OPEN ACCESS

GAVIN PUBLISHERS

Educational Research Applications

Research Article

Forman A, et al. Educ Res Appl: ERCA-153.
DOI: 10.29011/2575-7032/100053

My Painted Plate: Art Enhances Nutrition Education with Children

Abby Forman[1], Sarah Colby[1*], Lauren Gellar[2], Marsha Spence, Kristin Riggsbee[1], Marleah Payne[1], Molly Rigell[1], Chelsea Allison[1], Katie Kavanagh[1], Cary Springer[3]

[1]Department of Nutrition, The University of Tennessee, Knoxville, TN, USA

[2]Medical University of South Carolina, Beaufort, SC, USA

[3]Office of Information and Technology, University of Tennessee, Knoxville, TN, USA

[*]**Corresponding author:** Sarah Colby, Associate Professor, Department of Nutrition, The University of Tennessee, 1215 W. Cumberland Avenue, 229 Jessie Harris Building, Knoxville, TN, 37996-1920, USA. Tel: +18282265116; +18659746248; Fax: +18659743491; Email: scolby1@utk.edu

Citation: Forman A, Colby S, Gellar L, Spence M, Riggsbee K, et al. (2018) My Painted Plate: Art Enhances Nutrition Education with Children. Educ Res Appl: ERCA-153. DOI: 10.29011/2575-7032/100053

Received Date: 27 June, 2018; **Accepted Date:** 12 July, 2018; **Published Date:** 20 July, 2018

Abstract

Background: Visual art is often included in nutrition education with youth; however, the benefits of this inclusion have not been independently evaluated.

Aims: This study investigated the impact of visual art on the effectiveness of nutrition education to improve knowledge, attitudes, and dietary behavior of children.

Methods: Six classes included two, 30-minute sessions of nutrition education and art activities. Pre-test, post-test, three arm intervention study: control (n=27), standard art (n=22), and enhanced art (n=33) at six summer day camps with children ages 8-12 years old.

Results: From baseline to post, participants in the standard and enhanced groups had increases in nutrition knowledge ($p<0.05$). Statistically significant increases were found in intentions to reduce fat for all groups. A minimal but significant decrease in dietary behaviors related to fruits and vegetables were observed in the control group.

Discussion: Using visual art activities along with traditional nutrition education could increase nutrition knowledge more effectively than nutrition education alone.

Conclusions: Nutrition-related art activities should be considered for inclusion in child nutrition education interventions.

Keywords: Adolescent; Art; Education; Nutrition; Youth

Introduction

Engagement in arts has been suggested to produce many benefits to one's health, including physiological, psychological, and social. Incorporation of the arts into healthcare can encourage a healing environment, affecting health issues "from post-traumatic stress disorder to autism, mental health, chronic illnesses, Alzheimer's and dementia, neurological disorders and brain injuries, premature infants, and physical disabilities"[1]. A growing body of research supports the concept that art therapy and creativity can improve overall quality of life for patients in a variety of healthcare settings [1,2].

Many health programs have focused on the incorporation of art education to yield health behavior change but education alone may be insufficient to stimulate behavior change. However, knowledge and attitudes can change with education and have a powerful influence on healthy behavior change [3-7]. The Sensory Stimulation Learning theory posits that the learning process is enhanced when the learners' senses are stimulated [8] as happens during the kinesthetic process of creating visual art. The art-health framework, proposed by Davies et al. indicates that more active forms of art engagement, including creating and making art, can directly impact mental, social, and physical health [9].

Visual arts, dance, and theater are several art forms that have shown different levels of success when used with children in

nutrition education programs [10-16]. A study published in 2013 revealed positive effects of arts-based learning with third grade students using a combination of movement and visual art activities including yoga, music, movement and meditation, creative writing, coloring, making collages, and drawing [17]. The students showed improvement in overall health and behavior at the end of the sessions. In 2016 another study found statistically significant improvements in nutrition and exercise behaviors of fourth and fifth graders using arts-based and activity-based learning methods during a 5-week program [18]. Art activities such as making model portion control plates using construction paper cut-outs for portion sizes were used to increase students' nutrition knowledge and positive health behaviors. These studies indicate that interactive learning could potentially be more effective than standard teaching methods for increasing health knowledge and behavior [17,18].

