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Social-Cognitive Correlates of Fruit and Vegetable Consumption in Minority and Non-Minority Youth

D.L. Franko, Ph.D.^{1,*}, T.M. Cousineau, Ph.D.², R.F. Rodgers, Ph.D.^{1,3}, J.P. Roehrig, M.A.¹, and J.A. Hoffman, Ph.D.¹

¹Northeastern University, Boston, Massachusetts

²Bodimojo, Inc., Milton, Massachusetts

³Centre d'Etudes et de Recherches en Psychopathologie CERPP Université Toulouse II le Mirail, Toulouse, France

Abstract

Objective—Inadequate fruit and vegetable consumption signal a need for identifying predictors and correlates of intake, particularly in diverse adolescents.

Design—Participants completed an online assessment in early 2010.

Setting—Computer classrooms in 4 high schools.

Participants—One-hundred twenty-two Caucasian and 125 minority (African American and Hispanic) high school students (mean age = 15.3 years, sd = 1.0) with parental consent. Response rate was 89%.

Variables measured—Self-efficacy as measured by confidence in goal-setting and decision-making about healthy eating; perceived benefits and barriers to eating fruits and vegetables; healthy-eating related social support; body esteem; and fruit and vegetable intake.

Analysis—T-tests were used to examine group differences and binary logistic regression analyses were conducted to explore the predictors of 5-a-day fruit and vegetable consumption.

Results—Thirty-four percent of the non-minority and 28% of the minority group reported typically eating five or more portions of fruits and vegetables a day. Self-efficacy and perceived benefits predicted consumption in minority participants, whereas barriers and social support were significant predictors in the non-minority group.

Conclusions and Implications—These findings suggest different variables predict consumption for minority and non-minority groups and that self-efficacy is an important variable to consider in dietary change programs for adolescents.

Keywords

fruit and vegetable consumption; self-efficacy; minority; youth; adolescence; ethnicity

The positive benefits of adequate fruit and vegetable (F&V) intake are well documented in studies of health, obesity, and weight management [1]. Research has shown that higher intake of F&V decreases risk for chronic diseases [2] and can be beneficial for weight management [3]. However, studies have also indicated that adolescents rarely eat the recommended number of fruits and vegetables each day [4, 5]. Developing health promotion interventions to increase F&V may be particularly challenging with adolescents because the negative health consequences of poor eating habits may not occur until later in life and are often devoid of personal immediacy in this age group.

The higher rates of obesity in minority youth are mirrored in their lower rates of F&V consumption [6]. Recent studies have continued to note low rates of F&V intake in minority youth [7, 8], as indicated in a report [9] showing that 66.4% of Mexican Americans and 71.9% of African Americans (ages 2-18 years) did not meet the recommendations for fruit consumption, with even higher rates of inadequate vegetable consumption (82.9% and 86.1%, respectively). Two large-scale survey studies have found that the low rates of fruit and vegetable consumption did not differ statistically between African American and Hispanic youth [9, 10]. Although some have examined predictors of F&V consumption in ethnic minority children and younger adolescents [11], very few studies have investigated relevant predictor variables in older adolescents [12]. Targeting older adolescents is important as lifelong eating habits begin to consolidate during this developmental period [13].

Low rates of F&V consumption have led the Center for Disease Control and Prevention [14] to recommend strategies that are grounded in social cognitive theory to promote greater F&V consumption [15]. A key construct emphasized in social cognitive theory is reciprocal determinism, which refers to the two-way interaction between individual and environmental factors to influence behavior. In regard to F&V consumptive behavior, social cognitive factors include: individual factors (e.g., self-efficacy and body image); interpersonal influences (e.g., family and peers who provide modeling and expectations); and the physical environment (e.g., benefits and barriers to consumption). An important research aim is to identify tenets of the social-cognitive model that increase the probability of F&V consumption [16-23], particularly in older and racially and ethnically diverse adolescents.

This study adds to the existing literature by: (1) examining individual, interpersonal, and environment factors as predictors of F&V consumption; (2) adding body image as an individual-level factor that has not been investigated previously; and (3) investigating these questions in an older and racially diverse sample. We expected that higher self-efficacy and more positive body image, greater familial and peer support, and lower barriers would predict higher rates of F&V intake, in both minority and non-minority adolescents.

