-Ed

6. What is your position in this program?

   ☐ Agent/Other Peer Educator ☐ Program Assistant

7. How long have you worked with the EFNEP or SNAP-Ed program?

   ☐ Less than 1 year ☐ 1-2 years ☐ 3 years or more

8. What district do you work within?

   ☐ Northeast ☐ Northwest ☐ Southeast ☐ Southwest

I.3 Survey Instructions

INSTRUCTIONS FOR THE SURVEY:

We are working on developing eight new recipes for the Food Talk curriculum, and we need your input as the voice of your community! These recipes are not yet being used in any Food Talk curriculum, and we are not asking you to implement these recipes at this time.

This survey will be asking you to rate your liking of one new Food Talk recipe, which you just prepared. You will answer questions based on your experience preparing the recipe and while tasting the recipe. Please answer these questions with your own opinions unless otherwise noted in the question. For example, there are some questions that will ask how your participants might respond to the recipes.

PLEASE HAVE THE FOLLOWING WITH YOU AS YOU GO THROUGH THE SURVEY:

1. A sample of the recipe you prepared
2. A bottle of room-temperature water

If you are ready to take the survey, please click the arrow at the bottom of the screen to continue.

I.4 Sensory Post-Survey

"RECIPE NAME"
[Recipe Photo]

Did you have to substitute any ingredients to make this recipe?

☐ No

☐ Yes (please specify which ingredients were substituted and with what): *(open-ended format)*

INSTRUCTIONS:	**Key:**
1. Take a sip of room temperature water to rinse your mouth. 2. Take one bite of your sample. 3. Rate your responses on a scale of 1-9. 4. Sample the recipe as needed to answer the questions. Before each bite, take another sip of water.	1 Dislike Extremely 5 Neither Like nor Dislike 9 Like Extremely

How would you rate your **overall liking** of this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

How much do you like the **title** of this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

How much do you like the **appearance** of this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

How much do you like the **flavor** of this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

How much do you like the **texture** of this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

How much do you like the **saltiness [or sweetness]** of this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

How much do you like the **preparation** required to make this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

Comments (Optional - here you can explain your reasoning behind your responses): *(Large paragraph format)*

INSTRUCTIONS:	**Key:**
For the following questions, use the recipe information and video to rate your responses on a scale of 1-9.	1 Extremely Unlikely 5 Neither Likely nor Unlikely 9 Extremely Likely

How likely are you to **prepare** this recipe **at home**?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Extremely Unlikely				Neither Likely nor Unlikely				Extremely Likely

If this recipe was offered as an option for Food Talk, how likely are you to **prepare** this recipe at a **Food Talk session**?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Extremely Unlikely				Neither Likely nor Unlikely				Extremely Likely

Comments (Optional - here you can explain your reasoning behind your responses): *(Large paragraph format)*

Of the existing Food Talk sessions, **which session** do you think this recipe would fit best?

☐	☐	☐	☐	☐	☐	☐	☐	☐
Keep Your Pressure in Check	Color Me Healthy	Eat Well on the Go	Keep Yourself Well!	Keep Your Health Out of Jeopardy	Stress Free Mealtimes (SNAP-Ed only)	Become a Nutrition Detective (EFNEP only)	Your Food, Your Choice (EFNEP only)	Save with Smart Shopping (EFNEP only)

Comments (Optional - here you can explain your reasoning behind your responses): *(Large paragraph format)*

INSTRUCTIONS:	**Key:**
For the following questions, **please respond based on how you think your usual Food Talk participants would answer the questions.**	1 Dislike Extremely 5 Neither Like nor Dislike 9 Like Extremely

How do you think your participants would rate their **overall liking** of this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

How much do you think your participants like the **preparation** required to make this recipe?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Dislike Extremely				Neither Like nor Dislike				Like Extremely

INSTRUCTIONS:	**Key:**
For the following questions, **please respond based on how you think your usual Food Talk participants would answer the questions.**	1 Extremely Unlikely 5 Neither Likely nor Unlikely 9 Extremely Likely

How likely do you think your participants are to **prepare** this recipe **at home**?

1	**2**	**3**	**4**	**5**	**6**	**7**	**8**	**9**
Extremely Unlikely				Neither Likely nor Unlikely				Extremely Likely

Comments (Optional - here you can explain your reasoning behind your responses): *(Large paragraph format)*

I.5 End Survey Message

Thank you for your participation in this survey. Your input is very valuable to us as we work to constantly improve the Food Talk curriculum.

