



Family and Friend Influences on Fruit and Vegetable Intake in Elementary Aged Children

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Abstract

The purpose of this study was to investigate the eating behaviors and social cognitive factors that affect fruit and vegetable consumption. Strategies to change, pros & cons, enjoyment, family support, and peer influence were measured in children ages 8–10 years both pre- and post- Zest Quest® program (pre: n = 82; post: n = 80). Children for a comparison group were selected from comparable elementary schools and pre- and post- measures were evaluated (pre: n = 92; post: n = 87). Chi-squared analyses were conducted on individual measures and Spearman correlations & linear regression were used for composite variables with fruit and vegetable consumption as the dependent variable. Results from the study demonstrated significant moderate correlations for fruit change strategies pre- ($r_s = 0.39$) and post-intervention ($r_s = 0.33$) and vegetable change strategies pre-intervention ($r_s = 0.42$) in the Zest Quest® group. Peer influence ($r_s = 0.33$) and enjoyment ($r_s = 0.38$) showed significant moderate correlations with fruit intake in the comparison group. The regression analysis showed pros ($\beta = 0.24$, p value 0.05) and cons ($\beta = 0.14$, p value 0.05) to be significant predictors for fruit intake post-intervention in the Zest Quest® group. Prior to the intervention, strategies to change ($\beta = 0.10$, p value 0.02) was a significant predictor for fruit intake and cons ($\beta = 0.15$, p value = 0.03) for vegetable intake in this group. Family support and peer influence were not significant in the regression models, but demonstrated significance in the crude model. Eating behaviors and social cognitive factors may have an effect on fruit and vegetable consumption, but these measures are difficult to capture. Future research should continue exploring the impact of family support and peer influence on fruit and vegetable intake.

Keywords Social support · Family · Friend · Peer · Elementary children · Nutrition · Fruit · Vegetable · School health · Intervention

Introduction

Diet is a major factor affecting the health of children and adolescents. Poor eating patterns during childhood are a significant contributor to childhood obesity, chronic diseases that originate in childhood, and diseases that emerge later in life [1]. In 2012, there were 17% of children and adolescents in the United States classified as obese [2]. Obesogenic behaviors in childhood are often demonstrated as adults, thus bringing along increased risks for many chronic conditions, including diabetes, stroke, heart disease, arthritis, and

certain types of cancer. South Carolina consistently ranks in the top ten for child obesity in the United States. In 2012, 28% of children ≤ 5 years and 31.7% of adolescents in South Carolina were either overweight or obese [3].

In recent years, the diet quality of children and adolescents has not reached USDA recommendations [4]. According to the United States Department of Health and Human Services guidelines, two or more servings of fruits and three or more servings of vegetables should be consumed daily [4]. However, a previous South Carolina survey suggests that only 25.2% and 9.8% of adolescents met the fruit and vegetable daily servings in 2016, respectively [3]. These low rates of fruit and vegetable consumption reflect the child and adolescent obesity epidemic in South Carolina.

Obesity and obesogenic behaviors, such as overeating, sedentary time, and lack of physical activity, tend to cluster in youths' peer networks [5]. Peer networks are the groups of people that children interact with on a day-to-day

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basis, in settings such as school, after-school programs, and church youth groups. Previous research suggests that in the presence of others, individuals tend to eat a greater quantity than when eating alone. In fact, when eating behavior during snack time was observed, children ate more rapidly and consumed a greater amount of food while surrounded by their peers when compared to eating by themselves [6]. Since overweight youth tend to be friends with other overweight youth, overconsumption is perpetuated in their peer groups when eating together [5].

According to Birch [7], eating is a social experience and the behaviors of others can have an impact on the food preferences of children. Previous research suggests that modeling can be a powerful process for contexts in which children acquire complex behaviors, such as healthy eating (i.e., fruit and vegetable intake). For example, research suggests that mothers may be more successful in changing the willingness of a child to eat a new food than when strangers modeled the same behavior. Children were also more likely to eat a new food when they observed another person eating the same food [7].