Methods

Participants and Recruitment

Students at four urban and suburban Boston public high schools were recruited for participation in the study. High schools were chosen by contacting 6 public high schools in the greater Boston area and inquiring about their potential interest in the study. Of the 6 schools contacted, 4 agreed to participate. In these schools, 279 students were given parental consent forms and information packets in health class, of which 247 signed consents were returned, yielding a participation rate of 89%. The mean age of the sample was 15.31 (SD = 1.03); 141 girls and 106 boys participated, and minority representation was 49%. Additional demographic information is provided in Table 1.

Measures

Individual-level variables

Physical Activity and Healthy Eating Food Efficacy Scale for Children [PAHFE; 24]:

The PAHFE is a 20-item measure that assesses perceived confidence to set goals and make decisions about healthy eating and physical activity on a 5-point Likert-type scale ranging from “not sure at all” to “completely sure.” Only the items related to healthy eating were used for the current study. The measure has two subscales: healthy eating goal-setting (e.g., “How sure are you that you can set goals for yourself to eat healthy foods like fruit and vegetables?”) and healthy eating decision-making (e.g., “How sure are you that you can choose a healthy food to eat every day?”). Perry et al. [24] reported good convergent, criterion, and discriminant validity for this measure, which was validated in a diverse sample that included 68.9% Caucasian (non-Hispanic), 11.3% African American, 3.8% Latino/a, and 4.7% Asian American adolescents. Cronbach alphas in the current sample were 0.84 for goal-setting and 0.90 for decision-making.

Body Esteem Scale for Adolescents and Adults[25] is a 23-item scale that taps the affective evaluations of adolescents' bodies, using a Likert scale response format from 1 (never) to 5 (always), with higher scores indicating more positive body esteem. A factor analysis of the scale resulted in three subscales: *Appearance*, *Weight*, and *Attribution*[25]. The authors reported good validity and reliability of this scale with adolescents [25] and this measure has been used in studies with large samples of ethnic minority adolescents [26]. Cronbach alpha coefficients for the current sample were 0.90 (Appearance), 0.91 (Weight), and 0.76 (Attribution).

Interpersonal-level Variable

Social Support for Dietary Changes [27]: This measure assesses psychological and social support received by family (3 items) and peers (3 items) when making dietary changes and is scored from 1 (no help) to 5 (a great deal of help). Respondents are prompted with phrases such as, “If you decided to try and make changes to your diet so that it became ‘healthier,’ how much help would you get from your family (friends) in making such changes?” and “Would your family (friends) encourage you to keep trying to make changes if the going got tough?” Steptoe and colleagues [27] reported Cronbach alpha coefficients of 0.84 for the family social support scale and 0.78 for the peer scale in a study with adults. The Cronbach alpha for the current sample was 0.82 for the family subscale and 0.80 for the peer subscale.

Environmental-level Variables—Fruit and Vegetable Benefits and Barriers [27] is a 12-item validated questionnaire that measures both perceived benefits and perceived barriers of eating fruits and vegetables. Examples of specific questions for benefits are: “Eating more fruit and vegetables makes me feel good; Eating more fruit and vegetables will improve the way I look.” Specific questions for barriers are: “I do not like fruit and vegetables; When I am with friends, eating fruits and vegetables can be embarrassing.” Steptoe and colleagues [27] reported Cronbach alpha coefficients of 0.72 for benefits and 0.78 for barriers in a study of adults. However, we are not aware of this measure being used with adolescents. In the current sample, Cronbach alpha coefficients were 0.70 and 0.76 respectively, for perceived benefits and barriers.

Outcome Variable

Fruit and Vegetable Consumption: Participants responded to two single-item questions measuring the number of servings of fruit and vegetables consumed per day (“How many servings of fruits/How many servings of vegetables (not potatoes) do you usually eat each day?”), which were each followed by examples of what was meant by a serving. For fruit,

the wording was “A portion of fruit is an apple or banana, a small bowl of grapes, or three tablespoons of canned fruit.” For vegetables, the wording was “A serving or portion of vegetables means three heaped tablespoons of green or root vegetables such as carrots, parsnips, spinach, small vegetables like peas, baked beans or sweet corn, or a medium bowl of salad (lettuce, tomatoes, etc).” Our preliminary pilot testing indicated that the wording of this question was well understood by adolescents [28]. This measure has been validated by Steptoe and colleagues against biochemical markers and used in a number of studies examining dietary change in adults [29-31]. A recent study [22] used a similar question with 12-14 year old adolescents to ascertain F&V consumption and found good reliability.