If you have any questions regarding the survey, please email gocox@uga.edu or melanie.ng25@uga.edu.

Click the arrow below to complete the submission of this survey.

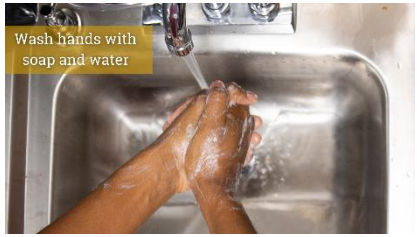
APPENDIX J

STORYBOARDS FOR EIGHT MODIFIED RECIPES (CHAPTER 5)

Step-by-step videos were provided in the pre-surveys of the final study (Chapter 5) to provide additional sensory input and better preparation understanding for educators who had not yet prepared or tasted the recipes. Recipes were prepared in the Sensory and Product Development Laboratory by one researcher while another took aerial photos. A focus on food safety can be noted in the preparation, which followed The Partnership for Food Safety Education's *Safe Recipes Style Guide*. Photos were reviewed and edited by UGA SNAP-Ed's senior graphic designer—Jennifer Denson—before video production. Videos were produced and edited in Canva to create a text-animated slideshow of photos overlaid with jaunty, upbeat music. Videos were uploaded to a private YouTube account and embedded in the Qualtrics pre-surveys (Chapter 5).

J.1 Breakfast Tacos (1 minute, 48 seconds)

1. Two-tone recipe title, "Breakfast Tacos with Zesty Sauce"



2. Hand-washing reminder, "Wash hands with soap and water"

3. "In a small bowl…"

4. "Add 1 cup plain, nonfat yogurt"

5. “¼ cup mild salsa”

6. “Stir to combine”

7. “Cover and refrigerate at or below 40-degrees Fahrenheit”

8. “Gently rub green onions under running water”

9. “Chop 3 green onions”

10. “Set aside”

11. “Wash bell pepper with a vegetable brush under running water”

12. “Dice 1 bell pepper”


13. Process photo of chopping pepper


14. Process photo of chopping pepper

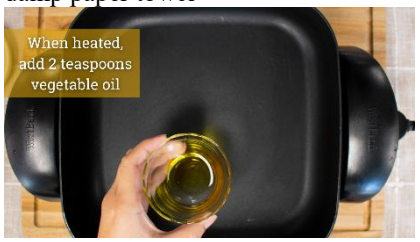
15. “Set aside”

16. “Wipe can of black beans with a damp paper towel”

17. “Open can…”

18. “Drain and rinse black beans. Set aside.”

19. “Pre-heat skillet to 300-degrees Fahrenheit”



20. “When heated, add 2 teaspoons vegetable oil”

21. “Add green onions”

22. “Add bell pepper”

23. “Cook 3 minutes”

24. “Add black beans”

25. “1/2 teaspoon minced garlic”

26. “3/4 teaspoon cumin”

27. “And ¼ teaspoon black pepper”

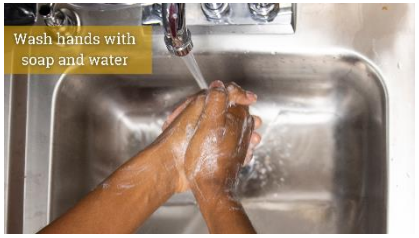
28. “Cook for 3 minutes”

29. “Transfer to a plate. Set aside.”

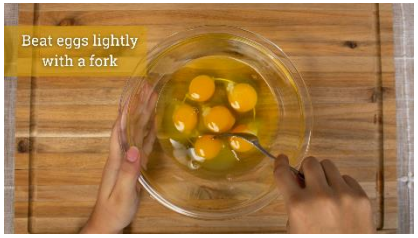
30. “In a small bowl…”

31. “Crack 6 large eggs”


32. Process photo of all six cracked eggs



33. “Wash hands with soap and water”



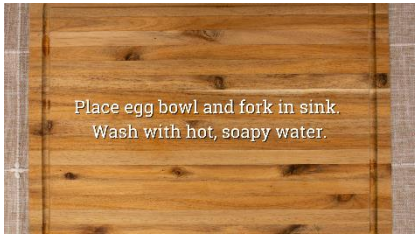
34. “Beat eggs lightly with a fork”


35. Process photo of beating eggs

36. “Carefully wipe out skillet”

37. “Spray with cooking spray”

38. “Add eggs”



