

Providing Salt-Free and Sugar-Free Seasoning Blends to Adolescents and their Effect on Vegetable Intake in the School Environment

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ABSTRACT

Objective: To evaluate the effect of providing sugar-free, salt-free spice blends on vegetable intake among adolescents

Design: Quasi-experimental, case-control

Methods: Subject selection, consumption, and enjoyment of vegetables served in school-offered meals was measured prior to the intervention period and again following 4 weeks of providing spice blends. Measurements were made using numerical and Likert scales along with open-ended solicitation of feedback.

Setting: South Jefferson High School, Adams, New York

Participants: High school students enrolled in health classes in the 2023-2024 school year (n=13).

Intervention: Following a pre-test assessment, students were provided with optional spice blends in the lunch lines for 4 weeks. After the 4 weeks, a post-test was administered to measure the effect of the spices on vegetable selection, consumption, and enjoyment.

Results: After 4 weeks, the spice blends did not produce significant changes in vegetable selection, consumption or enjoyment among subjects.

Conclusions and Implications: Herbs and spices have been demonstrated elsewhere to be effective methods for improving vegetable intake in the adolescent population (1,2). This study's results suggest the need for further, more rigorous testing in the population.

INTRODUCTION

- Vegetable intake is lacking in Americans, particularly American teenagers.
- Children and adolescents site inability to guarantee pleasant taste as a barrier to vegetable acceptance and intake. This is often overcome with the addition of salt and sugar to increase palatability.
- Added sodium and sugar are associated with chronic disease development.
- Herbs and spices represent an avenue for increasing pleasant taste without added sodium and sugar. (3)
- Data are limited regarding the efficacy of salt-free and sugar-free spice blends for increasing vegetable acceptance and intake among adolescents.
- This study aimed to assess the efficacy of providing these herbs and spices as a method of improving vegetable acceptance and intake among adolescents.

METHODS

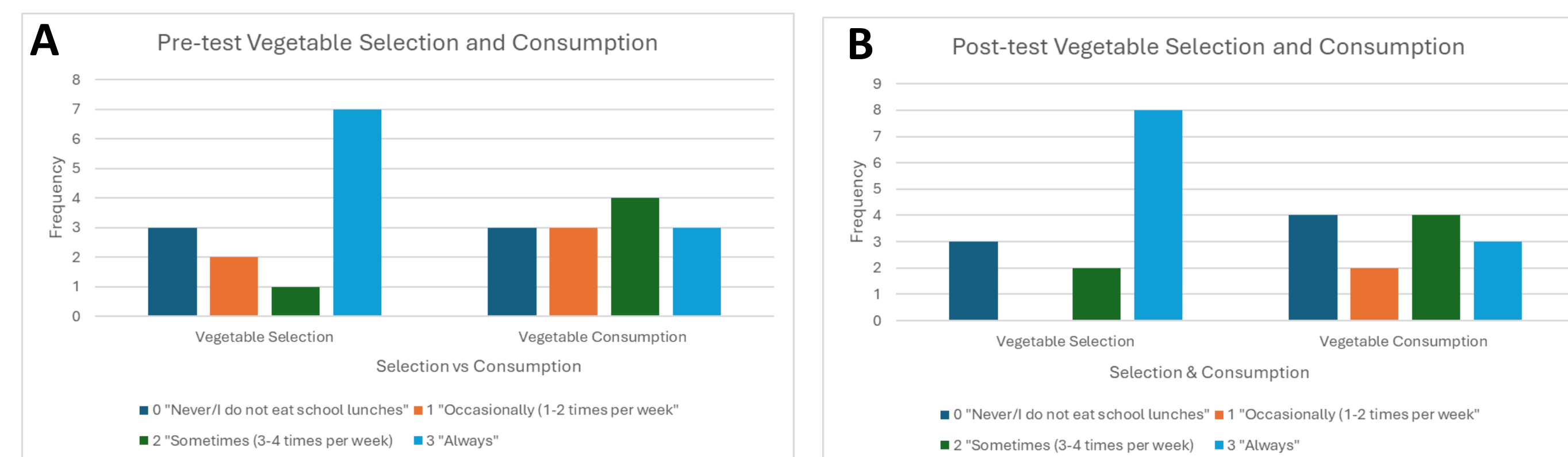
- The study was conducted in a high school in a low-income district in Upstate New York.
- 13 students were enrolled in the study.
- Subjects' selection, consumption, and enjoyment of vegetables in school-offered meals were assessed via a pre-test.
- 3 salt-free and sugar-free spice blends were developed for students to use during lunch periods (**Table 1**).
- Spice blends were then made available in lunch lines for 4 weeks in March-April 2024, with nudging by staff for use on vegetables.
- After 4 weeks, a post-test was administered again assessing subjects' selection, consumption, and enjoyment of vegetables. Open-ended feedback regarding vegetable intake and school-offered meals was solicited.
- Data from pre- and post-assessments were converted into quantitative data and analyzed using Wilcoxon signed rank tests where significance was considered as $p < 0.05$.
- Open ended feedback was thematically assessed for students' subjective feelings toward school-offered meals and vegetables.