Drawing versions of MyPlate on paper is a common visual art activity used by some nutrition education programs. These visual art activities often involve drawing and coloring on papers or paper plates with outlines of food or portion sizes [19-25]. However, differences in the intensity and impact of nutrition-related art actives have not been tested. This study was designed to determine how including art in a nutrition education program for children impacts their dietary behaviors, nutrition attitudes, and nutrition knowledge. This was investigated for both over all inclusion of art and by differing intensity levels of the included art using a randomized cluster control trial design based on the Sensory Stimulation Learning theory and the Knowledge-Attitude-Behavior (KAB) model [3,26].

Methods

Summer camps (n=6) were assigned randomly into one of three different groups: Control, Standard art, or Enhanced art. The summer camp directors informally verbally reported they perceived that overall the six summer camps served similar populations and were in similar neighborhoods. Eligibility criteria included being 8 to 12 years of age and attending one of the camps. Parents were informed about the study and an opt-out procedure was utilized. No parents opted out of the program.

Six classes of nutrition education were conducted over the course of three weeks with the three groups of children (Control n=51; Standard arm n=54; and Enhanced art n=62) from summer day-camps. Classes were delivered by trained nutrition students under the supervision of a Registered Dietitian. Two classes, one hour each, were given each week. The first 30 minutes consisted of the same nutrition education instruction for all groups. The second 30 minutes were for art activities that differed between groups. The control group received non-nutrition related art lessons, the Standard group used paper plates to draw their meals using the MyPlate template, and the Enhanced group used ceramic plates to paint their meals using the MyPlate template. By the end of the program, each participant in the Enhanced group who had attended all sessions of the three-week program had painted six dinner-sized plates. Researchers heated the plates in a kiln (furnace) to permanently adhere the paint and render them food safe. Plates were then returned them to the participants post-assessments. All procedures were approved by the [Blinded] Institutional Review Board.

Assessments (baseline and post intervention) included a survey (demographics, dietary behaviors, nutritional knowledge and attitudes related to food) and dinner meal recall. The recall only included the previous evening meal because the participants ate breakfast, lunch, and snacks together as part of their summer camp. Thirty questions from the What Do You Think? Questionnaire [27] were used for the nutrition knowledge section with possible scores ranging from 0-100% correct. Forty-three questions from the Coordinated Approach to Child Health (CATCH) Evaluation Tool were used to evaluate dietary behaviors and attitudes related to food[28]. The food behavior portion of the CATCH tool included three sections: reduce fat, fiber, and fruit and vegetable intake [28]. Both questionnaires were previously validated for this population [27,28]. A multiple pass method [29] was used to conduct the Evening Meal Recalls (EMR) with each child individually to determine their MyPlate recommendation adherence. Food models and measuring cups were used to aid in the recalls. Trained research assistants conducted all survey and EMR data collection and the same research assistants later performed all data entry. A Registered Dietitian with extensive research experience supervised all training.

A five-point, Likert-like scale "smileyometer" [30] was used in four questions that were added to the post-assessment to identify how much the participants' enjoyed the program, the likeability of the lesson leaders, and the participants' interest to learn more about nutrition.

Analysis

If a child was absent for four or more of the lessons or was absent during the post-assessment, they were classified as a non-completer and were not included in data analysis. IBM's Statistical Package for the Social Sciences (SPSS) Version 22.0 [31] was used for survey data analysis. Nutrition Data System for Research software version NDSR (2013) and Standard data entry procedures from the Nutrition Coordinating Center, University of Minnesota, Minneapolis, MN [32] were used for dietary intake (EMR) data analysis. The children's adherence to using MyPlate for their meal and consuming each food group was determined by using a modified version of the Food Group Servings Count System software. Dairy, vegetable, fruit, protein, and grain intake amounts were compared to the National School Lunch Program

(NSLP) minimum requirements [33] since these were MyPlate compliant and based on an individual meal as compared to a total day average provided by MyPlate alone.