39. Text reminder, “Place egg bowl and fork in sink. Wash with hot, soapy water.”

40. “Stir eggs until almost cooked”

41. “Warm corn tortillas on top of the eggs”


42. Process photo of tortillas warming

43. “Cook until eggs reach 165-degrees Fahrenheit”

44. “Add eggs to tortillas and top with veggies”

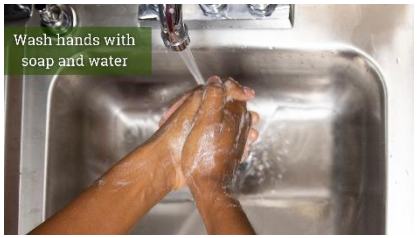
45. “Serve with Zesty Sauce. Enjoy!

46. UGA Extension and Healthy Georgia logos with text, “An Equal Opportunity, Affirmative Action, Veteran, Disability Institution”

47. Food Talk and Georgia SNAP-Ed logos with the text, “This material was funded by USDA’s Supplemental Nutrition Assistance Program—SNAP. This institution is an equal opportunity provider.”

J.2 Chicken Chili with White Beans (1 minute, 37 seconds)

1. Two-tone recipe title that reads, “Chicken Chili with White Beans”



2. Handwashing reminder, “Wash hands with soap and water”

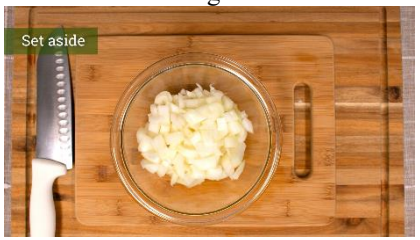
3. “Wash onion with a vegetable brush under running water”

4. “Wash jalapeno with a vegetable brush under running water”

5. “Peel onion”

6. “Chop onion into ½-inch pieces”

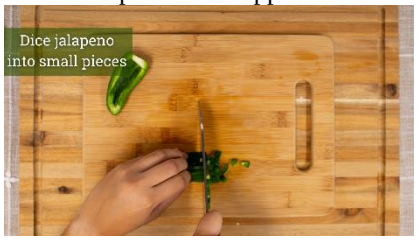

7. Process photo of chopped onions



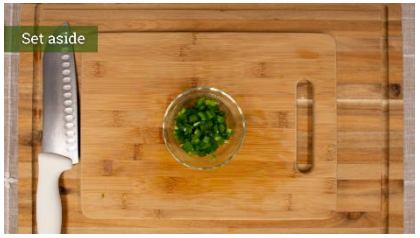
8. “Set aside”

9. “Remove jalapeno seeds”

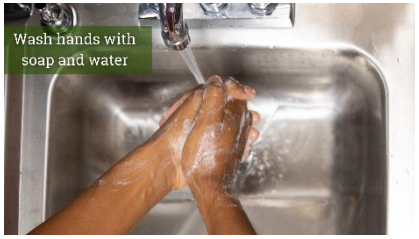

10. Process photo of removing jalapeno seeds with a spoon



11. “Dice jalapenos into small pieces”



12. “Set aside”



13. “Wash hands with soap and water”

14. “Wipe cans with a damp paper towel”

15. “Open cans”

16. “Drain green chilies, chicken, and beans”

17. “Set aside”

18. “Pre-heat skillet to 300-degrees Fahrenheit”

19. “When heated, add 1 tablespoon vegetable oil”

20. “Add 1 diced onion”

21. “1 diced jalapeno”

22. “1 (4-oz) can mild diced green chilies, drained”

23. “Cook for 3 minutes”

24. “Add 2 (12.5-ounce) cans white chunk chicken breast, drained”

25. “2 teaspoons minced garlic”

26. “2 teaspoons dried oregano”

27. “1 teaspoon ground cumin”

28. “1 ½ teaspoon chili powder”

29. “Cook for 2 minutes”

30. “Add 2 (14.5-oz) cans reduced sodium chicken broth”

31. “2 (14.5-oz) cans Great Northern Beans, drained and rinsed”

32. “2 tablespoons lime juice”

33. “Turn heat to 350-degrees Fahrenheit”

34. “Cook for 8 minutes”

35. “Until it reaches 165-degrees Fahrenheit”

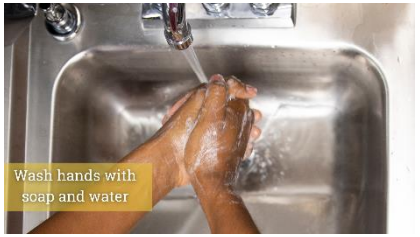
36. “Serve hot… Enjoy!”

