



Theory-informed Predictors of Fruit and Vegetable Intake among Cost-offset Community Supported Agriculture Enrollees

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ABSTRACT

Background: In Cost-Offset Community Supported Agriculture (CO-CSA), low-income households receive subsidized shares of a local farm's produce harvest with the aim of improving their access to and consumption of fruits and vegetables (FV). Social Cognitive Theory (SCT) is a commonly-leveraged behavior change theory and informed the design of a CO-CSA plus nutrition education intervention trial for low-income households with children. **Objective/Hypothesis:** To model the cross-sectional relationships at baseline between SCT-aligned variables and FV intake among CO-CSA trial enrollees. We hypothesized that nutrition-related attitudes, beliefs, and self-efficacy as well as perceived FV availability and accessibility would be significant predictors of FV intake. **Methods:** In Spring 2016 and 2017, adult enrollees (n=305) completed a baseline questionnaire containing study-specific questions and validated scales to measure nutrition-related psychosocial (knowledge, attitudes, beliefs), environmental (FV availability and accessibility), behavioral (self-efficacy) factors, and self-reported FV intake (National Cancer Institute's All-Day FV Screener). An objective proxy measure FV intake, dermal carotenoid score, was also assessed via resonance Raman spectroscopy. Descriptive statistics and multiple regression models were completed in SPSS. Models controlled for demographic characteristics. **Results:** Self-efficacy to prepare and eat FV ($\beta=0.27$, $p<0.001$) and in-home FV availability ($\beta=0.13$, $p=0.04$) were significant predictors of daily FV intake ($R^2=0.121$, $p<0.001$). In-home FV availability ($\beta=0.20$, $p<0.001$), accurate knowledge of FV recommendations ($\beta=0.15$, $p=0.008$), and perceived geographic access to FV ($\beta=0.11$, $p=0.046$) were significant predictors of carotenoid score ($R^2=0.227$, $p<0.001$). **Conclusions:** Among a set of SCT-informed variables expected to influence FV intake, knowledge of FV recommendations, geographic access to FV, in-home availability of FV, and self-efficacy to prepare and eat FV were significant predictors. However, these only explained 22-23% of outcome variability among a sample of CO-CSA adult enrollees. SCT alone may not be the most appropriate theory through which to understand potential levers of FV intake among adults participating in CO-CSA programs.

BACKGROUND

In Cost-Offset Community Supported Agriculture (CO-CSA), low-income households receive subsidized shares of a local farm's produce harvest with the aim of improving their access to and consumption of fruits and vegetables (FV).

Overcoming financial and geographic barriers to FV access may be insufficient to improve rates of consumption; perceptions of the food environment and nutrition-related knowledge, attitudes, and beliefs also affect dietary behavior.

CO-CSA programs can provide concurrent nutrition classes to address gaps in nutrition-related psychosocial factors and skills. Social cognitive theory (SCT) is a commonly-leveraged behavior change theory used to inform such curricula.

Farm Fresh Foods for Healthy Kids (F3HK) was a randomized controlled intervention trial informed by SCT that provided CO-CSA shares and offered nutrition classes to low-income families with children in NY, VT, NC, and WA to increase the household's fruit and vegetable consumption and reduce obesity risk.

RESEARCH OBJECTIVE & HYPOTHESES

We aimed to model the cross-sectional relationships between Social Cognitive Theory-aligned variables and measures of fruit and vegetable intake among enrollees in a Cost-Offset Community Supported Agriculture intervention.

Rationale: This analysis will facilitate understanding of forthcoming trial outcomes (e.g., the degree to which behavioral levers of interest were already related to study outcomes before the CO-CSA intervention) and the utility of SCT for predicting FV intake among a subset of low-income consumers.