Table 1: Spice blends offered as part of the In-School Vegetable Consumption of Adolescents intervention.

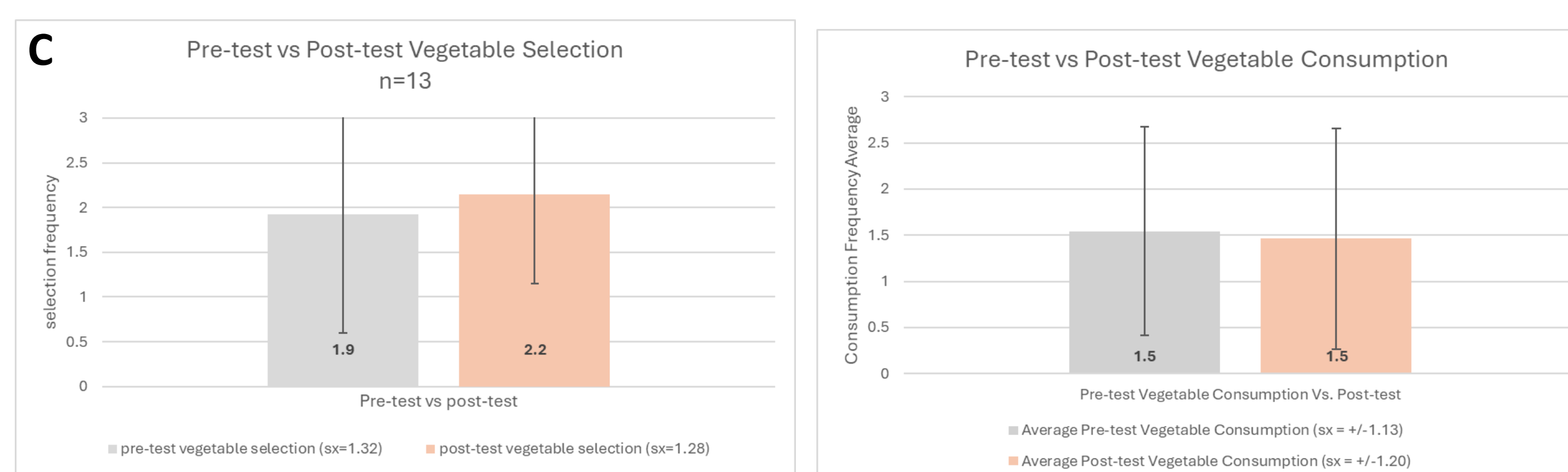
| Blend 1: "Spartan's House Blend" (All purpose) | Blend 2: "Smoked Spartan" (Smoky-sweet)* | Blend 3: "Blackened Gold" (Spice and citrus) |
|---------------------------------------------------|---------------------------------------------|-------------------------------------------------|
| Onion | Chili powder | Garlic |
| Garlic | Cayenne | Onion |
| Paprika | Ground cumin | White pepper |
| Mustard powder | Onion | Black pepper |
| Salt-free lemon pepper | Smoked Paprika | Cayenne |
| Basil | Spanish paprika | Thyme |
| Oregano | Oregano | Oregano |
| Parsley | Salt-free lemon pepper | |
| Thyme | Sucralose* | |
| Dill | | |

(* Sucralose was included for the perception of sweet without adding nutritive sweetener.