37. Food Talk and Georgia SNAP-Ed logos

38. UGA Extension and Healthy Georgia logos

J.3 Creamy Banana Overnight Oats (1 minute, 15 seconds)

1. Two-tone text of recipe title, “Creamy Banana Overnight Oats”



2. Handwashing reminder, “Wash hands with soap and water”

3. “In a large bowl…”

4. “Add 1 banana”

5. “Mash banana with a fork”


6. Process photo of mashing banana


7. Process photo of mashed banana

8. “Add 1 cup old fashioned oats”

9. “1 cup nonfat vanilla yogurt”

10. “3/4 cup skim milk”

11. “1 tablespoon chia seeds”

12. “2 teaspoons cinnamon”

13. “And 1 teaspoon vanilla extract”

14. “Stir”


15. Process photo of stirring oats


16. Process photo of combined oats

17. “Divide into 4 mason jars”

18. Text reminder, “Refrigerate overnight at or below 40-degrees Fahrenheit”

19. “Add 1 graham cracker to a plastic bag”

20. “Crush with rolling pin, wooden spoon, or hands”

21. Process photo of crushed graham crackers

22. Text reads, “The next morning…”

23. “Slice a second banana into ¼-inch pieces”

24. “Top overnight oats with banana slices”

25. “Graham cracker crumbles…”

26. “And chia seeds (optional)”

27. “Enjoy!”

28. UGA Extension and Healthy Georgia logos

29. Food Talk and Georgia SNAP-Ed logos

J.4 Homemade Salsa (1 minute, 23 seconds)

1. Two-tone text of recipe title, “Homemade Salsa”

2. Handwashing reminder, “Wash hands with soap and water”

3. “Wipe cans with a damp paper towel”

4. “Open cans and set aside”

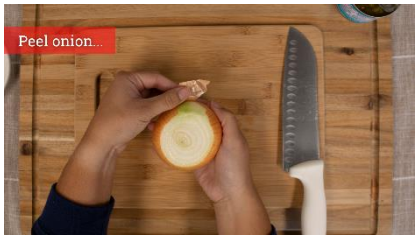
5. “In a large colander…”

6. “Drain 2 (14.5-oz) cans diced tomatoes”

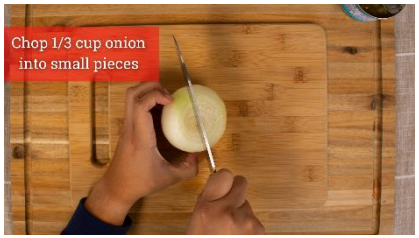
7. “Set aside”

8. “Wash onion with a vegetable brush under running water”

9. “Cut top off of 1 yellow onion”



10. “Peel onion”



11. “Chop 1/3 cup onion into small pieces”

12. “Set aside”

13. “Wash hands with soap and water”

14. “Gently rub cilantro leaves under running water”

15. Chop ¼ cup cilantro”


16. Process photo of chopping cilantro

17. “Wash hands with soap and water”

18. “In a medium bowl…”

19. “Add drained tomatoes”

20. “1 (4-oz) can diced green chilies”

21. “1/3 cup diced onion”

22. “1/4 cup chopped cilantro”

23. “1/2 teaspoon cumin”

24. “1/2 teaspoon chili powder”

25. “1 teaspoon minced garlic”

26. “Stir to combine”


27. Process photo of stirred salsa

28. “Cover and refrigerate at or below 40-degrees Fahrenheit”

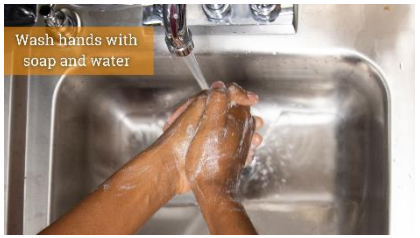
29. “Serve the next day… Enjoy!”