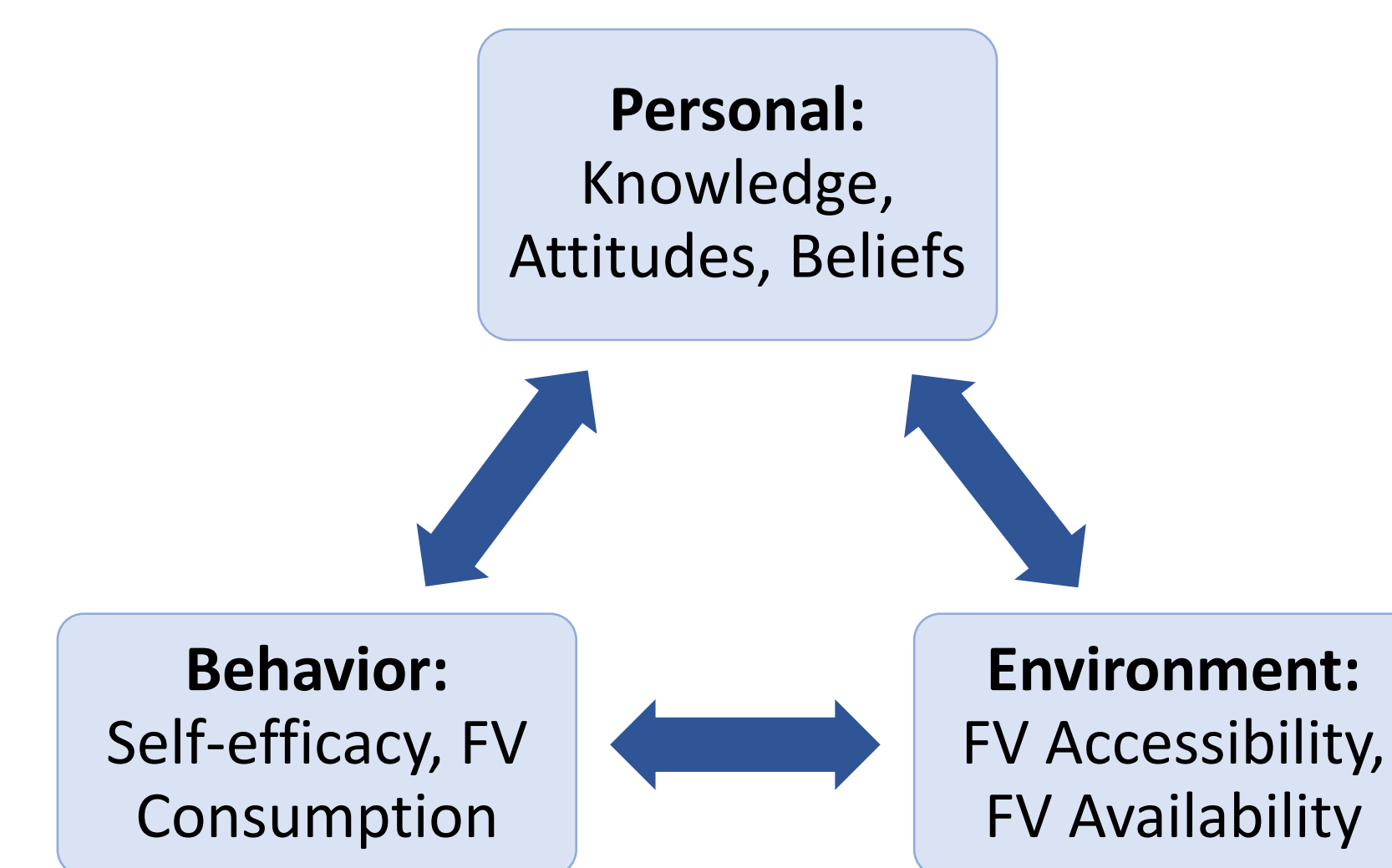
Hypothesis: Nutrition-related attitudes, beliefs, and self-efficacy and perceived FV availability and accessibility will be significant predictors of FV intake.

METHODS

F3HK baseline data were collected from adult enrollees via online questionnaires in Spring 2016 and Spring 2017.

Validated tools and study-specific questions were used to measure caregivers' nutrition-related psychosocial factors, environment, and dietary intake (Table 1). Variables were grouped by SCT construct (Figure 1).