The fear of new foods may be an important limiting factor in fruit and vegetable intake [8]. Children who are hesitant to try new foods generally consume fewer fruits and vegetables. However, a child's repeated exposure to unfamiliar foods and family influence (i.e., child observes a parent eating an unfamiliar food) can help a child overcome their dislike for these foods. If a child observes their parent eating an unfamiliar food during mealtime, the child is more likely to sample that food. According to Patrick and Nicklas [8], children who eat meals with other family members consume healthier foods and children who have companionship during meal-times tend to eat more servings of basic food groups, such as fruits and vegetables. Specifically, group eating as a family is positively associated with fruit and vegetable intake, in addition to the intake of other key food groups and nutrients [9].

Patrick and Nicklas [8] also suggest that fruit and vegetable intake in children is higher when foods are readily prepared and accessible. Children are more likely to eat foods that have been prepared into age-appropriate sizes and are ready to be eaten. Fruit and vegetable consumption may be positively associated with ease of preparation. For example, Cullen et al. [10] demonstrated a positive association between fruit and vegetable accessibility and consumption in a focus group of fourth to sixth grade children in the southeastern United States. These researchers found that the preference for fruits and vegetables was a strong predictor for consumption when the foods were readily available, suggesting that children who already preferred fruits and vegetables would consume these food groups if they were accessible in the home [10].

The attitudes and behaviors of peers have a significant influence on the eating behaviors of children and adolescents

[11]. Youth spend a substantial amount of time with friends and other peers where they socialize and participate in recreation. Specifically, one of the most important forms of socialization and recreation is eating. Since children and adolescents in particular strive for peer approval, peer influence and group conformity are especially important determinants of food choice for these age groups [12]. Similarities among friends in the consumption of calorically dense foods may be partially demonstrated by social influence, such as modeling their friends' dietary behaviors in order to fit into a peer group [13]. Additionally, environmental influence and other opportunities that engage a child in a specific set of eating patterns and behaviors could influence dietary decisions. To demonstrate how social influence can affect eating behavior, Birch [7] found that children who were exposed to peers with food preferences different from their own immediately showed a higher preference for those foods. Further, the children who were younger than the peers exhibited more change in preference than children who were older than the influencing peers. Birch [7] also suggested that preschoolers' food choices, preferences, and consumption patterns are all strongly influenced by their peers. For example, preschool children exposed to peer modeling for a non-preferred food positively changed their outlook and tolerance for this food. In this group of children, increased food preference remained even weeks after exposure to peer modeling. Therefore, group eating and repeated exposure to non-preferred foods, such as certain fruits and vegetables, could result in greater acceptance and increased consumption.

The purpose of this study is to investigate the eating behaviors and the social cognitive factors that affect fruit and vegetable consumption in Upstate South Carolina elementary school children. This research is part of an evaluation conducted on the Zest Quest® wellness program and assesses the role of social support (i.e., family and friends), pros and cons, change strategies, and enjoyment in increasing fruit and vegetable consumption for elementary children.

Methods

The Zest Quest® program is an educational health initiative encouraging kids to adopt healthy lifestyle choices. The program is collaborative and involves elementary school children, their families, faculty and staff, and the community. The mission of Zest Quest® is to create an environment that educates and inspires children and their communities to lead physically, emotionally, and intellectually healthier lifestyles [14]. The present study measured the social cognitive factors affecting the eating behaviors, specifically fruit and vegetable intake, among elementary school aged children through an evaluation of the Zest Quest® program during the 2008–2009 school year. The Zest Quest® program

was delivered at four elementary schools (pre: $n=82$; post: $n=80$) in Upstate South Carolina fewer than 75 miles from Clemson University and four elementary schools served as the comparison (pre: $n=92$; post: $n=87$). The comparison schools were similar to the treatment with regards to basic demographic information.

Baseline and post-intervention self-reported survey data were collected on fourth and fifth grade students at the beginning and the end of the school year. Data that were collected included anthropometric measures (i.e., height, weight, and body mass index), frequency of fruit and vegetable consumption (i.e., cups equivalent for fruits and vegetables), frequencies and quantities for specific fruits and vegetables (i.e., apple or green bean frequencies and quantities), and social cognitive measures related to fruit and vegetable consumption. The social cognitive measures were separated into categories that included fruit and vegetable change strategies (i.e., I set goals to eat at least five servings of fruits and vegetables per day), pros (i.e., I think I would have more energy if I ate fruits and vegetables) and cons (i.e., I am embarrassed when other kids see me eating fruits and vegetables), family support (i.e., I can ask someone in my family to buy my favorite fruit or vegetable), peer or friend influence (i.e., my friends encourage me to eat fruits and vegetables), and enjoyment of fruits and vegetables (i.e., I enjoy eating fruits and vegetables). These psychosocial variables of the students' attitudes and confidence in their ability to perform a behavior were measured by answering each question with a response of either not like me, a little like me, or a lot like me.