Procedures

Four public high schools in the Boston metropolitan area participated in this study. Students in required health classes were given parental consent and child assent forms to take home and return to the teacher within a 2-week period. All students with signed consent forms were given an anonymous ID number and completed the assessment at an individual station in their school's computer lab during one class period. All assessments were completed on the Internet at a secure website using Concentus® software. Participants were weighed and height was measured individually in a private space outside the classroom, with shoes removed. Systematic anthropometric techniques followed those described by Lohman et al. [32]. Weight was measured to 0.1 kg (Seca digital electronic scale, Creative Health Products, Plymouth, MI, 2009). Standing height was measured to 0.1 cm with a portable stadiometer (Shorr Productions, Olney, MD, 2007). The study was reviewed and approved by the Office of Human Subjects Protection at Northeastern University.

Data analysis

In order to examine differences associated with ethnic minority status, the sample was dichotomized into those who self-identified as white/non-Hispanic and a second group who self-identified as African-American, Hispanic or bi-racial. T-tests were used to examine group differences on study variables. Binary logistic regression analyses were conducted to explore the predictors of 5-a-day fruit and vegetable consumption within each group, controlling for gender. A post-hoc power analysis was conducted for the logistic regression using G*Power 3 [33]. Odds ratios for the predictors of F&V consumption in the two groups were compared using the procedure outlined by Altman and Bland [34]. In this analysis a general test for interaction, comparing both estimates with their standard error, was used in order to test the strength of the differences in predictor variables between the minority and non-minority groups. All analyses were conducted using PASW Statistics Release Version 18.0.0 (SPSS, Inc., 2009, Chicago, IL).

Results

Descriptive statistics

Summary statistics according to ethnic status are presented in Table 2. Significant differences were found between the groups on both subscales of the self-efficacy measure, healthy eating goal setting ($p<.05$) and healthy eating decision making ($p<.01$), with the minority group scoring lower than the non-minority group, confirming our hypothesis.

Characteristics associated with 5-a-day fruit and vegetable consumption

Each group was classified according to whether or not they met the recommended guidelines of 5 daily portions of fruit and vegetable (5-a-day group). Thirty-four percent of the Caucasian group ($n=42$) and 28% ($n=35$) of the minority group met these guidelines. A Chi-

square test indicated that the difference in rates between the groups was not significant [$\chi^2(1, 247) = 0.27, p = .34$].

Within each ethnic group, participants who met the 5-a-day guidelines were compared to those who ate fewer F&V on the dependent measures (Table 3). Significant differences were found within the Caucasian group, with the 5-a-day participants reporting lower scores on the measure of perceived barriers to fruit and vegetable consumption ($p < .05$). Although the differences did not meet significance, this group also reported higher levels of peer support ($p = .055$), healthy eating goal-setting ($p = .083$), healthy eating decision-making ($p = .064$), and appearance satisfaction ($p = .053$), relative to those who ate less than 5 F&V a day. Among the ethnic minority group, the 5-a-day group reported significantly higher levels of healthy eating goal setting ($p < .001$), higher perceived benefits of fruit and vegetable consumption ($p < .001$), and lower levels of barriers to fruit and vegetable consumption ($p < .001$). Although the difference did not meet significance, this group also reported higher levels of family social support ($p = .08$).

Predicting 5-a-day fruit and vegetable consumption

In order to explore the predictors of 5-a-day fruit and vegetable consumption, logistic regressions were conducted, controlling for gender, using healthy eating decision making and goal setting, perceived barriers and perceived benefits to fruit and vegetable consumption, and family/peer social support as predictors (Table 4). Among the Caucasian participants, a test of the full model against a constant only model was statistically significant (chi square = 14.27, $p < .05$, $df = 6$, Nagelkerke R square = .15). Prediction success overall was 67%. Perceived barriers to fruit and vegetable eating ($p < .05$) and family social support ($p < .05$) were significant negative predictors, while peer social support ($p < .05$) was a significant positive predictor. Gender was not found to be a significant predictor in the regression analysis.

Among the ethnic minority group, a test of the full model against a constant only model was statistically significant (chi square = 24.19, $p < .001$, $df = 6$, Nagelkerke R square = .26). Prediction success overall was 74%. Healthy eating goal setting ($p < .05$) and perceived benefits of fruit and vegetable consumption ($p < .05$) were positive predictors. Gender was not significantly related to F&V consumption in this group. However, note that power was somewhat limited for these analyses (post-hoc power analysis, power = 0.30).

