Research Article

Agricultural Experiences Are Positively Associated With High School Students' Fruit and Vegetable Perceptions and Consumption

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ABSTRACT

Objective: To examine the relationship between high school students' agricultural experiences and their (1) attitudes about consuming local fruits and vegetables, (2) willingness to try new fruits and vegetables, and (3) fruit and vegetable consumption.

Design: Cross-sectional survey research.

Setting: Public high schools in a lower-income, diverse, urban, northeastern community.

Participants: A total of 327 students from 3 public high schools.

Main Outcome Measure(s): Exposures were prior experience helping on a farm or community garden (yes/no) and having a home garden (yes/no). Outcomes were perceptions about local produce consumption ($\alpha = .73$), willingness to try new fruits ($\alpha = .86$) and vegetables ($\alpha = .86$), and adequate fruit and vegetable consumption (yes/no) as measured by a valid 2-item cup screener.

Analysis: Independent *t* tests, 1-way ANOVA, and chi-square tests were used.

Results: Half of students (52.9%) reported prior farm experience; 29.7% reported having a garden at home. Few students reported consuming at least 3 cups/d of vegetables (9.8%) or 2 cups/d of fruit (37.0%). Students with prior farm experience had more favorable scores for local produce perceptions ($P = .002$) and willingness to try new fruits ($P = .001$) and vegetables ($P < .001$) than were students without prior experience. Students with a home garden had more favorable scores for local produce perceptions ($P = .02$) and willingness to try new fruits ($P = .001$) and vegetables ($P = .001$) and more often consumed adequate vegetables ($P = .007$) than did students without a garden.

Conclusions and Implications: Those working with high school students might consider offering agriculture experiences that could promote positive fruit and vegetable attitudes and behaviors.

Key Words: fruit, vegetable, school, student, garden *(J Nutr Educ Behav.* 2017;■■:■■–■■.)

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INTRODUCTION

Adequate fruit and vegetable consumption has been linked to myriad health benefits including reduced risk for cardiovascular disease, type 2 diabetes, certain types of cancers, overweight and obesity, and micronutrient deficiencies.[1] Adequate fruit and vegetable consumption among youth is at least 1–2 cups of fruit and 2–3 cups of vegetables, although recommended amounts vary based on age, gender, and activity status.[1]

Fruit and vegetable intake among most US youth is insufficient.[2] Data from the 2013 Youth Risk Behavior Surveillance System indicated that among US high school students, only 8.5% met the fruit consumption recommendation and 2.1% met the vegetable consumption recommendation.[3] Youth from households with low socioeconomic status consumed even fewer fruits and vegetables compared with their counterparts living in households with higher socioeconomic status.[4]

A social-ecological approach,[5] which considers environmental influences on behavior, is recommended when promoting fruit and vegetable consumption.[1] For example, studies examined how exposure to agricultural

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experiences might influence youth's attitudes and behaviors related to fruit and vegetable consumption.[6-10] Agricultural experiences can include gardening and farming at home, school, or within one's community for the purpose of work, service, food acquisition, or play and recreation.

To date, most studies examining the impact of agricultural experiences among US youth were conducted with children rather than adolescents[6,7] and focused narrowly on school garden interventions. Studies examining how school gardens might benefit children found positive impacts on recognition of, attitudes toward, and preferences for fruits[8,9] and vegetables[9,10]; improved nutrition knowledge[8]; as well as an improved willingness to taste vegetables, choose more vegetables in a lunchroom setting,[8] and consume more fruits and vegetables in general.[10,11] Because of significant developmental differences and differences in fruit and vegetable consumption[12] between children and adolescents, it is reasonable to assume that agricultural experiences might affect children and adolescents differently. The limited research examining how agricultural experiences might benefit adolescents is reviewed subsequently.

Agricultural Impacts on Adolescents

Of the few studies examining agricultural experiences among adolescents, most focused on school garden impacts. Ratcliffe and colleagues[13] examined the impact of a 13-week garden education program and found improvements in students' recognition of, attitudes toward, preferences for, and willingness to taste vegetables, as well as increases in the variety of vegetables eaten. Utter and colleagues[14] used data from a national survey administered in Australia and found that students attending schools with gardens had lower fast-food consumption and lower body mass indexes than did students without school gardens. Middle school teachers were interviewed in Hawaii and indicated that school-based gardening improved students' willingness to try new foods and improved their diets.[15] However, a study examining the impact of hydroponic gardening among high school students did not see a significant difference in fruit and vegetable consumption from baseline to follow-up.[16]

Although the literature suggested that school gardens are an efficacious approach to improving fruit and vegetable consumption among youth, there are some limitations to implementing school garden programming. School garden programming relies on buy-in from school administrators and teachers, which can be challenging in school climates where student testing scores are a priority.[17] Agricultural experiences outside schools, such as community farm and home garden experiences, might benefit youth without school-specific challenges. This is not to say that school garden programming is irrelevant but that communities might consider investing in a variety of agricultural experiences.

The current authors were able to identify 2 studies that examined the impact of urban agricultural experiences other than school gardening on adolescents. Lautenschlager and Smith[18] evaluated the impact of a youth gardening program for inner-city youth aged 9–15 years. Those youth worked to plant and harvest food for local farmers' markets and participated in nutrition and cooking education activities. Youth in the gardening program were more willing to eat nutritious food, try unfamiliar food, and cook and garden on their own compared with youth who did not participate in the gardening program. Grier and colleagues[19] examined the impact of a community garden program on primarily black youth aged 5–17 years from lower-income households and found improvements in self-efficacy for asking for fruits and vegetables and gardening and plant part knowledge. However, there were no significant improvements in willingness to try fruits and vegetables, self-efficacy for eating fruits and vegetables, self-efficacy for gardening, or nutrition knowledge.

Appleton and colleagues[20] identified the need for interventions promoting fruit and vegetable intake among adolescents. Given the limited body of literature examining the relationship between urban agricultural experiences and fruit and vegetable consumption among adolescents, additional research is warranted before urban agricultural interventions are implemented. This study made an important contribution by examining the association between high school students' agricultural experiences and their (1) perceptions of consuming local fruits and vegetables, (2) willingness to try new fruits and vegetables, and (3) fruit and vegetable consumption. The findings provide a basis for developing urban agricultural experiences among adolescents.

METHODS

Study Context

Bridgeport is the largest and poorest city in the state of Connecticut (Bridgeport median household income = $39,822; Connecticut median household income = $69,519.[21] It also has a large minority population (39.6% white, 34.6% black, and 38.2% Hispanic).[21] In a prior study,[22] Bridgeport youth talked about Bridgeport as a "bad place" and identified urban agriculture (eg, community farms, school gardens) as a way to build trust and a sense of community within their city. Furthermore, when Bridgeport youth talked about growing their own food, they did so with a sense of pride. This was particularly meaningful in a community in which up to two thirds of residents in some neighborhoods experienced food insecurity.[23]

A recent community health assessment[24] indicated that fruit and vegetable consumption was low among Bridgeport residents and that only 33% of adults reported consumption of at least 5 servings/d of fruits and vegetables. All students attending Bridgeport public schools receive free school breakfast and lunch where fruits and vegetables are served daily according to national school lunch standards. However, students can choose to consume other foods. It seems there is an opportunity to leverage students' interest in urban agriculture as a way to improve perceptions and behaviors for consuming fruits and vegetables.

Project partners for this study crossed sectors and included the Bridgeport Public School System, Sacred Heart University, and Green Village Initiative, a nonprofit organization that supported school gardens and managed community gardens, an