Stata v. 14 was used to conduct the analyses for this study, which included descriptive statistics, linear regressions, Chi square analyses, and Spearman correlations. Descriptive statistics report basic demographic information, including age, gender, ethnicity, body mass index, and total consumption for fruits and vegetables for both the treatment and comparison groups. Linear regression used the composite scores from the social cognitive survey to estimate the effect on the total amount of fruit and vegetables self-reported by each child. The independent variables, suggested by Hagler, Norman, Radick, Calfas, and Sallis [15], included fruit and vegetable change strategies, pros and cons, family support, peer or friend influence, and enjoyment. The dependent variables included fruit only consumption, vegetable only consumption, and the combined consumption of fruits and vegetables (all measured in cups). For the Chi square analyses, the responses for the psychosocial measures were dichotomized. From the three response options measuring each psychosocial variable, "a little like me" and "a lot like me" were collapsed into one response to yield the equivalent of a positive response. Further, fruit and vegetable consumption measured in cups equivalent were dichotomized into either meets current recommendations (i.e., 2 cups fruit, 3

cups vegetables) or does not meet current recommendations. Combined fruit and vegetable intake was dichotomized similarly if the child met both the recommendations for fruit and vegetables separately. Spearman correlations were also conducted for the psychosocial composite measures and fruit and vegetable intake measured in cups equivalent. A p value less than or equal to 0.05 indicated significant findings for all three analyses. This research was approved by the Clemson University Institutional Review Board and both parental consent and child assent were obtained prior to a child being considered for the research study.

Results

Basic demographic information, including gender, age, race, body mass index (BMI), and fruit and vegetable consumption, is presented in Table 1. Students receiving the Zest Quest® intervention were 52% female, 9.82 ± 0.70 years old, and predominately white (65%) with an average BMI of 20.75 ± 5.23 kg/m², an average fruit intake of 2.14 ± 1.42 cups, and an average vegetable intake of 1.34 ± 1.15 cups before the Zest Quest® intervention. The comparison was similar to the Zest Quest® group, with students being 51% female, 10.03 ± 0.75 years old, and 66% white with an average BMI of 20.39 ± 4.79 . Fruit and vegetable consumption were slightly lower than the Zest Quest® group, with an average fruit intake of 1.75 ± 1.36 cups and an average vegetable intake of 1.05 ± 0.90 cups.

Results from the linear regression are presented in Table 2 for the Zest Quest® intervention group and Table 3 for the comparison. For each group, there were a total of six linear regressions used to examine the effect of the composite scores from the psychosocial factors on fruit, vegetable, and combined fruit and vegetable intake, both pre and post intervention (i.e., school year). There were no significant findings in any of the regressions for the comparison; however, significant results emerged from the Zest Quest® intervention group. For fruit intake, change strategies was significant prior ($\beta=0.10$, p value 0.02), but not after ($\beta=-0.01$, p value 0.87) the intervention. Fruit and vegetable pros ($\beta=0.24$, p value 0.05) and cons ($\beta=0.14$, p value 0.05) were significant post-intervention, but not pre-intervention. Additionally, fruit and vegetable cons were significant pre-intervention for vegetables ($\beta=0.15$, p value 0.03) and post-intervention for fruit and vegetables combined ($\beta=0.22$, p value 0.04).