Changes in nutrition knowledge, attitude, and behavior of the different groups over the two time points were measured using ANOVA individual repeated measures. Data were then split by group to examine significant interactions. Paired t-tests were used to identify any significance of change in scores within the groups. An ANOVA with Tukey's post hoc comparisons was then run to identify any differences between the group mean differences with significance value of $p < 0.05$.

Results

At the end of the study, 82 of the 167 children recruited at baseline completed the study including all assessments (completers). Baseline measurements did not differ between completers and non-completers using independent sample t-test at a $p > .05$. Additionally, there were no differences in demographics using an independent sample t-test for age and Chi Square for gender and race at baseline (see Table 1).

Participant Demographic Characteristics by Group				
Characteristics	**Control Group (n=27) Mean ± SD**	**Standard Group (n=22) Mean ± SD**	**Enhanced Group (n=33) Mean ± SD**	**Total (n=82) Mean ± SD**
Age, y	9.1 ± 1.0	9.9 ± 1.5	9.9 ± 1.3	9.6 ± 1.3
	n (%)	n (%)	n (%)	n (%)
Sex				
Male	15 (55.6)	15 (68.2)	12 (36.4)	42 (51.2)
Female	12 (44.4)	7 (31.8)	21 (63.6)	40 (48.8)
Race/ethnicity				
Black	16 (59.3)	13 (59.1)	18 (54.5)	47 (57.3)
White	8 (29.6)	7 (31.8)	10 (30.3)	25 (30.5)
Other	3 (11.1)	2 (9.1)	5 (15.2)	10 (12.2)

Table 1: Participant Demographic Characteristics by Group.

Nutrition Knowledge

At baseline the Control, Standard, and Enhanced groups of the study scored 63.6%, 68.3%, and 58.3% correct (respectively) on the nutrition knowledge What Do You Think? Questionnaire [27]. At the post-assessments the Control group scored decreased to 61% correct while the Standard and Enhanced groups average scores increased to 76.3% and 68.7%, respectively. Baseline and post-tests results for the three groups are presented in Table 2. Repeated measures ANOVA revealed significant difference between time and group [$F(2,79)=4.780$, $p=.011$]. The observed power for the overall interaction was 0.780. To determine if knowledge increased within each group, separate paired t-tests were run. Nutrition knowledge over time did not change for the Control group ($p=0.447$). However, there was a significant increase in nutrition knowledge over time for both the Standard group ($p=0.006$) and Enhanced art group ($p=0.003$). An ANOVA with Tukey's post hoc comparisons on the difference between baseline and post change scores were run to determine any differences between the groups. No significant differences between the Enhanced group and Standard group were indicated by Tukey's post hoc comparisons ($p= 0.877$) which means they both improved the same amount. However, the Enhanced group increased significantly more than Control group ($p=0.011$). No significant differences were revealed between the Standard and Control ($p=0.075$) groups. This indicated that there were no differences between the standard and enhanced group, however there were differences between the enhanced and control group and differences between standard and the control group approached significance. Power analysis based on current means estimated that if the study had recruited 36 per group, differences between all groups would have been found with a power of 0.8. Based on this approaching significance, the initial ANOVA that showed significant improvements in knowledge for both standard and enhanced from pre to post and the additional power analysis, it can be concluded that both the standard and enhanced approaches improved knowledge over control conditions.

Comparison of Nutrition Knowledge by Group and Time			
Time Point	**Control Mean (Std. Deviation) n=27**	**Standard Mean (Std. Deviation) n=22**	**Enhanced Mean (Std. Deviation) n=33**
Baseline	19.1 (4.5)	20.5[a] (4.8)	17.5[a] (6.9)
Post	18.3[b] (5.2)	23.0[a] (4.9)	20.6[ab] (6.0)

[a]Significant changes ($p<.05$) in the mean score for nutrition knowledge from baseline to post assessment, determined by repeated measures ANOVA.

[b]Significant changes ($p<.05$) in the mean score for nutrition knowledge difference from baseline to post assessment, determined by paired sample t-test.

Table 2: Comparison of Nutrition Knowledge by Group and Time.

Food Attitudes

For the CATCH construct of Intentions to Reduce Fat, there was a statistically significant overall time difference. Repeated Measures ANOVA revealed that Scores increased for all groups at the post-assessment [$F(1,79)=8.699$, $p=0.004$]; but revealed no significant interaction [$F(2,79)=1.641$, $p=0.200$] and no overall group effect [$F(2,79)=1.312$, $p=0.275$]. No other changes in food attitudes were observed.

