



Gardening Experience Is Associated with Increased Fruit and Vegetable Intake among First-Year College Students: A Cross-Sectional Examination

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ABSTRACT

Background Gardening interventions have been shown to increase fruit and vegetable (F/V) intake among school-aged children. It is unknown whether these effects persist into later adolescence or adulthood, and little is known about whether gardening in later adolescence is related to F/V intake.

Objective To identify the relationship between both childhood and recent (within the past 12 months) gardening experiences and current F/V intake among college students.

Design/participants A cross-sectional evaluation of 1,121 college freshmen with sub-optimal F/V consumption from eight US universities.

Main outcome measures Participants completed the National Cancer Institute Fruit and Vegetable Screener and questions about gardening experiences. Respondents were grouped as having gardened or not gardened during childhood and recently.

Statistical analyses performed A linear mixed model was used to evaluate the relationship between childhood and recent gardening and current F/V intake.

Results Of the student participants, 11% reported gardening only during childhood, 19% reported gardening only recently, 20% reported gardening both as a child and recently, and 49% of students reported never having gardened. Students who gardened both during childhood and recently had a significantly higher mean current intake of F/V compared with students who never gardened (2.5 ± 0.6 vs 1.9 ± 0.5 cup equivalents [CE], respectively; $P < 0.001$). In addition, F/V intake increased with frequency of recent gardening engagement when comparing students who did not garden with those who gardened monthly or weekly (2.1 ± 0.5 CE, 2.4 ± 0.6 CE, and 2.8 ± 0.7 CE, respectively; $P < 0.001$).

Conclusions This analysis suggests that the combination of childhood and recent gardening experience is associated with greater current F/V intake among first-year college students not currently meeting national F/V recommendations. In addition, a greater frequency of gardening experience may further enhance this effect.

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GARDENING INITIATIVES HAVE AGAIN GAINED momentum in the United States over the past 2 decades. Historically, active gardening programs have been used to address economic crises related to war, promote sustainable and environmentally friendly farming practices, and encourage active learning in school curricula.¹ More recently, gardening initiatives have gained popularity as a way to encourage positive dietary behaviors, specifically increased fruit and vegetable (F/V) consumption.² More than 25% of US public elementary schools report having a garden on campus³ and 35% of households in America grow food at home or in a community garden.⁴

Current literature suggests, with mixed results, that gardening interventions increase F/V intake among school-aged participants during or immediately after the intervention period.^{5,6} However, the long-term influence of actively growing F/V on F/V consumption is unknown. Eating a diet rich in F/V is important for health and is associated with reduced risk for several chronic diseases, including hypertension, cardiovascular disease, and cancer.⁷⁻¹⁰ A recent meta-analysis of 95 peer-reviewed publications concluded that an estimated 5.6 million premature deaths annually could be attributed to low F/V intake (< 3 cup equivalents [CE]).¹¹

Despite the accumulation of evidence on the benefits of adequate F/V intake, fewer than half of children and adolescents aged 4 to 18 years consume the recommended five or more CE of F/V per day.¹² Because dietary habits developed in childhood tend to persist well into adulthood,¹³ interventions that establish greater F/V consumption among children and adolescents may have promising long-term health benefits.

Gardening programs in schools and communities have successfully promoted F/V intake among participants in the short-term follow-up range of 6 months to 1 year after program implementation.^{5,14-18} School gardening programs often combine lessons in nutrition with opportunities for students to work in a garden. Studies examining the short-term effects of school gardening programs have found gardening experiences increase both nutrition knowledge and vegetable preferences.¹⁴⁻¹⁸ Community gardens have helped families in both rural and urban settings acutely increase their F/V intake.¹⁹⁻²¹ Participation in community gardening once a week can significantly increase F/V intake for adults and children, even when only one member of a household participates.²⁰⁻²²