After running the Pearson Chi square test of independence between dichotomized psychosocial measures and dichotomized fruit and vegetable intake responses, there were several significant correlations that were found for the Zest Quest® intervention, but not the comparison group (Tables 4, 5). Prior to the intervention, change strategies

Table 1 Demographics

		Zest Quest® Program		Comparison	
		Pre (n = 82)	Post (n = 80)	Pre (n = 92)	Post (n = 87)
Gender					
Male	N (%)	39 (48%)	38 (48%)	45 (49%)	41 (47%)
Female		43 (52%)	42 (52%)	47 (51%)	46 (53%)
Age	Mean ± SD	9.82 ± 0.70	9.80 ± 0.70	10.03 ± 0.75	10.05 ± 0.75
Race					
White		54 (65%)	52 (65%)	61 (66%)	61 (70%)
Black	N (%)	8 (10%)	7 (9%)	14 (15%)	12 (14%)
Hispanic		12 (15%)	12 (15%)	12 (13%)	9 (10%)
Other		8 (10%)	9 (11%)	5 (6%)	5 (6%)
BMI (kg/m ²)	Mean ± SD	20.75 ± 5.23	20.80 ± 5.04	20.39 ± 4.79	20.71 ± 5.45
BMI category					
Underweight		2 (2%)	0 (0%)	3 (3%)	0 (0%)
Healthy weight	N (%)	54 (66%)	48 (60%)	55 (60%)	50 (57%)
Overweight		8 (10%)	14 (17%)	19 (21%)	19 (22%)
Obese		18 (22%)	18 (23%)	15 (16%)	18 (21%)
Fruits (cups)	Mean ± SD	2.14 ± 1.42	1.91 ± 1.50	1.75 ± 1.36	1.53 ± 1.07
Vegetables (cups)	Mean ± SD	1.34 ± 1.15	0.89 ± 0.93	1.05 ± 0.90	0.84 ± 0.84

Table 2 Linear regression for the cups equivalent of fruits, vegetables, or fruits and vegetables (Zest Quest® intervention)

	Fruits		Vegetables		Fruits and vegetables	
	Pre (n = 81)	Post (n = 69)	Pre (n = 81)	Post (n = 69)	Pre (n = 81)	Post (n = 69)
	β	p value	β	p value	β	p value
Gender						
Male	Reference		Reference		Reference	
Female	0.39	0.23	-0.09	0.82	-0.001	0.99
Age	-0.13	0.58	-0.30	0.28	-0.15	0.43
Race						
White	Reference		Reference		Reference	
Black	0.93	0.07	0.06	0.90	0.35	0.48
Hispanic	0.42	0.36	-0.26	0.52	-0.04	0.91
Other	1.47	0.01	1.36	0.02	0.03	0.94
BMI-Z	0.01	0.95	-0.07	0.59	-0.06	0.63
FV change	0.10	0.02	-0.01	0.87	0.07	0.40
FV pros	-0.04	0.76	0.24	0.05	0.04	0.69
FV cons	0.06	0.43	0.15	0.03	0.02	0.08
FV family	0.02	0.85	0.02	0.85	0.02	0.81
FV friend	0.06	0.44	0.04	0.67	-0.09	0.77
FV enjoy	-0.23	0.50	0.13	0.74	-0.18	0.74

Significant values (p<0.05) are in bold

and cons were significantly related to fruit consumption. For example, when asked to respond to “I am embarrassed when other kids see me eating fruits and vegetables,” 30.9% ($\chi^2=5.38$, p value 0.02) responded with a positive response (i.e., not like me) and met the recommended fruit intake. Similarly, when asked to respond to “I think more about

the positive benefits of eating fruits and vegetables and less about healthy eating negatives, 45.7% ($\chi^2=4.48$, p value 0.03) responded positively (i.e., a little or a lot like me) and met the fruit recommendations. Further, prior to the intervention in the Zest Quest® group, peer influence was significantly related to vegetable and combined fruit

Table 3 Linear regression for the cups equivalent of fruits, vegetables, or fruits and vegetables (comparison)