Dietary Behavior

The CATCH Evaluation Tool constructs and EMR were used to measure dietary behaviors. Repeated Measures ANOVA results revealed that there was a significant interaction of time by group for the CATCH Behavioral construct of fruits and vegetables [$F(2,79)=3.367$, $p=0.040$], but no significant change by time or by group for the EMR. To explore the interaction, paired t-tests were run to determine which group had a significant change for the CATCH Behavioral construct of fruits and vegetables. Only the Control group significantly decreased their reported healthy eating behaviors related to fruits and vegetables from pre to post test ($p=0.015$) with a difference of 2 points between the means. This change, while statistically significant, represents a marginal practical change in the overall score as the construct includes eight questions with a possible score range of 8-31. An ANOVA was run to determine if the amount of change differed between groups ($F(2,79)=3.367$, $p=0.040$). Tukey's post hoc differences found a statistically significant difference in means scores baseline to post-assessment between the Control and Enhanced groups only ($p=0.034$) but no difference was found between Control and Standard ($p=0.690$) or Standard and Enhanced ($p=0.278$).

Program Enjoyment

Survey responses revealed the majority of the participants (95.1%) liked the art activities, 91.5% enjoyed the nutrition lessons, 92.7% liked their nutrition lesson teacher, and 76.8% wanted to learn more about nutrition. MANOVA was run on question responses and no differences were found between the three groups [$F(8,52)=0.785$, $p=0.617$].

Discussion

Nutrition-related visual art was found to significantly increase the children's nutrition knowledge, no matter the intensity of the visual-art resource. The Control group also participated in non-nutrition visual art activities; since there were no difference in the control group in any variable from pre to post intervention, this indicates that the art activities alone did not enhance the nutrition learning. As in previous studies that found art to be effective in improving nutrition education outcomes, [11,14,15] the findings of this study provide evidence to support using visual art in nutrition education to improve nutrition knowledge with children. It is imperative to identify ways to produce positive outcomes in nutrition education programs when there is limited funding and resources available for these programs. Since no greater improvements in knowledge occurred with more cost intensive art activities, nutrition-related art using low-cost approaches appears to be a feasible way to increase nutrition knowledge with children.

Although there were changes found in the CATCH Behavioral construct of eating fruits and vegetables, no changes were found in CATCH Behavioral constructs of reducing fat and eating fiber or the children's adherence to using MyPlate for their meal by consuming each food group. Lack of behavior change may have been in part because of the brief time span between assessments and the small number of teaching sessions. Other nutrition education programs for children using similar methods but with positive change outcomes in both knowledge and behavior were conducted using 12 or more lessons [11,15,33]. Many successful nutrition education programs often occurred throughout an entire school year [34,35]. This study used a summer camp-based design which limited the number and length of lessons. However, these results revealed an increase in nutrition knowledge from only attending four to six lessons; Dietary behavior change may require more time and lessons. Additionally, there was no parental component in this program; previous research has indicated that parental involvement

may help produce more positive behavior change [29].

Another factor possibly associated with the lack of changes found in the CATCH constructs of reduced fat or increased fiber intake may be associated with the dietary behaviors questionnaire itself. The CATCH Curriculum and evaluation tools have been considered appropriate for use in this age group by the National Institutes of Health; however, a number of concerns with this tool were discovered during this study. Three children reported that they were vegetarians and were not sure how to respond to questions related to meat preference. Four children experienced difficulty answering questions about diary preferences since they were physiologically unable to consume diary milk products. They reported using rice-milk or soymilk alternatives at home. Alternative dietary measurement tools considered for use in this study that do take into consideration these dietary issues were not used because they had not been validated for use with the age group included in this study [30].

Differences in adherence to MyPlate recommendations were assessed using the evening recalls but differences in dietary behaviors were not assessed using the evening recalls. Three 24-hour dietary recalls (two on non-consecutive week days and one on a weekend day) would have been needed in order for recalls to be used to assess changes in dietary behaviors. This was not feasible given the limitations of the summer camp schedules. Other commonly reported issues with dietary assessments involving children include social desirability and dietary recall biases despite the acceptance of recalls for dietary assessment [36,37].

