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The Impact of Combining Nutrition Education with Active Choice on the Fruit and Vegetable Consumption Among Second Grade Students

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Abstract

Daily intake of fruits and vegetables provides the basis for healthy nutrition. Yet low consumption of fruits and vegetables (FV) persists among school-aged children. Framed by the Social Cognitive Theory, this study aimed to determine the effectiveness of nutrition lessons combined with an active choice intervention on children's FV consumption. Using a quasi-experimental design, 89 second graders were assigned to groups. Students in the experimental group (n=46) received four nutrition lessons combined with nine active choice sessions, while those in the control group (n=43) received active choice sessions only. Responses to pre- and post-intervention surveys that inquired FV knowledge and consumption were compared within and between groups using independent and paired t-tests. Empowered by improved knowledge, self-efficacy and the positive environment created through nutrition lessons and active choice, the experimental group showed improvement in consumption behavior compared to the control group at post-intervention: bringing FV to school and finish eating (69.7 vs. 51.2, p=.05 for fruits; 43.5 vs. 39.5, p=.41 for vegetables); like choosing FV (84.8 vs. 65.1, p=.01); like to eat more FV (80.4 vs. 62.8, p=.16); FV are healthy (100 vs. 95.3, p=.14). The magnitude of improvement is small yet consistent in every aspect of outcome measures. Combining nutrition education with the active choice component showed potential for a larger impact on behavior change among study participants. Parental support and community involvement could enhance the effectiveness of nutrition education in schools.

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Introduction

Childhood obesity is a national concern, with 13.9% of 2- to 5-year olds classified as obese[1]. It is not surprising that the consumption of fruits and vegetables among younger populations is considerably lower than the guidelines provided by the United States Department of Agriculture (USDA)[2]. Data from the 2009-2010 National Health and Nutrition Examination Survey revealed that while many youth consume some fruits and vegetables daily, they often do not meet the USDA guidelines[2]. For children facing food insecurity, access to convenient and affordable fruits and vegetables is particularly important[3].

With the rise of dual-working households, teaching children proper nutrition education is a shared responsibility between the school and within the home[4]. The type of food children consume is important to address, as a previous study disclosed that French fries represented nearly 25% of their vegetable intakes[4,5]. Research has indicated dietary habits adopted in childhood will likely continue through adulthood[6]. Therefore, it is imperative to expose children to a variety of fruits and vegetables at a young age to decrease the neophobic tendencies of trying new foods as they get older.

Recent studies provide overwhelming evidence that students learn best when they are actively engaged and play a major role in the learning process, as demonstrated in the Active Learning Model[7-9]. It has been demonstrated that students engaged in active learning lessons, generally understand and apply the learned concepts throughout their lives[8]. Engaging in an active learning environment can result in a sense of motivation, pride, and independence that can positively affect behavior [9]. Unfortunately, this approach has not been embraced within the traditional learning models implemented in many American schools and universities. In order to provide experiential learning, which involves learning through doing, novel active learning programs have been similarly designed around learning models suggested in the Confucian proverb: "I hear and I forget, I see and I remember, I do and I understand" [10].

This study was framed under the Social Cognitive Theory (SCT). A central construct is reciprocal determinism, reflecting a dynamic interaction among personal factors, behavior, and the environment[11,12]. There is an emphasis on social influences while highlighting both external and internal reinforcements. Reinforcements, expectations and expectancies can influence whether individuals engage in a particular behavior[13]. When SCT is applied in education, the teacher is merely a facilitator. The students are actively engaged and take actions in various ways [8]. To date, few studies have looked at SCT applied in an active learning environment as a means to increase the consumption of fruits and vegetables during lunchtime through an active choice intervention.

The purpose of this study was to determine whether nutritional lessons in addition to an active choice intervention were a significant factor in increasing students' consumption of fruits and vegetables compared to engaging empowerment selectively through exposure, environment, and active choice to create behavior change.