	Fruits				Vegetables				Fruits and vegetables			
	Pre (n=92)		Post (n=84)		Pre (n=92)		Post (n=84)		Pre (n=92)		Post (n=84)	
	β	p value	β	p value	β	p value	β	p value	β	p value	β	p value
Gender	Reference				Reference				Reference			
Male	Reference				Reference				Reference			
Female	0.28	0.38	0.30	0.20	-0.34	0.09	-0.11	0.59	-0.06	0.89	0.20	0.58
Age	-0.07	0.71	0.16	0.31	-0.05	0.68	0.05	0.72	-0.13	0.66	0.21	0.38
Race	Reference				Reference				Reference			
White	Reference				Reference				Reference			
Black	0.48	0.27	0.33	0.35	-0.04	0.89	0.40	0.18	0.45	0.47	0.73	0.18
Hispanic	0.66	0.16	0.25	0.55	0.26	0.37	0.43	0.22	0.93	0.17	0.68	0.29
Other	0.26	0.69	0.15	0.80	-0.59	0.16	-0.07	0.89	-0.33	0.73	0.08	0.93
BMI-Z	0.15	0.31	-0.08	0.51	0.14	0.13	-0.11	0.27	0.29	0.17	-0.19	0.30
FV change	0.01	0.75	0.02	0.52	-0.03	0.20	0.03	0.26	-0.02	0.73	0.05	0.30
FV pros	0.01	0.88	0.07	0.38	0.08	0.14	0.04	0.53	0.10	0.45	0.11	0.36
FV cons	-0.04	0.67	0.04	0.42	0.05	0.38	0.02	0.69	0.01	0.93	0.06	0.45
FV family	0.05	0.61	0.01	0.91	-0.004	0.95	0.01	0.85	0.05	0.74	0.02	0.86
FV friend	-0.06	0.51	0.08	0.27	0.06	0.23	0.01	0.84	0.01	0.94	0.09	0.40
FV enjoy	0.45	0.16	0.31	0.19	0.29	0.15	-0.04	0.84	0.74	0.11	0.27	0.45

Table 4 Chi-Squared tests for dichotomized individual level measures (Zest Quest® intervention)

Individual measure	Fruit N (%)		Vegetable N (%)		Fruit and Vegetable N (%)	
	Pre (N=81)	Post (N=78)	Pre (N=81)	Post (N=78)	Pre (N=53)	Post (N=49)
A friend or family member encourages me to eat more F&V	36 (44.4%)	30 (38.5%)	11 (13.6%)	3 (3.8%)	10 (18.9%)	3 (6.1%)
Think more about the positive benefits of eating F&V, and less about healthy eating negatives	37 (45.7%)*	30 (44.1%)	11 (13.6%)	3 (3.8%)	10 (18.9%)	3 (6.1%)
I am embarrassed when other kids see me eating F&V	12 (14.8%)*	8 (10.3%)	4 (4.9%)	3 (3.8%) [†]	3 (5.7%)	3 (6.1%) [†]
I think my parents are happy when I eat F&V	37 (45.7%)	31 (39.7%)	11 (13.6%)	3 (3.8%)	10 (18.9%)	3 (6.1%)
During a typical week...	Pre (N=81)	Post (N=69)	Pre (N=81)	Post (N=69)	Pre (N=53)	Post (N=44)
A member of my household encourages me to eat F&V	34 (42.0%)	26 (37.7%)	8 (9.9%)	3 (4.3%)	8 (15.1%)	3 (6.8%)
A member of my household provides me with F&V as a snack or part of a meal	36 (44.4%)	28 (40.6%)	9 (11.1%)*	3 (4.3%)	9 (17.0%)	3 (6.8%)
A member of my household eats F&V with me	35 (43.2%)	–	10 (12.3%)	–	9 (17.0%)	–
My friends encourage me to eat F&V	31 (38.3%)	22 (31.9%)	11 (13.6%)*	3 (4.3%)	10 (18.9%)*	3 (6.8%)
My friends eat F&V with me	32 (39.5%)	25 (36.2%)	10 (12.3%)	3 (4.3%)	9 (17.0%)	3 (6.8%)
I enjoy eating fruits and vegetables	36 (44.4%)	27 (39.1%)	9 (11.1%) [†]	3 (4.3%)	9 (17.0%)*	2 (3.4%)

Individual measures: answered either “a little like me” or “a lot like me” F&V: Fruits and Vegetables

Fruit: ≥ 2 cups per day Vegetables: ≥ 3 cups per day Fruit & Vegetables: ≥ 2 cups fruit & ≥ 3 cups vegetables