30. UGA Extension and Healthy Georgia logos

31. Food Talk and Georgia SNAP-Ed logos

J.5 Kale and Orange Salad (1 minute, 33 seconds)

1. Two-tone text of recipe title, “Kale and Orange Salad”



2. Handwashing reminder, “Wash hands with soap and water”

3. “In a small bowl…”

4. “Add ¼ cup apple cider vinegar”

5. “1/2 cup nonfat plain yogurt”

6. “1 tablespoon olive oil”

7. “1/4 teaspoon crushed red pepper”

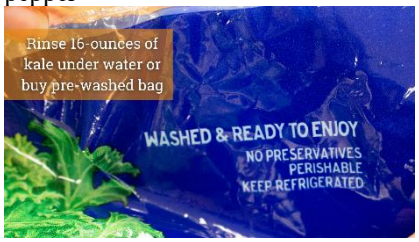
8. “1/4 teaspoon salt”

9. “1/4 teaspoon ground black pepper”

10. “Whisk together”


11. Process photo of whisked dressing

12. “Cover and refrigerate at or below 40-degrees Fahrenheit”



13. “Rinse 16 ounces of kale under water or buy pre-washed bag”

14. “Separate kale leaves from stems”

15. “Throw away stems and damaged pieces”

16. “Shred or chop kale into smaller pieces”

17. “Add kale and 1 tablespoon olive oil to a large bowl”

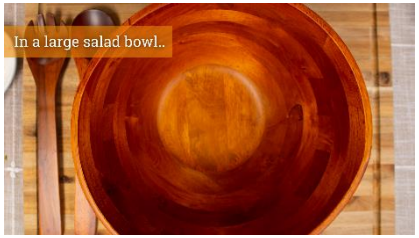
18. Massage kale for 1 minute to soften”

19. Text reminder, “Wash red onion with a vegetable brush under running water”

20. “Peel onion”

21. “Dice ¾ cup onion into small pieces”

22. “Set aside”



23. “In a large salad bowl…”

24. “Add massaged kale”

25. “32 ounces mandarin oranges in 100% juice, drained”

26. “2 tablespoons reserved mandarin orange juice”

27. “3/4 cup red onion”

28. “Toss to combine”

29. Process photo of tossed salad

30. “Refrigerate at or below 40-deegrees Fahrenheit until ready to serve”

31. “Drizzle salad with dressing before serving”

32. “Enjoy!”

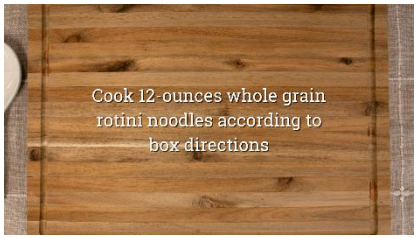
33. UGA Extension and Healthy Georgia logos

34. Food Talk and Georgia SNAP-Ed logos

J.6 Rustic Rotini with Tomatoes and Beans (1 minute, 33 seconds)

1. Two-tone text of recipe title, “Rustic Rotini with Tomatoes and Beans”

2. Handwashing reminder, “Wash hands with soap and water”

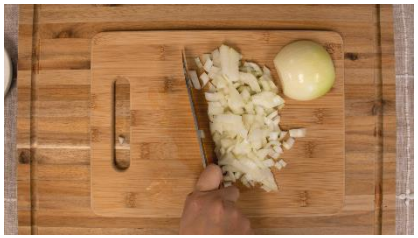


3. Text reminder, “Cook 12-ounces whole grain rotini noodles according to box directions”

4. “Wash onion with a vegetable brush under running water”

5. “Peel onion”

6. “Chop onion into ½-inch pieces”


7. Process photo of chopped onion

8. “Wash bell pepper with a vegetable brush under running water”

9. “Dice bell pepper”


10. Process photo of dicing pepper


11. Process photo of diced pepper

12. “Set onion and bell pepper aside”

13. “Wash hands with soap and water”

14. “Wipe cans with a damp paper towel”

15. “Open cans”

16. “Set aside”

17. “Pre-heat skillet to 300-degrees Fahrenheit”

18. “When heated, add 2 tablespoons oil”

19. “Add 1 diced onion and 1 diced bell pepper”

20. “And 1 (8-oz) package sliced white mushrooms”

21. “Cook for 5 minutes”


22. Process photo of cooked vegetables

23. “Add 1 teaspoon minced garlic”

24. “1 (28-oz) can crushed tomatoes”

25. “1 (14.5-oz) can diced tomatoes”

26. “1 ½ tablespoons Italian seasoning”

27. “1/4 teaspoon crushed red pepper”

28. “1 (14.5-oz) can drained and rinsed Great Northern Beans”

29. “Stir”

30. “Lower heat to 250-degrees”

31. “Cover and cook for 8 minutes”

32. “Add cooked rotini”

33. “Stir and cook for 2 minutes”

34. “Until it reaches 165-degrees Fahrenheit”

35. “Top with parmesan cheese… Enjoy!”