Another major limitation of this study was the high attrition rate generating a small sample size. There is increased confidence in the differences identified during statistical analysis as being true differences since they were found with even smaller sample sizes than were indicated as needed to find differences between groups during post hoc power analysis. If there had been larger sample sizes, it would have been possible that statistical differences between Standard and Enhanced groups might have been observed.

Exclusion of non-completers, while reducing the sample size, was done to ensure that all participants included in the data analysis had received greater than half of the information provided during the study. Conservative definitions of completers and non-completers were used since children who were unable to attend four or more lessons would have missed learning about three of the five food groups displayed on MyPlate, potentially decreasing the averages of knowledge gain related to lack of exposure instead of effectiveness of the program. There were a number factors leading to absences. Participants and camp directors reported absences were due to events such as doctor appointments, illnesses, injuries, family trips, moving, and enrollment in other day camps or weeklong camps occurring at the same time. Other day-camp based interventions have shown a similar attrition rate [34, 38].

Another limitation related to the sample was the lack of detailed demographic information necessary to compare baseline similarities or differences between the summer camp participants. Although the summer camp directors reported that they perceived the camps served similar populations and neighborhoods, this was an informal assessment. Because of perceived lack of potential parental participation, more detailed information on individual camper demographics was not collected.

Despite these limitations, this research provides evidence for the positive impact of visual art activities in nutrition education with children. It is well recognized that changes in nutrition knowledge alone are not the same as behavior change [3,4,26]. However, it often seen that the behavior change process does involve changes in knowledge thus rendering knowledge an essential piece of the behavior change process [3,4,5,6,7]. This research provides evidence on how visual art has the ability to catalyze positive changes in knowledge, which may assist in promoting positive changes in behavior to a greater extent than what is seen in programs that do not use visual art. Assessment tools that more effectively assess constructs of food attitudes and diet behavior and a longer-term program should be used to further test this theory.

Acknowledgments

None, no external funding was received for this project.

No conflicts of interest to report.

References

1. Rollins J, Snoke J, Cohen, R, Boles A, Li J (2009) State of the Field Committee. State of the field report: Arts in healthcare /2009. Washington, DC: Society for the Arts in Healthcare.
2. Howarth L (2018) Creative health: the arts for health and wellbeing. Perspect Public Health 138: 26-27.
3. Contento IR (2007) Nutrition education: Linking research, theory, and practice. Jones & Bartlett Learning. 2007.
4. Baranowski T, Cullen KW, Baranowski J (1999) Psychosocial correlates of dietary intake: advancing dietary intervention. Annual review of nutrition 19: 17-40.
5. Bauer K, Liou D, Sokolik C (2012) Nutrition counseling and education skill development. 2nd ed. Cengage Learning. 2012.
6. Reynolds KD, Yaroch AL, Franklin FA, Maloy J (2002) Testing mediating variables in a school-based nutrition intervention program. Health psychology 21: 51-60.
7. Sharma M, Mehan, MB, & Surabhi S (2010) Using social cognitive theory to predict obesity prevention behaviors among preadolescents in India. International quarterly of community health education 29: 351-361.
8. Laird D (1985) Approaches to Training and Development. In: 2nd ed. Boston, MA: Addison-Wesley Pub. Co. 1985.

9. Davies CR, Knuiman M, Wright P, Rosenberg M (2014) The art of being healthy: a qualitative study to develop a thematic framework for understanding the relationship between health and arts. BMJ Open 4(4).

10. Olvera N, Bush J, Sharma S, Knox B, Scherer R, et al. (2010) BOUNCE: A Community□based Mother–daughter Healthy Lifestyle Intervention for Low□income Latino Families. Obesity 18: S102-S104.

11. Colby S, Haldeman L (2007) Peer-led theater as a nutrition education strategy. Journal of nutrition education and behavior 9: 48-49.

12. Neumark-Sztainer D, Haines J, Robinson-O'Brien R, Hannan P, Robins M, Morris B, et al. (2009) 'Ready. Set. ACTION!'A theater-based obesity prevention program for children: a feasibility study. Health education research 24: 407-420.