Methods

Study Design

Using a quasi-experimental design, this study was conducted in one elementary school, located in a suburban town in northern New Jersey. The investigation targeted the second graders in the school. Second grade was chosen because this is when students begin learning about healthy eating based on the school's health curriculum. Among the four classes of second graders, two classes were divided into the experimental group and the remaining two classes were designated as the control group. The experimental group received both nutritional lessons on the importance of fruits and vegetables and participated in an active choice intervention during lunchtime, whereas the control group participated in the active choice intervention only (using the active learning model). Each of the theory constructs was addressed in the nutrition lessons as well as in active choice intervention (Table 1) [14].

A pre- and post-intervention survey was administered to determine if there were any significant changes in the overall fruit and vegetable consumption behavior within and between groups. The survey contained basic demographic questions as well as

Table 1. Social Cognitive Theory and Connection to Intervention

Construct	Definition	Connection to Intervention
Reciprocal Determinism	The dynamic and reciprocal interaction of person (individual with a set of learned experiences), environment (external social context), and behavior (responses to stimuli to achieve goals)	Lessons 2 and 4 Active Choice
Behavioral Capability	A person's actual ability to perform a behavior through essential knowledge and skills	Lessons 1to 4 Active Choice
Observational Learning	The ability to reproduce an action after witnessing and observing the behavior performed by others	Lessons 1 to 4 Active Choice
Reinforcements	The internal or external responses to a person's behavior that affect the likelihood of continuing or discontinuing the behavior	Lessons 2 and 3 Active Choice
Expectations	The anticipated consequences of a person's behavior	Lessons 1 to 4 Active Choice
Self-efficacy	The level of a person's confidence in his or her ability to successfully perform a behavior	Lessons 1 to 4 Active Choice

[14] Bandura A. (1986). *Social Foundations of Thought and Action.* Englewood Cliffs, NJ: Prentice-Hall.

questions about fruits and vegetables. Students were asked about their preferences, opinions, and consumption behaviors: e.g. frequency of bringing fruits and vegetables to school, whether they consume their home-brought fruit and/or vegetable, and whether they selected fruit or vegetable during the lunchtime active choice intervention.

The study took place between February and April 2016. The study protocol was a combination of different investigations adapted from previous research[6-8]. The present study offered an intervention design that combined the SCT constructs and Active Choice principles to increase fruit and vegetable consumption behavior, as opposed to previous research lacking theoretical frames. The Superintendent of Schools and the elementary school's principal gave permission for this study, and the Institutional Review Board approved the protocol. Parental consent and child assent forms were completed before the study began. Parents were instructed to disclose any fruit or vegetable allergies their child may have. Particular items of produce were excluded during the intervention for very few students that had allergies to these fruits or vegetables.

Active Choice Intervention During Lunchtime

Both the experimental and control groups received the Active Choice intervention during lunchtime. This intervention continued for a total of nine sessions, with each session lasting approximately 20-minutes. It consisted of a decorated table stand with fruit and vegetable selections in the lunchroom. Verbal praise was made by the adult table attendee when a selection was made. Before lunch time, students were given two colored tickets: red for fruits and green for vegetables. The experimental and control groups had a different shade of the colored tickets to easily decode

each group. The tickets allowed the researcher to examine how much of each fruit and vegetable were taken by each group.

Once the students settled themselves at their lunch table, they were able to approach the fruit and vegetable table, which was decorated with laminated pictures of fruit and vegetable art. The table also had a colorful menu displayed so the students could see what their options were for the particular day. Both the colorful menus had the names of the fruit or vegetable and a picture directly below the name. The menu was displayed on a poster size paper using a playful font in order to be more attractive to the second graders.

Each intervention day, students had a choice between two fruits and two vegetables. The decision to provide more than one option for fruits and vegetables was to increase self-efficacy as well as to elicit participants' consciousness-based decision making. This tends to be more deliberate, slow, and analytical than spontaneous, affective decisions [15]. The students gave their ticket(s) to the school nurse, a lunch aide, or the researcher attending the lunch table if they wanted a fruit and/or vegetable. Those tickets went into a special bag labeled "used." Unused tickets (if the students wanted only one or none of the items) went into a special "unused" bag to easily cross-reference the data from the remaining fruits and vegetables at the end of each session.