Figure 1: Social Cognitive Theory-Aligned Study Variables



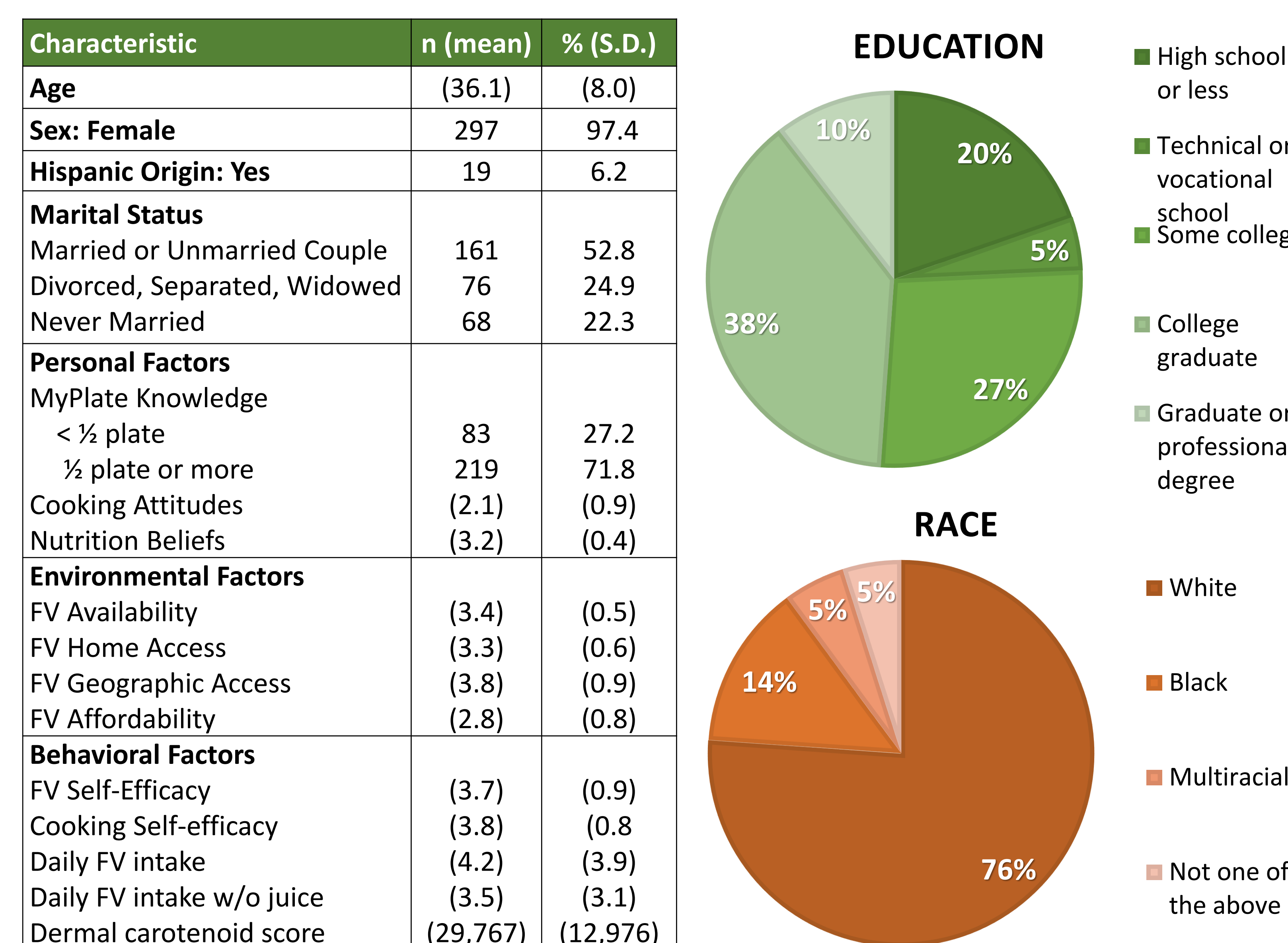
Descriptive statistics (Figure 2), t-tests and Pearson correlations (Table 3), and multiple linear regression models (Table 4) were conducted using SPSS. Significance for all tests was set at $p < 0.05$.

	Variable	Measure
Personal	Knowledge	Knowledge of MyPlate guidelines for FV portioning (<i>study-specific question</i>)
	Attitudes	Negative Cooking Attitude Scale (Condrasky et al., 2011)
	Beliefs	General Nutrition Knowledge Belief Scale (Beydoun & Wang, 2008)
Environment	FV Availability	Scale for fruit and vegetable availability within the home (Robinson-O'Brien et al., 2009)
	FV Accessibility	1. Scale for fruit and vegetable accessibility within the home (Robinson-O'Brien et al., 2009) 2. FV Affordability (<i>study-specific question</i>) 3. FV Geographic Access (<i>study-specific question</i>)
	Self-efficacy	1. Self-Efficacy for Eating/Cooking Fruits and Vegetables Scale (Condrasky et al., 2011) 2. Cooking Techniques and Meal Preparation Self-Efficacy Scale (Condrasky et al., 2011)
Behavior	FV Consumption	1. National Cancer Institute's All-Day Fruit/Vegetable Screener (Thompson et al., 2002) 2. Dermal Carotenoid Score via Pharmanex Biophotonic Scanner S3