Some college students participate in university gardening programs, although much less is known about the relationship between gardening and eating behaviors in this population. Of the few studies that have looked at gardening among college students, it was found that many gardening programs focus on emotional and mental health benefits rather than nutrition education or improved nutrition habits.^{23,24} A literature search resulted in only one publication comparing F/V intake between college students who gardened and those who did not. This study enrolled 18 participants from a small southern college and provided gardening plots for each participant. Researchers conducted follow-up interviews after students had been gardening for 3 months and found that students enjoyed gardening as a means of obtaining fresh produce, but identified emotional benefits, like stress relief and relaxation, as the primary benefits of participation.²⁵ Students who participated in gardening in this study did not have a higher F/V intake as a result of gardening, which investigators attributed to the substitution of store-bought produce with the freshly grown produce.²⁵ A large-scale, quantitative study is necessary to fill gaps in understanding the relationship between gardening and F/V intake among college students.

College students and other young adults face specific challenges as they transition from being cared for to caring for themselves. This transition period can have significant effects on health and health behaviors.²⁶⁻²⁸ College students may gain unwanted weight over the course of their academic experience, with the most rapid weight gain usually occurring during their first year.^{26,27,29} Weight gain during the collegiate years is often associated with increased consumption of convenience and readily available food²⁶ that is typically energy-dense and nutrient-poor.³⁰ In addition, a decrease in physical activity and an increase in sedentary behaviors can contribute to weight gain among college students.^{31,32} Therefore, identification of effective strategies for countering this decline in diet quality and physical activity is needed.

Gardening initiatives among children appear to hold promise for increasing F/V intake, but it is unclear whether similar initiatives may be successful for older adolescents and

RESEARCH SNAPSHOT

Research Question: Is there an association between having gardening experiences in childhood and later adolescence and higher fruit and vegetable intake among first-year college students?

Key Findings: In this cross-sectional cohort of 1,121 college freshmen with suboptimal fruit and vegetable intake from eight US universities, those who gardened both during childhood and recently had a significantly higher current mean daily intake of fruit and vegetables compared with students who never gardened (2.5 ± 0.6 vs 1.9 ± 0.5 cup equivalents, respectively; $P < 0.001$). In addition, fruit and vegetable intake increased with frequency of recent gardening engagement when comparing students who did not garden with those who gardened monthly ($P < 0.001$) or weekly ($P < 0.001$).

college students. Furthermore, the vast majority of previous studies involving children have short follow-up periods: typically within 1 year post-intervention. Therefore, there is a lack of information regarding long-term implications of gardening interventions. The primary objective of this study is to examine the long-term influence of childhood gardening as well as the influence of recent gardening experiences (within the past 12 months) on current F/V intake among a diverse sample of first-year college students not currently consuming the recommended 5 CE/day of F/V.

MATERIALS AND METHODS

Study Overview

Data for this cross-sectional evaluation of gardening experiences and F/V intake were collected as a substudy of the Get your Fruits and Vegetables (GetFRUVED) project, a US Department of Agriculture-funded multi-institutional study with the goal of promoting health behaviors and preventing excess weight gain among college freshmen. This analysis includes data obtained at baseline from eight different US universities. Data collection occurred during the fall 2015 academic semester on each university campus. All study procedures were approved by the institutional review boards of each participating university, and written informed consent was obtained from all participants before completing the questionnaire and assessment procedures. This study was registered at Clinicaltrials.gov with the identifier code NCT02941497.

Participant Recruitment and Enrollment

Recruitment of freshmen participants began in late summer 2015 and extended into early fall. Researchers employed a variety of recruitment strategies to reach incoming freshmen. These strategies included sending E-mail messages to newly enrolled freshmen, posting flyers on campuses, manning tables at orientation events, and advertising through various listservs. Interested freshmen were invited to take a short survey to determine eligibility. In addition to being enrolled as a first-year student at one of the eight participating institutions and being aged 18 years or older, eligibility criteria

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