Once a student submitted a ticket or tickets, self-efficacy was reinforced through partaking in the intended behavior. The students were able to ask questions about the fruit or vegetable if they were unsure what they were. Using this newly gained information, the students in both groups were able to use the tickets to make their own choice (consciousness-based decision).

The students were not coerced to take the fruits and vegetables. However, they received some sort of praise from the lunch aides, the principal, the school nurse or the researcher when they were eating something they chose as a means to promote a sense of positive reinforcement, as per the study protocols. This intended admiration from authority figures prospectively assured the students that they were doing something good and while receiving approval from adults. Still, it was of their own free will to select what they wanted, if they wanted anything at all.

Nutrition Lessons Intervention

The experimental group received four 30-minute nutrition lessons based on the constructs of the SCT (reciprocal determinism, behavioral capability, expectations, self-efficacy, observational learning [modeling], and reinforcements) and the importance of eating fruits and vegetables to increase behavior change (See Table 1). The first nutrition lesson included an educational video about the importance of consuming fruits and vegetables, and a game in which students guessed what fruit or vegetable was inside a brown sandwich bag without looking inside, but by touching it with their hands. They were then offered pre-cut samples of those fruits and vegetables to taste. The second lesson taught students how to distinguish healthy foods from unhealthy foods and allowed students to acknowledge the role of individual tastes and preferences when choosing foods to eat. The third lesson involved an interactive game in which the students identified fruits and vegetables based on their colors and were encouraged to eat these foods in a variety of colors. Finally, the fourth lesson prompted the students to create edible artwork using pre-cut fruits and vegetables. Students were separated into small groups and given an image to recreate with the provided fruits and vegetables. After each group was finished, the students were encouraged to view and taste the artwork that the other groups created.

Data Analysis

The data for the active choice intervention were gathered through ticket collection, as well as through the raw count of fruits and vegetables taken on each particular day. It was difficult to determine food waste because the participants would often forget to deposit their empty or partially eaten fruit/vegetable bags in the basket that was labeled 'finished or uneaten produce.' Hence, the number of fruits and vegetables taken was regarded as consumed (actual fruit and vegetable consumption). The ratio of total number of fruits or vegetables taken to the number of fruits or vegetables offered was calculated and compared between groups at

the conclusion of the intervention using independent t-test.

The participating students' demography was summarized by a descriptive analysis. A paired t-test within groups was performed to determine if the behavior (bringing fruits and vegetables to school to eat) changes occurred after the intervention. An independent t-test was performed to test if the behavior difference between groups at post-intervention was significant. Chi-square analysis was employed to analyze the nonnumeric data.

Results

Participant Demography

There was a total of 92 second grade students divided into four separate classes in this school, with a total of 51 girls and 41 boys. Their ethnic backgrounds included 49 Caucasian/White, 16 Asian, 11 Hispanic/ Latino, 13 Interracial, 2 African American/Black, and 1 Alaskan/Native American. No students in this grade qualified for free or reduced lunch (at the time of the research), and only 4% of the population were either non-native English speakers or had a learning disability.

Among the total 92 second graders in the school, 89 students participated in this study (96.7% participation rate): 46 in the experimental group and 43 in the control group. The experimental group consisted of 61% female, 39% male, 58% 7-year old, and 42% 8-year old. The control group consisted of 56% female, 44% male, 62% of 7-year old, and 38% 8-year old.

Participants' Preference and Opinions About Fruits and Vegetables

After the intervention, 100% of the students in the experimental group specified that they thought fruits and vegetables were good [healthy] for them and 84.8% liked the option to choose a healthy snack during lunch. This was an improvement of their opinion compared to their responses before the intervention, though the magnitude of improvement was small and statistically insignificant (See Tables 2 and 3). On the other hand, the opinion of students in the control group negatively changed after the intervention. A higher proportion of students in the control group reported that they denied or were unsure if fruits and vegetables were good for them after the intervention compared to before the intervention: 4.7 vs. 2.3% (p=.48). Similarly, a smaller proportion of students in the control group liked choosing a healthy snack during lunch after the intervention compared to before the intervention: 65.1 vs. 69.8% (p=.63). Many students in both groups disclosed that they brought fruits (from home) as snacks more often than vegetables. When asked whether they preferred fruits or vegetables, over 50% of students indicated fruit preferences in both groups. When asked to select the types of fruits and vegetables they liked most, both groups were similar in the order of their preference (see Figures 1 and 2).