The analysis was re-run, controlling for both gender and BMI, and the results were very similar, except that the family social support variable just failed to meet significance ($p = .069$) among the White/non-Hispanic group. As seen in Table 4, a comparison of the odds ratios between the two groups indicated that the differences were significant (p 's $< .05$ to $.001$, depending on the variable tested).

Discussion

Targeting interventions to improve the dietary behaviors of adolescents is a priority and represents a unique challenge. Utilizing social cognitive theory to better understand the correlates of adolescent health behaviors among diverse demographic groups may inform program planning and public health campaigns. In this study, individual, interpersonal, and environmental variables were found to predict F&V consumption in line with our expectations based on the social cognitive framework. Self-efficacy levels were associated with higher F&V consumption in both groups, although overall levels of self-efficacy, as measured both by confidence in goal setting and decision-making about healthy eating, were found to be higher in non-minority participants. These data suggest that the minority sample experienced less confidence in their ability to eat in healthy ways, relative to the non-

minority sample. Although a number of studies have emphasized the importance of self-efficacy for healthy eating behaviors in adult samples [19, 35, 36] and primarily non-minority adolescent samples [37-39], to our knowledge few have examined self-efficacy in minority samples [12]. Our data suggests that self-efficacy is a particularly important target for dietary interventions and that future research might investigate ways to promote greater self-efficacy in health promotion programs for diverse groups of adolescents.

For both minority and non-minority youth, greater barriers were associated with less F&V intake, a link reported by others [23, 39], and suggests that decreasing barriers to healthy eating may be an important route to improving eating behaviors. The barriers scale used in this study examined a variety of barriers toward eating fruits and vegetables, some of which were interpersonally-focused (“When I am with friends, eating fruits and vegetables can be embarrassing;” “My family does not like fruit and vegetables”), whereas others were more practically-focused (“Fruits and vegetables are inconvenient to eat”). However, this scale did not specifically examine the multitude of barriers that may make F&V consumption more difficult such as availability and accessibility. Efforts such as those of Rolnick et al. [40] that emphasize a close examination of the barriers to healthy eating will be important to build upon in program development.

Within the minority sample, perceived benefits and barriers, as well as self-efficacy in relation to goal-setting, separated those who ate 5-a-day from those who did not. Previous studies have indicated greater barriers to F&V availability in minority samples [41] and this study confirms those results in a sample of adolescents. The finding that that goal setting (as a component of self-efficacy) was a robust correlate of consumption in minority youth has implications for incorporating this teachable skill when devising F&V promotion programs and has not been reported in earlier studies. A unique contribution of this finding, then, is that including goal-setting as an important component when devising programs for minority youth may be an important avenue toward increasing F&V consumption in this group.

As in previous studies [20, 38, 42], both family and peer support were associated with F&V intake, although only significantly so in the non-minority sample. It is not clear why social support did not predict intake in the minority sample; however, low statistical power may have been an issue in these analyses as indicated by the power analysis results. Efforts to increase peer involvement, specifically, in the encouragement of fruit and vegetable consumption are worthwhile, as it is likely that leveraging support and social accountability may be key factors in promoting health behavior change in this group [43].

Limitations of this study include the single location of schools, the self-reported nature of F&V intake, and the relatively small sample size, particularly for the group who reported higher F&V consumption. Low power for the predictor analyses indicates these findings should be viewed with caution.

Overall, this study highlights the role of self-efficacy in fruit and vegetable consumption for both minority and non-minority youth. Benefits and barriers to healthy eating were associated with intake in both minority and non-minority adolescents. The results of this study have implications for interventions designed to promote healthy eating in youth and suggest that these social-cognitive variables should be included as targets for change, particularly with diverse samples of adolescents.

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Table 1

Participant Characteristics (Means and SD)

Race	N		Age		BMI	
	Boys	Girls	Boys	Girls	Boys	Girls
Caucasian	63	59	15.1 (1.0)	15.1 (1.0)	21.5 (3.1)	20.9 (1.8)
African American	18	43	15.4 (.85)	15.3 (.81)	22.1 (3.2)	23.9 (5.7)
Hispanic	16	21	15.9 (1.5)	15.0 (.62)	24.1 (4.5)	20.9 (2.8)
Bi-racial (Hispanic and African American)	9	18	15.0 (1.3)	15.7 (1.2)	25.3 (6.8)	24.8 (5.8)