Table 1. Variables and Measures used to Assess Psychosocial, Environmental, and Behavioral Factors among CO-CSA Enrollees

RESULTS

Figure 2. Characteristics of CO-CSA Adult Enrollees (n=305)



RESULTS

	Personal			Environment				Behavior			
	1 [†]	2	3	4	5	6	7	8	9	10	11
1. MyPlate Knowledge	–	–	–	–	Interpretation of Correlation Coefficient						
2. Cooking Attitudes	-0.18	–	–	–	0.00 to 0.30			Negligible			
3. Nutrition Beliefs	-0.11	-0.02	–	–	0.30 to 0.50			Low			
4. FV Availability	-0.03	-0.22**	0.22**	–	0.50 to 0.70			Moderate			
5. FV Home Access	-0.04	-0.22**	0.23**	0.68**	0.70 to 0.90			High			
6. FV Geographic Access	0.07	-0.11	0.02	0.10	0.18**	–	–	–	–	–	–
7. FV Affordability	0.07	-0.16**	0.02	0.22**	0.23**	0.34**	–	–	–	–	–
8. FV Self-Efficacy	-0.14	-0.34**	0.30**	0.45**	0.42**	0.07	0.19**	–	–	–	–
9. Cooking Self-Efficacy	-0.16	-0.47**	0.15*	0.34**	0.36**	0.16**	0.24**	0.54**	–	–	–
10. Daily FV intake	-0.12	-0.14*	0.11	0.25**	0.15*	-0.02	0.14*	0.33**	0.22**	–	–
11. Daily FV intake (w/o juice)	-0.14	-0.16**	0.07	0.28**	0.20**	0.01	0.15*	0.34**	0.26**	0.93**	–
12. Dermal carotenoids	-5696**	0.01	0.04	0.25**	0.20**	0.19**	0.10	0.18**	0.10	0.13*	0.21**

Table 3. Relationships between CO-CSA Enrollees' Nutrition-Related Psychosocial, Environmental, and Behavioral Factors

[†]All values represent mean differences tested via independent t-tests. All other values are Pearson correlation coefficients. Significant values are indicated by (*) if $p < 0.05$ and by (**) if $p < 0.01$.

Predictors	Model Summary				Unstandardized Coefficients		Standardized Coefficients		P-Value		95% Confidence Interval for B	
	R	R ²	R ² _{adj}	R ² change	B	SE	β	p	Lower Bound	Upper Bound		
Dependent Variable: Daily FV Intake												
	0.347	0.121	0.115	0.13								
FV Self-Efficacy					0.185	0.042	0.271	<0.001	0.103	0.267		
FV Availability					0.154	0.074	0.127	0.040	0.007	0.300		
Dependent Variable: Daily FV Intake (w/out juice)												
	0.366	0.134	0.128	0.020								
FV Self-Efficacy					0.174	0.040	0.265	<0.001	0.095	0.252		
FV Availability					0.186	0.071	0.160	0.009	0.047	0.325		
Dependent Variable: Dermal Carotenoid Score												
	0.477	0.227	0.213	0.098								
FV Availability					5239.3	1460.3	0.198	<0.001	2363.9	8114.8		
MyPlate Knowledge					4325.5	1605.7	0.149	0.008	1163.6	7487.4		
FV Geographic Access					1581.9	788.4	0.112	0.046	29.5	3134.2		
Completed College					7083.5	1488.8	0.273	<0.001	4152.0	10015.1		
In a Coupled Unit					3464.8	1443.3	0.134	0.017	622.8	6306.8		

Table 4. Stepwise Linear Regression Models

CONCLUSIONS

Among a set of SCT-informed variables expected to influence FV intake, knowledge of FV recommendations, geographic access to FV, in-home availability of FV, and self-efficacy to prepare and eat FV were significant predictors of dermal carotenoid score. These variables only explained 22-23% of outcome variability among our sample of CO-CSA adult enrollees.

Discrepancies in predictors between measures of FV intake reveal a need for further research on the relationships between psychosocial, environmental, and behavioral factors and FV intake as measured by dermal carotenoid score.

Individuals self-selecting into CO-CSA interventions may already have desirable psychosocial and behavioral characteristics. Such characteristics are not necessarily key drivers, or levers, of FV intake. SCT alone may not be the most appropriate theory through which to understand potential levers of FV intake among adults participating in CO-CSA programs.

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