Fruit and Vegetable Consumption During Active Choice Intervention

During nine sessions of active choice intervention, students in the experimental group were more likely to consume both fruits and vegetables than those in the control group. On average, the experimental group consumed 81.2% of fruits offered and 77.7% of vegetables offered. The control group consumed on average 73.4% of fruits offered and 62.1% of vegetables offered. The difference between groups was significant for vegetable consumption (p=.01), while fruit consumption was statistically similar (p= .13) (See Table 4).

Fruit and vegetable consumption behavior was also measured in a survey by asking how many days of the week students brought either fruits or vegetables from home to eat and whether they finished what they brought in. Students in the experimental group brought fruits and vegetables to school more days in a week post- than pre-intervention: fruits (2.67 pre- vs. 3.00 post-, p=.37), vegetables (1.74 pre- vs. 2.02 post-, p=.47). When this behavior (bringing fruits and vegetables to school) was compared to students in the control group, it was consistently more frequent for those in the experimental group at both pre- and post-intervention. Among students in the experimental group, it was apparent that there was an increase in their intention to eat fruits and vegetables during lunch as they brought them to school more days in the week after the intervention. However, this increment was not statistically significant: fruits p = .94; vegetables p=.05).

At the conclusion of the intervention, students in the experimental group showed higher likelihood of

Table 2. Pre- and post-intervention survey comparison within groups

Survey Questions		Experimental Group (%)			Control Group (%)		
		Pre-	Post-	*p*	Pre-	Post-	*p*
If I bring fruit to eat with lunch, I…	Finish eating all	63.0	69.7	.94	44.2	51.2	.39
	Take back home	21.7	15.2		23.3	30.2	
	Throw out leftover	6.5	6.5		2.3	0	
	Do not bring fruit	8.7	8.7		30.2	18.6	
If I bring vegetables to eat with lunch, I…	Finish eating all	52.2	43.5	.05	46.5	39.5	.13
	Take back home	15.2	26.1		11.6	23.3	
	Throw out leftover	6.5	4.3		7.0	0	
	Do not bring vegetable	26.1	26.1		34.9	37.2	
Do you like to choose fruit or vegetable during lunch	Yes	78.3	84.8	.23	69.8	65.1	.63
	No	2.2	8.7		4.7	4.7	
	Unsure	19.6	6.5		25.6	30.2	
Do you think fruits and vegetables are good for you?	Yes	95.7	100	.36	97.7	95.3	.48
	No/Unsure	4.3	0		2.3	4.7	
Which do you like more, fruits or vegetables?	Fruits	52.2	50	.73	58.1	58.1	.58
	Vegetables	0	4.3		4.7	4.7	
	Both	45.7	45.7		37.2	34.9	
	Neither	2.2	0		0	2.3	

Table 3. Post-intervention survey comparison between groups

Survey Questions		Post-Intervention		
		Experimental	Control	*p*
If I bring fruit to eat with lunch, I	Finish eating all	69.7	51.2	.05
	Take back home	15.2	30.2	
	Throw out leftover	6.5	0	
	Do not bring fruit	8.7	18.6	
If I bring vegetables to eat with lunch, I	Finish eating all	43.5	39.5	.41
	Take back home	26.1	23.3	
	Throw out leftover	4.3	0	
	Do not bring vegetable	26.1	37.2	
Do you like to choose fruit or vegetable during lunch	Yes	84.8	65.1	.01
	No	8.7	4.7	
	Unsure	6.5	30.2	
Do you think fruits and vegetables are good for you?	Yes	100	95.3	.14
	No/Unsure	0	4.7	
Which do you like more, fruits or vegetables?	Fruits	50	58.1	.58
	Vegetables	4.3	4.7	
	Both	45.7	34.9	
	Neither	0	2.3	
Do you want to eat more fruits & vegetables?	Yes	80.4	62.8	.16
	No	4.3	11.6	
	Unsure	15.2	25.6	