36. UGA Extension and Healthy Georgia logos

37. Food Talk and Georgia SNAP-Ed logos

J.7 Vegetarian Tacos (1 minute, 17 seconds)

1. Two-tone text of recipe title, “Vegetarian Tacos”

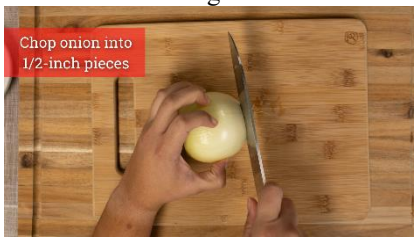
2. Handwashing reminder, “Wash hands with soap and water”

3. “Wash onion with a vegetable brush under running water”

4. “Cut top off of 1 yellow onion”

5. “Peel onion”


6. Process photo of peeled onion



7. “Chop onion into ½-inch pieces”


8. Process photo of chopped onion


9. Process photo of onion in a bowl

10. Text reminder, “Wash hands with soap and water”

11. “Pre-heat skillet to 300-degrees Fahrenheit”

12. “When heated, add 1 tablespoon vegetable oil”

13. “After 30 seconds, add 1 chopped onion”

14. “Cook for 3 minutes”

15. “Break up 1 (12-ounce) bag of soy crumbles”

16. “Add soy crumbles to skillet”

17. “Add 1 teaspoon chili powder”

18. “And ½ teaspoon dried oregano”

19. “Stir”

20. “Reduce heat to 250-degrees”

21. “Cook for 8 minutes”

22. “Add 1 teaspoon minced garlic”

23. “Cook for 1 minute”

24. “Until it reaches 165-degrees Fahrenheit”

25. “Serve on a corn tortilla”

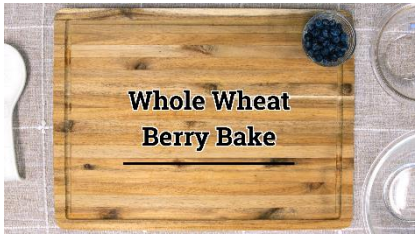
26. “Top with optional lettuce, plain Greek yogurt, salsa, cilantro, or cheese”

27. “Enjoy!”

28. UGA Extension and Healthy Georgia logos

29. Food Talk and Georgia SNAP-Ed logos

J.8 Whole Wheat Berry Bake (1 minute, 30 seconds)



1. Two-tone text of recipe title, “Whole Wheat Berry Bake”

2. Text reminder, “Pre-heat oven to 350-degrees Fahrenheit”

3. “Wash hands with soap and water”

4. “In a medium bowl…”

5. “Add 1 cup and 2 tablespoons whole wheat flour”

6. “1/2 cup packed dark brown sugar”

7. “1 teaspoon baking powder”

8. “1 teaspoon baking soda”

9. “And 1/8 teaspoon salt”

10. “Whisk”

11. “In a small bowl…”

12. “Add 1 and ¼ cups light buttermilk”

13. “3 tablespoons vegetable oil”

14. “And 1 teaspoon vanilla extract”

15. “Whisk”

16. “in an 8”x8” baking dish…”

17. “Add 2 tablespoons unsalted butter”

18. Text reminder, “Melt butter in the oven for 2 minutes”

19. “Add buttermilk mixture to flour mixture”

20. “Whisk to combine”

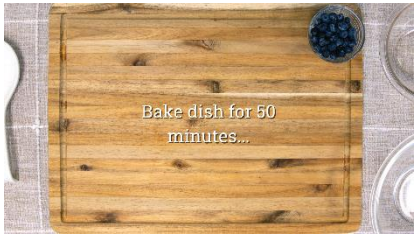
21. “Remove baking dish from oven”

22. “Carefully pour batter into baking dish”

23. “Spread batter to edges of dish”

24. “Sprinkle blueberries evenly over batter”

25. “Wash hands with soap and water”



26. Text reminder, “Bake dish for 50 minutes…”

27. “Until it reaches 200-degrees Fahrenheit…”

28. “Or a knife/toothpick comes out clean”

29. “Cool for 2 hours”

30. “Cover and refrigerate at or below 40 degrees Fahrenheit”

31. “Remove from fridge 1 hour before serving… Enjoy!”

32. UGA Extension and Healthy Georgia logos

33. Food Talk and Georgia SNAP-Ed logos