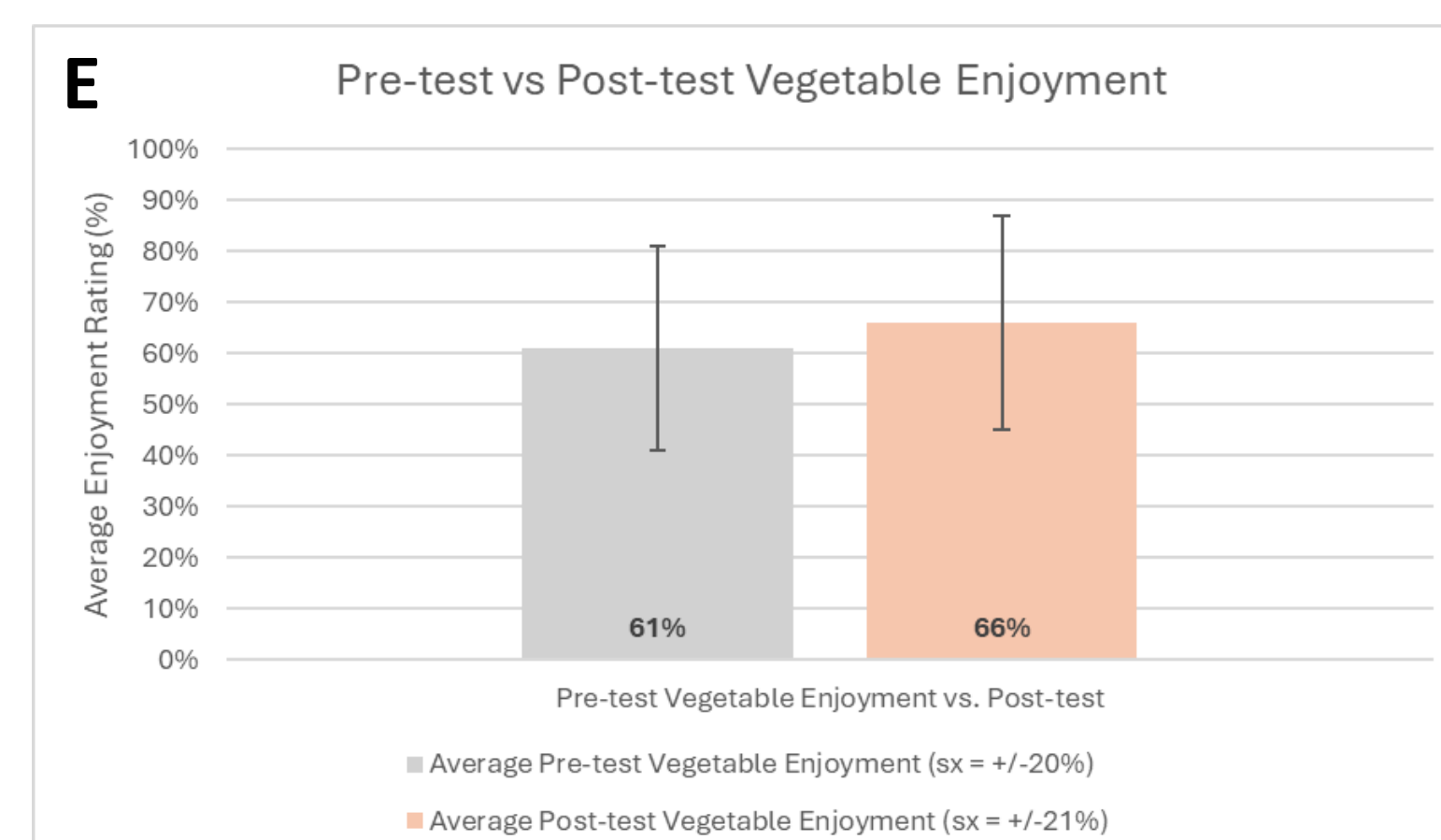
RESULTS



(A) Pre-test vegetable selection and consumption Rates. (B) Post-test vegetable selection and consumption rates. Students most often reported always selecting vegetables, however consumption varied to a greater extent both before and after the intervention periods.



(C) and (D) compare pre- and post-test vegetable selection and consumption At $\alpha=0.05$, findings were insignificant ($p=0.414$, $p=0.655$).



(E) Pre- vs post-test vegetable enjoyment shows no significant changes.

DISCUSSION

Providing salt-free and sugar-free spice blends over the course of the four-week intervention was not associated with significant changes in vegetable selection, vegetable consumption, or overall vegetable enjoyment. These data contradict earlier data in support of such spices/herbs. (1).

Students used spice blends most often on two specific entrees: salads and pizzas. Among side dishes, salads were again the most popular. While these choices may displace high-fat, high-salt sauces and salad dressings, this effect was not measured.

The study was limited by the small subject pool (n=13), the short intervention period of 4 weeks, and a lack of accounting for plate waste as an objective indicator of vegetable selection vs consumption.

The study was strengthened by buy-in from faculty at the research site that increased awareness of the blends, and staff's use of spice blends may have provided modeling behavior to promote students' use.

The presence of the primary researcher in the lunch lines during the intervention and providing nudges in the form of pairing suggestions was acknowledged as a confounding variable.

CONCLUSION

Provision of salt-free and sugar-free spice blends to high school students did not produce significant changes in vegetable selection, consumption, or enjoyment among high school students. Open ended feedback regarding spices was generally positive with students reporting further desire for differences in preparation methods. The study was limited by a short intervention time period and weak statistical power. Further studies examining adolescents' vegetable intake behaviors in the school setting are warranted given impending changes regarding the reduction of sodium and added sugars in meals reimbursable by the USDA.(4)

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