Table 4. Number of fruits and vegetables offered during active choice intervention

	Fruits						Vegetables					
Day	Experimental			Control			Experimental			Control		
	Offered	Taken	Ratio	Offered	Taken	Ratio	Offered	Taken	Ratio	Offered	Taken	Ratio
1	45	40	89	42	35	83	45	40	89	42	34	81
2	44	40	91	42	38	90	44	37	84	42	30	71
3	42	34	81	42	32	76	43	32	76	42	20	48
4	45	37	82	40	20	50	45	34	76	40	19	48
5	41	33	80	39	24	62	41	33	80	39	26	67
6	43	31	72	39	34	87	43	33	77	39	21	54
7	44	32	73	40	25	63	44	31	70	40	17	43
8	45	40	89	39	28	72	45	28	62	39	31	79
9	45	33	73	41	31	76	45	38	84	41	28	68
Total	394	320	81	364	267	73	394	306	77	364	226	62

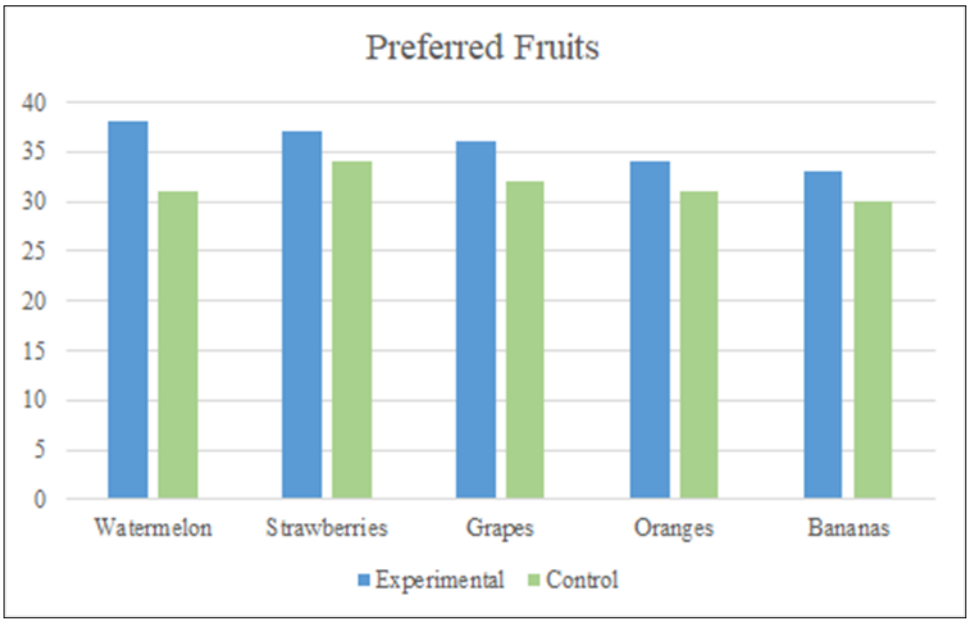

Figure 1. Preferred Fruits

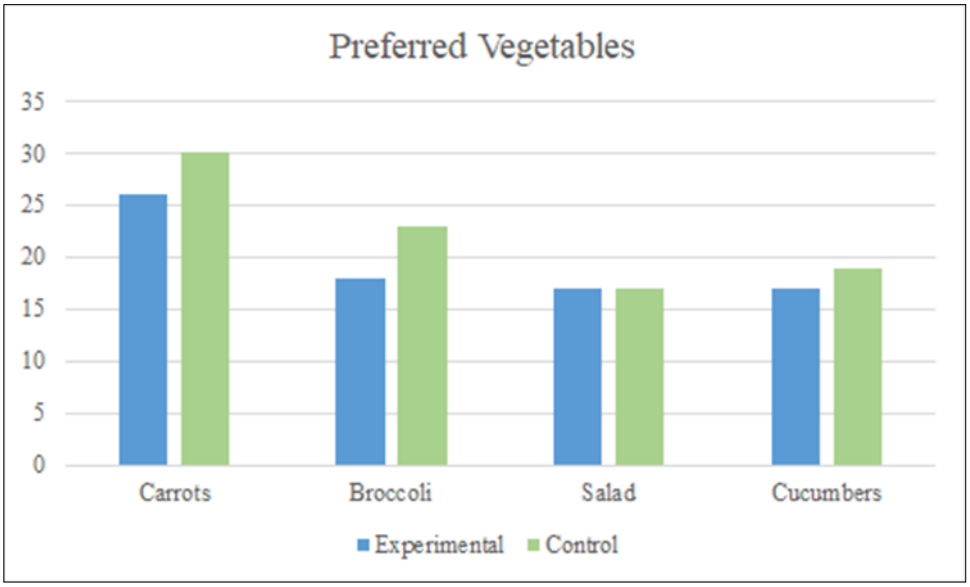

Figure 2. Preferred Vegetables

finishing fruits (69.7 vs. 51.2%, p=.05) and vegetables (43.5 vs. 39.5%, p=.41) that they brought in from home to eat. A higher proportion of students in the experimental group also expressed their 'wanting' to eat fruits and vegetables than those in the control group (80.4 vs. 62.8%, p=.16). A significantly higher proportion of students in the experimental group liked to choose fruits and vegetables during active choice intervention than those in the control group (84.8 vs. 65.1, p=.01). (See Table 3).

Discussion

The findings from this study suggest that the additional intervention element (nutrition lesson) given to the experimental group had a positive effect on every aspect of the behavior change. Students who received both nutrition lessons and active choice intervention showed positive behavior changes in 'bringing fruits and vegetables from home to eat' as well as 'likelihood of finishing' what they brought in. It is noteworthy that the vegetable consumption (selected from the active choice table) during lunch exhibited the most impressive and significant difference compared to the control group.

A strength of this study is in the theoretical framework applied in the intervention. While a number of previous studies employed various strategies to improve fruit and vegetable consumption for school children, many have not combined theoretical avenues, which could lead to more sustainable outcomes [16-19]. The present study offered an intervention design that combined the constructs of the SCT and active choice principles to increase fruit and vegetable consumption behavior.