*p value < 0.05

[†]p value < 0.01

and vegetable consumption. For example, the question “My friends encourage me to eat fruits and vegetables” led to a positive response (i.e., a little or a lot like me) in 13.6% ($\chi^2=4.46$, p value 0.04) and 18.9% ($\chi^2=4.87$, p value 0.03) of children who met the vegetable and combined fruit and

vegetable guidelines, respectively. Meeting the combined fruit and vegetable guidelines and a positive response to peer encouragement was also significant in the comparison group with 6.7% of children responding positively and meeting the recommendations ($\chi^2=3.75$, p value 0.05). Family influence

Table 5 Chi-Squared tests for dichotomized individual level measures (comparison)

Individual measure	Fruit N (%)		Vegetable N (%)		Fruit and Vegetable N (%)	
	Pre (N=92)	Post (N=86)	Pre (N=92)	Post (N=86)	Pre (N=60)	Post (N=60)
A friend or family member encourages me to eat more F&V	30 (32.6%)	25 (29.1%)	4 (4.4%)	3 (3.5%)	10 (16.7%)	2 (3.3%)
Think more about the positive benefits of eating F&V, and less about healthy eating negatives	31 (33.7%)	24 (27.9%)	2 (2.2%)	3 (3.5%)	2 (3.3%)	2 (3.3%)
I am embarrassed when other kids see me eating F&V	8 (8.7%)	12 (14.0%)*	0 (0.0%)	1 (1.2%)	0 (0.0%)	1 (1.7%)
I think my parents are happy when I eat F&V	35 (38.0%)	27 (31.4%)	4 (4.4%)	3 (3.5%)	4 (6.7%)	2 (3.3%)
During a typical week...	Pre (N=92)	Post (N=86)	Pre (N=92)	Post (N=86)	Pre (N=60)	Post (N=60)
A member of my household encourages me to eat F&V	31 (33.7%)	24 (28.0%)	4 (4.3%)	3 (3.5%)	4 (6.7%)	2 (3.3%)
A member of my household provides me with F&V as a snack or part of a meal	34 (37.0%)	26 (30.2%)	4 (4.3%)	2 (2.3%)	4 (6.7%)	1 (1.7%)
A member of my household eats F&V with me	33 (35.9%)	–	4 (4.3%)	–	4 (6.7%)	–
My friends encourage me to eat F&V	23 (25.0%)	18 (20.9%)	4 (4.3%)	3 (3.5%)	4 (6.7%)*	2 (3.3%)
My friends eat F&V with me	30 (32.6%)	24 (27.9%)	4 (4.3%)	3 (3.5%)	4 (6.7%)	2 (3.3%)
I enjoy eating fruits and vegetables	35 (38.0%)	25 (29.8%)	4 (4.3%)	3 (3.6%)	4 (6.7%)	2 (3.3%)

Individual measures: answered either “a little like me” or “a lot like me” F&V: Fruits and Vegetable

Fruit: ≥ 2 cups per day Vegetables: ≥ 3 cups per day Fruit & Vegetables: ≥ 2 cups fruit & ≥ 3 cups vegetables

*p value < 0.05

†p value < 0.01

and enjoyment was also found to be significantly related to vegetable intake prior to the intervention in the Zest Quest® group. When prompted with the statement, “A member of my household provides me with fruits and vegetables as a snack or part of a meal,” there were 11.1% ($\chi^2=4.76$, p value 0.03) who indicated a positive response (i.e., a little or lot like me) and met the vegetable guidelines. Similarly, 11.1% ($\chi^2=13.05$, p value < 0.001) also met the guidelines and positively responded to “I enjoy eating fruits and vegetables.” Post-intervention results showed similar significant findings in the Zest Quest® group for cons and peer influence. For example, the statement focused on fruit and vegetable cons (i.e., embarrassed to eat fruits and vegetables in front of peers) yielded significant findings for vegetable ($\chi^2=9.69$, p value < 0.01) and combined fruit and vegetable

($\chi^2=7.99$, p value < 0.01) intake post-intervention in the Zest Quest® group. Significant findings also emerged for cons in the comparison group for fruit intake ($\chi^2=6.29$, p value 0.01). There were no other significant findings post-intervention for either group.