Table II
Summary Statistics for Study Variables by Ethnic Status

	Caucasian group Mean (SD) n= 122	Ethnic minority group Mean (SD) n= 125
Age	15.18 (1.01)	15.44 (1.04)
Healthy Eating Decision Making	25.88 (7.6)	23.05 (6.61) **
Healthy Eating Goal Setting	7.15 (1.92)	6.52 (2.02) *
Fruit & Vegetable Barriers	11.15 (3.97)	12.02 (4.25)
Fruit & Vegetable Benefits	21.62 (3.99)	21.19 (4.19)
Appearance Satisfaction	2.60 (0.76)	2.66 (0.91)
Weight Satisfaction	2.56 (0.92)	2.40 (1.02)
Appearance Attribution	2.28 (0.75)	2.40 (0.89)
Peer Social Support	8.77 (3.18)	8.91 (3.18)
Family Social Support	11.48 (2.67)	10.93 (3.44)

*
 $p < .05$

**
 $p < .01$

 $p < .001$

Note: asterisks indicate significant mean differences (t-tests) between the White/non-Hispanic group and the Ethnic minority group.

Table III
Differences between Participants Meeting or not Meeting the 5-a-day Guidelines by Ethnic Status

	Caucasian group		Ethnic minority group	
	5-a-day Mean (SD) n=42	Less than 5 Mean (SD) n= 80	5-a-day Mean (SD) n=35	Less than 5 Mean (SD) n= 90
Healthy Eating Decision Making	27.64 (6.93)	24.96 (7.81)	24.66 (7.43)	22.42 (6.24)
Healthy Eating Goal Setting	7.57 (1.75)	6.93 (1.98)	7.51 (1.75)	6.13 (1.98) ***
Fruit & Vegetable Barriers	9.90 (3.48)	11.81 (4.08) *	10.08 (3.39)	12.76 (4.32) ***
Fruit & Vegetable Benefits	21.88 (5.34)	21.48 (3.10)	23.37 (4.17)	20.34 (3.90) ***
Appearance Satisfaction	2.78 (0.73)	2.50 (0.76)	2.57 (1.03)	2.70 (0.86)
Weight Satisfaction	2.73 (0.95)	2.46 (0.90)	2.37 (1.10)	2.42 (1.00)
Appearance Attribution	2.40 (0.75)	2.22 (0.75)	2.21 (0.96)	2.47 (0.85)
Peer Social Support	9.54 (2.89)	8.38 (3.23)	9.17 (3.62)	8.81 (3.00)
Family Social Support	11.24 (2.58)	11.61 (2.73)	11.80 (3.54)	10.59 (3.37)

* $p < .05$

** $p < .01$

*** $p < .001$

Note: asterisks indicate significant mean differences (t-tests) between participants who met the 5-a-day guidelines were compared to those who ate fewer F&V within each ethnic group.

Table IV
Results from the Logistic Regression Analyses Predicting Consumption of 5 Daily Portions of Fruit and Vegetable

	White/non-Hispanic group						Ethnic minority group					
	β	χ^2	<i>p</i>	Odds Ratio	95% CI	R^2	β	χ^2	<i>p</i>	Odds Ratio	95% CI	R^2
Step1						.05						.00
Gender	.25	.41	<i>ns</i>	1.28	.60-2.70		-.03	.00	<i>ns</i>	.97	.43-2.22	
Step2						.15						.26
Healthy Eating Decision Making	0.00	0.03	<i>ns</i>	1.00	.93-1.09		-.03	0.88	<i>ns</i>	.96	.89-1.04	
Healthy Eating Goal Setting	0.03	0.03	<i>ns</i>	1.03	.74-1.4		0.31	4.23	<.05	1.36	1.02-1.82***	
Fruit & Vegetable Barriers	-.016	4.70	<.05	.85	.74-.96		-.11	2.34	<i>ns</i>	.90	.78-1.03**	
Fruit & Vegetable Benefits	-.06	0.98	<i>ns</i>	.94	.84-1.06		0.14	5.36	<.05	1.16	1.02-1.31*	
Peer Social Support	0.16	3.82	<.05	1.18	1.00-1.4		-.10	1.45	<i>ns</i>	.90	.76-1.06*	
Family Social Support	-.018	4.13	<.05	.83	.70-.99		0.09	1.16	<i>ns</i>	1.09	.93-1.29*	

Note: asterisks indicate significant differences in Odds Ratio between the White/non-Hispanic group and the Ethnic minority group

* $p < .005$
 ** $p < .005$
 *** $p < .001$