The role of the SCT provided a guided theoretical framework in which reciprocal determinism reflected the continuous interaction among personal factors, the environment, and behavior (active choice concept). The interactive connection among these three components are crucial because if one changes, the other two components will also be affected. Another significant component to the SCT is self-efficacy. Allowing students to have repeated measures of exposure, an easy to follow set of instructions, and a sense of connection or importance between themselves and the behavior at hand can help promote mastery of skills, thus can increase one's level of self-efficacy.

The nutrition lessons allowed the students in the experimental group to be introduced to and develop a familiarity with a variety of fruits and vegetables through the senses of taste, touch, smell, and sight. The nutrition lessons overall had a positive impact on the behavior regardless of the magnitude or statistical significance of the difference between groups. The fact that 100% of students in the experimental group acknowledged the benefits of fruits and vegetables

indicates that the knowledge and familiarity gained from the nutrition lesson played a role in students' behavior to select (from active choice table) and bring (from home) fruits and vegetables. It should be noted that although behavioral capability is not necessarily essential for the behavior change to occur, positive associations have been found between nutrition knowledge and fruit and/or vegetable intake [20].

Additional evidence of the impact of nutrition lessons was displayed in students' responses to the survey question asking if they liked to choose healthy snacks during lunchtime. At pre-intervention, students in both groups showed similar enthusiasm to choose their own healthy snack during lunchtime. However, students in the experimental group displayed much improved enthusiasm at post-intervention, whereas those in the control group expressed increased uncertainty regarding whether they liked to choose healthy snacks during lunchtime. This tendency could be attributable to the knowledge and familiarity students gained during nutrition lessons. The nutrition lessons allowed those participants not only to understand the health impacts that are associated with a diet filled with fruits and vegetables, but also how including fruits and vegetables in your diet could be fun, exciting, and nutritious.