Spearman analyses yielded small to medium correlations of the composite scores for fruit and vegetable change strategies, pros and cons, family support, peer influence, and enjoyment (Tables 6, 7). For the Zest Quest® group, significant moderate correlations existed for change strategies for fruit both pre ($r_s=0.39$, p value < 0.001) and post-intervention ($r_s=0.33$, p value < 0.01), vegetables pre-intervention ($r_s=0.33$, p value < 0.01), and combined fruits and vegetables pre-intervention ($r_s=0.43$, p value < 0.001). Similarly, the comparison group showed significant moderate

Table 6 Spearman correlations (SC) for composite measures and cups equivalent for the consumption of fruits, vegetables, and both (Zest Quest® intervention)

Measures	Fruits		Vegetables		Fruits and vegetables	
	Pre	Post	Pre	Post	Pre	Post
BMI-Z	0.06	−0.11	−0.02	0.003	0.03	−0.08
FV change	0.39†	0.33†	0.33†	0.15	0.43†	0.29*
FV pros	0.01	0.27*	0.11	0.16	0.05	0.25*
FV cons	0.13	0.003	0.14	0.11	0.17	0.03
FV family	0.19	0.22	0.26*	0.07	0.22*	0.18
FV friend	0.21	0.26*	0.21	0.14	0.21	0.24*
FV enjoy	0.14	0.17	0.20	0.01	0.15	0.12

*p value < 0.05

†p value < 0.01

Table 7 Spearman correlations (SC) for composite measures and cups equivalent for the consumption of fruits, vegetables, and both (comparison)

Measures	Fruits		Vegetables		Fruits and vegetables	
	Pre	Post	Pre	Post	Pre	Post
BMI-Z	0.09	−0.13	0.09	−0.17	0.12	−0.14
FV change	0.18	0.36 [†]	0.15	0.26*	0.19	0.39 [†]
FV pros	0.22*	0.39 [†]	0.24*	0.28*	0.24*	0.42 [†]
FV cons	−0.12	−0.18	0.09	−0.12	−0.02	−0.20
FV family	0.24*	0.28 [†]	0.21*	0.11	0.24*	0.29 [†]
FV friend	0.13	0.33 [†]	0.22*	0.25*	0.17	0.36 [†]
FV enjoy	0.30 [†]	0.38 [†]	0.24*	0.22*	0.31 [†]	0.40 [†]

*p value < 0.05

[†]p value < 0.01

correlations for change strategies post-intervention for both fruit ($r_s = 0.36$, p value < 0.001) and combined fruit and vegetable ($r_s = 0.39$, p value < 0.001) intake. Moderate post-intervention correlations also existed for pros, peer influence, and enjoyment for fruits and combined fruits and vegetables in the comparison group (reported in Table 7).

Discussion

Results of this study demonstrated that change strategies, pros, and cons may be important in predicting fruit and vegetable consumption in children. Assessing strategies to change along with the benefits or barriers to eating fruits and vegetables may be important strategies when designing school-based interventions. Peer and family influence are also important variables to consider when evaluating fruit and vegetable intake in children. Our study showed low to moderate positive correlation between peer and family influence with fruit and vegetable intake, but results were not significant in our regression model after adjusting the model for change strategies, pros and cons, and demographic characteristics. However, when considering a crude regression model for peer influence and family support, there was a significant relationship for fruit intake (no table). For example, post-intervention family support had a significant influence on fruit intake in both the Zest Quest® ($\beta = 0.20$, p value 0.05) and comparison group ($\beta = 0.13$, p value 0.02). Additionally, post-intervention peer influence had a significant relationship to fruit intake in both the Zest Quest® ($\beta = 0.18$, p value 0.02) and comparison group ($\beta = 0.15$, p value < 0.01). This relationship was not significant in the crude model for vegetable intake. Pedersen et al. [11] suggest that parents are one of the main influencers for fruit and vegetable intake in children and adolescents. They propose that healthy eating interventions for children and adolescents should focus on increasing self-efficacy, including the family in interventions, and reinforcing the parents' awareness of their influence on their children's healthy eating behavior.