13. Jackson C, Mullis R, Hughes M (2010) Development of a theater-based nutrition and physical activity intervention for low-income, urban, African American adolescents. Progress in community health partnerships: research, education, and action 4: 89-98.

14. Perry C, Zauner M, Oakes J, Taylor G, Bishop D (2002) Evaluation of a theater production about eating behavior of children. Journal of school health 72: 256-261.

15. Koch P, Lee H, Milstein R (2012) Art & Healthy Living": Evaluating an Innovative Curriculum That Combines Art and Nutrition Education. Journal of nutrition education and behavior 44: S23.

16. Bohnert A, Randall E, Tharp S, & Germann J (2011) The development and evaluation of a portion plate for youth: a pilot study. Journal of nutrition education and behavior 3: 268-273.

17. Klatt M, Harpster K, Brwone E, White S, Case-Smith J (2012) Feasibility and preliminary outcomes for Move-Into-Learning: An arts-based mindfulness classroom intervention. The Journal of Positive Psychology 8: 233-241

18. Gandhi M, Feller E, Rayess FE (2016) Art and movement in nutrition education. Medical Education 50: 1145-1172

19. Dietitian KR. Lessons in proper nutrition: teaching MyPlate in the classroom.

20. My plate lesson plan- teaching kids about my plate. Nourish Interact website.

21. Lesson plan- super crew® & MyPlate. Super crew MyPlate lesson plan.

22. My plate lesson plans.

23. Roskelley, A. (n.d.) 8 MyPlate lesson ideas for K-2nd grade: healthy ideas for kids.

24. United States Department of Agriculture [cited 2014 May] Discover MyPlate nutrition education for kindergarten: student workbook.

25. Leone A (2015) Bring Nutrition Education to Life in the Classroom with MyPlate. Journal of the Academy of Nutrition and Dietetics 115: 1200-1202.

26. Lytle L (1995) Chapter 4: Nutrition education for school-aged children. Journal of nutrition education 27: 298-311.

27. Roberts LS, Sharma S, Hudes ML, Fleming SE (2012) Nutrition and physical activity knowledge assessment: development of questionnaires and evaluation of reliability in African American and Latino children. Journal of child nutrition and management 36.

28. National Institutes of Health. We Can! Progress Report: curriculum implementations by the intensive sites.

29. Hoelscher DM, Day RS, Kelder SH, Ward JL (2003) Reproducibility and validity of the secondary level School-Based Nutrition Monitoring student questionnaire. Journal of the american dietetic association 103: 186-194.

30. Livingstone MBE, Robson PJ, Wallace JMW (2004) Issues in dietary intake assessment of children and adolescents. British journal of nutrition 92: S213-S222.

31. IBM Corporation (2013) IBM SPSS Staticstics for Macintosh. Armonk, NY: IBM Corp. 2013.

32. Schakel SF (2001) Maintaining a nutrient database in a changing marketplace: keeping pace with changing food products-a research perspective. Journal of Food Composition and Analysis 14: 315-322.

33. United States Department of Agriculture. Nutrition standards for school meals.

34. Shepanski MA, Hurd LB, Culton K, Markowitz JE, Mamula P, et al. (2005) Health□related quality of life improves in children and adolescents with inflammatory bowel disease after attending a camp sponsored by the Crohn's and Colitis Foundation of America. Inflammatory bowel diseases 11: 164-170.

35. Kelder S, Hoelscher DM, Barroso CS, Walker JL, Cribb P, et al. (2005) The CATCH Kids Club: a pilot after-school study for improving elementary students' nutrition and physical activity. Public health nutrition 8: 133-140.

36. Livingstone MBE, Robson PJ (2000) Measurement of dietary intake in children. Proceedings of the nutrition society 59: 279-293.

37. Burrows TL, Martin RJ, & Collins CE (2010) A systematic review of the validity of dietary assessment methods in children when compared with the method of doubly labeled water. Journal of the American dietetic association.; 110: 1501-1510.

38. Koch S, Waliczek TM, & Zajicek JM (2006) The effect of a summer garden program on the nutritional knowledge, attitudes, and behaviors of children. Hort Technology 16: 620-625.