As shown in the current study, students in both groups demonstrated a preference of fruits to vegetables. For example, behaviors such as bringing more fruit than vegetables from home to eat, selecting more fruit than vegetables from the active choice table support this notion. This tendency is not surprising because it is an individual's natural predisposition to prefer sweet foods over those that are sour or bitter [16]. However, the experimental group improved their liking of vegetables after the intervention. The exposure to the nutrition lessons had an impact on the increase of vegetable preferences, which, in turn, offset the fruit preference. Similar findings were represented during a study in 2004 where the Cafeteria Power Plus project was implemented to increase the consumption of fruits and vegetables during lunch as a multi-component intervention. The results from the Cafeteria Power Plus project demonstrated that environmental changes in cafeterias could significantly impact the fruit and vegetable consumption of elementary school students. However, the authors suggested that classroom curricula and parental involvement could bolster the effects of such environmental interventions [5].

The positive role of the nutrition lesson element available only to experimental group was evident in behavior change as well during active choice. Nutrition lessons exposed the students to repetitive content along with additional understanding of why fruits and vegetables are healthy. Sometimes a preview was given to the experimental group of what fruits and vegetables were going to be on the menu, while some days the researcher would talk to them about the selection of produce that was given during previous intervention days. Moreover, a stronger rapport was developed with the experimental group and the researcher than with the control group because the researcher was able to spend more time with those students during the nutritional lessons. This supports the notion that the overall design combining nutrition education with an active choice component displayed a potential success for a larger impact on fruit and vegetable consumption [5].

The most important construct of the SCT, self-efficacy, is demonstrated when the participants exhibit confidence in their ability to perform the behavior at hand [13]. For this particular study, the participants were actively engaging in the behavior by approaching the fruit and vegetable table and looking at the menu during each intervention day. At that point, the participants were able to decide whether they wanted a fruit, a vegetable, both a fruit and a vegetable, or nothing at all. Even if the students (no matter which group they were in) did not take a fruit and/or vegetable that day, they still engaged in the intervention process and exposed to the selections. The mere behavior of walking up the fruit and vegetable table and viewing the selections presents the willingness [intention] to attempt the behavior change, and the potential change in the future.

It is possible that the consumption of fruit and vegetables during the active choice intervention sessions could have been increased or decreased due to peer-to-peer encouragement. Although this type of study is not designed to present a peer pressure situation, many times children are exposed to peer pressure without even recognizing it. A student in one

group may be a friend with a member in another group.

Their verbal or non-verbal (facial expressions) could have determined a participant's selection of fruit and/or vegetable or determined if they were not going to take any produce for that day. Peer pressure, however, does not always have to be negative. In many ways peer pressure can be used to encourage others to do things they would not normally do because they are unsure about the outcome [21]. If a participant encourages another participant to try a new fruit and/or vegetable or try something they like, the other participant may be more likely to engage in the behavior because they have the support of their friend [22].

There are several limitations in this study. There was not a wide array of participants with different socioeconomic statuses, geographic locations or ethnic backgrounds. Restricting the study to only one school in one town in northern New Jersey limited the generalizability of the findings. Time was another limiting factor for this study. Although this study established a baseline for future studies, other researchers may want to consider utilizing an entire school year with multiple follow-up periods, and possibly continue into the following school year to establish reliability in this type of intervention. The use of self-reported data in the form of surveys was also a limiting factor. Lastly, food waste was an area the researchers originally planned to measure, however, due to the participants' inconsistency with placing the empty or partially empty bags in the designated area, accuracy of measuring plate waste was unattainable. Additional administrators during the intervention could facilitate a more accurate measure of the plate waste.

Conclusions

Nutrition education programs in schools and communities need to be more effective in promoting confidence when adopting healthy eating behaviors among youngsters. Nutrition lessons combined with the active choice intervention showed a promising effect to improve fruit and vegetable consumption behavior of the children in this study. An important element in behavior change, self-efficacy, was reinforced in active choice. The nutrition lessons strengthened the individual's intention to change the behavior. Combining supplementary components such as parental/guardian, family practices, and community involvement could assist in enhancing the effectiveness of this program design.

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Conflict of Interest

There is no conflict of interest.