In order to encourage fruit and vegetable intake in young children, parents or teachers should provide repeated opportunities to try new fruits and vegetables along with enthusiastically modeling consumption themselves. Young children are highly influenced by adult dietary behaviors [16]. In a systematic review, Pearson, Biddle, and Gorely [17] found positive associations between home availability, family rules, and parental encouragement on children's fruit and vegetable consumption. There were also positive associations between parental occupational status and adolescent fruit consumption. In the present study, our evaluation team did not collect information around parental occupational status, but there were questions on parental encouragement and home availability in the composite family support variable. For example, the children were all asked to select one of three choices, including not like me, a little like me, or a lot like me for the statements, "during a typical week a member of my household encourages me to eat fruits and vegetables" and "during a typical week a member of my household provides me with fruits and vegetables as a snack or part of a meal." Shared family meals, nutritional knowledge, and self-efficacy may also be important factors in influencing healthy eating behaviors among children and adolescents [18]. Previous research suggests a decreased likelihood to report poor consumption of fruits and vegetables if the child eats four or five family meals per week when compared to three or fewer family meals. Further, increasing meals to six or seven family meals had even lower odds of poor fruit and vegetable consumption [19]. Ultimately, the parents are responsible for making healthy food items, such as fruits and vegetables, available and accessible to the child while encouraging him or her to make healthy food choices [18].

In addition to family support, peer influence increases as a child ages and moves from childhood to adolescence. Children may be influenced by their friends, family of their friends, or other people they interact with on a daily basis, such as teachers or staff members at their school. By eating a healthy lunch with students or speaking with them about healthy choices, teachers or staff may directly

influence fruit and vegetable intake [16]. According to a quantitative literature review conducted by Rasmussen et al. [18], previous studies found positive associations between perceived friend dietary intake and fruit or vegetable consumption, but strong evidence is lacking. Peer social influences on fruit and vegetable intake refers to the impacts that one or more friends have on a child's eating behavior. This impact may be direct or indirect and conscious or subconscious. Quantifying these social factors is difficult because the influences may differ by person, vary by time frames, and children are generally unaware of the social influences impacting their eating choices [12]. Nonetheless, social influence by peer pressure may be one mechanism for transmitting group norms and could affect healthy eating choices [20]. In the present study, our investigative team found small to moderate correlations between peer influence and fruit vegetable intake, which aligns with previous research and may be due to the difficulty quantifying social influence.

This study builds upon prior research by further examining the effect of social cognitive factors on fruit and vegetable consumption in elementary children. Although there were significant findings for change strategies, pros, and cons, our analysis failed to detect any significant relationship between family support and peer influence in our model. However, significant weak to moderate correlations exist between these social cognitive factors and fruit vegetable consumption, so it may be important for future research to continue examining these relationships. Our study was limited by a small to medium sample size with approximately 80 children in the intervention and comparison groups. Another study limitation is that using self-report survey measures from the children may not fully capture the context of the social cognitive factors that affect fruit and vegetable consumption. Our answer choices, not like me, a little like me, and a lot like me, were simple for the children to respond but may be limiting in measuring social cognitive influence. Further, the composite scores for family support and peer influence consisted of four and three measures, respectively, for fruit and vegetable consumption. Since the overall Zest Quest® evaluation measured physical activity, sedentary time, fruit and vegetable consumption, screen time, and low-fat dietary intake and also focused on change strategies, pros and cons, and enjoyment, the measures for fruit and vegetable family support and peer influence were limited to only a few questions. Additional research focusing on peer influence and family support should be explored. Finally, the length of time between the pre and post measures (i.e., an academic calendar year) may not be enough time to see significant positive outcomes for peer and family influence on fruit and vegetable consumption. Repeated exposure to new fruits and vegetables along with more guidance in changing family practices may be needed for long-term changes.

Conclusion

Social cognitive factors, such as peer influence and family support, may positively influence fruit and vegetable consumption in children. The results of this study present non-significant evidence after controlling for demographic characteristics, body mass index, change strategies, and perceived pros & cons for eating fruits and vegetables. However, upon examining the crude regression models, chi-squared analysis, and Spearman correlations, we found that our study did show that peer influence and family support affects fruit and vegetable intake. Future research should focus more on these social cognitive factors to determine their relationship with fruit and vegetable consumption.

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Compliance with Ethical Standards

Conflict of interest The authors have no conflicts of interest to report.

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