Affiliations

Authors' affiliation at the time of this study is Montclair State University

References

1. Centers for Disease Control and Prevention. (2019). Childhood obesity facts. Overweight and obesity. https://www.cdc.gov/obesity/data/childhood.html
2. Nielsen SJ, Rossen LM, Harris DM, & Ogden CL. (2014). Fruit and vegetable consumption of U.S. youth, 2009–2010. https://www.cdc.gov/nchs/products/databriefs/db156.htm
3. Centers for Disease Control and Prevention. (2018). State indicator report on fruits and vegetables, 2018. Atlanta, GA: Centers for Disease Control and Prevention, U.S. Department of Health and Human Services
4. Witt K & Dunn C. (2012). Increasing fruit and vegetable consumption among preschoolers: evaluation of Color Me Healthy. Journal of Nutrition Education and Behavior. 44(2), 107-113.
5. Perry CL, Bishop DB, Taylor GL, Davis M, Story M. et al. (2004). A Randomized school trial of environmental strategies to encourage fruit and vegetable consumption among children. Health Education & Behavior. 31(1), 65-76.
6. Hakim S & Meissen G. (2013). Increasing consumption of fruits and vegetables in the school cafeteria: the influence of active choice. Journal of Health Care for the Poor and Underserved. 24, 145-157.
7. Florida State University. (2011). Chapter 8: Using active learning in the classroom. Instruction of

Florida State Handbook, 75-102. Retrieved from https://distance.fsu.edu/docs/instruction_at_fsu/Chptr8.pdf

8. Kalem S & Fer S. (2013). The effects of the Active Learning Model on students' learning, teaching and communication. Educational Sciences: Theory & Practice. 3(2), 455-461.
9. Prince M. (2004). Does active learning work? A review of the research. Journal of Engineering Education. 93(3), 223-231.
10. Vaillancourt R. (2009). "I Hear and I Forget, I See and I Remember, I Do and I Understand." The Canadian Journal of Hospital Pharmacy. 62(4), 272–273.
11. Bandura A. (2004). Health promotion by social cognitive means. Health Education and Behavior. 31 (2), 143-164.
12. Knol L, Myers H, Black S, Robinson D, Awololo Y. et al. (2016). Development and feasibility of a childhood obesity prevention program for rural families: Application of the Social Cognitive Theory. American Journal of Health Education. 47(4), 204-214.
13. Gaines A & Turner L. (2009). Improving fruit and vegetable intake among children: A review of interventions utilizing the Social Cognitive Theory. California Journal of Health Promotions. 7(1), 52-66.
14. Bandura A. (1986). Social Foundations of Thought and Action. Englewood Cliffs, NJ: Prentice-Hall.
15. Peters E, Hess TM, Västfjäll D, & Auman C. (2007). Adult age differences in dual information processes: Implications for the role of affective and deliberative processes in older adults' decision making. Perspectives on Psychological Science. 2(1), 1–23.
16. Kral T, Kabay A, Roe L, & Rolls B. (2010). Effects of doubling the portion size of fruit and vegetable side dishes on children's intake at a meal. Obesity. 18(3), 521-527.
17. Baranowski T, Diep C, Baranowski J. (2013). Influences on children's dietary behavior, and innovative attempts to change it. Annals of Nutrition and Metabolism. 62(3), 38-46.
18. Just D & Price J. (2013). Using incentives to encourage healthy eating in children. The Journal of Human Resources. 48(4), 855-872.
19. Upton D, Upton P, & Taylor C. (2012). Increasing children's lunchtime consumption of fruit and vegetables: an evaluation of the Food Dudes programme. Public Health Nutrition. 16(6), 1066-1072.
20. Rasmussen M, Krølner R, Klepp KI, Lytle L, Brug J et al (2006). Determinants of fruit and vegetable consumption among children and adolescents: A review of the literature. Part I: quantitative studies. International Journal of Behavioral Nutrition and Physical Activity. 3(1), 22.
21. Cullen KW, Baranowski T, Rittenberry L, Cosart C, Hebert D et al (2001). Child-reported family and peer influences on fruit, juice and vegetable consumption: reliability and validity of measures. Health Education Research Theory & Practice. 16(2), 187-200.
22. O'Niell E. (2012). The degree of peer influences on children's food choices at summer camp. Retrieved from http://tigerprints.clemson.edu/cgi/viewcontent.cgi?article=2325&context=all_theses (1325)