

Playful Learning Paired with Age-Appropriate Educational Reinforcement Can Affect the Food choice of Pre-K Children in a Simulated Grocery Shopping Activity

Keywords: Pre-K nutrition; Playful learning; Children's food choices

Abstract

This study tested the benefits of a six-week, age-appropriate nutrition education program directed toward the food choices of Pre-K children ages 3 to 5 years. While it is well known that children learn through play, the researchers investigated the utility of play in teaching Pre-K children to make wise food choices. A mock grocery store was created and equipped with a child-sized shopping cart, play money, and child-sized cash register along with a wide selection of foods typically found in a supermarket. A classic pretest/posttest design was used in which each child was given a chance to "shop" and select any five items of their choice. The pretest shopping experience was followed by a six-week nutrition education program delivered in the form of puppets, stories, songs, and discussions of good foods and "sometime foods". Following the nutrition education program, the children were again given the chance to "shop" and select five items of their choice. Pretest and posttest food choices were evaluated for any potential trends or changes in the children's food choices.

Introduction

The concept of play as a mechanism for learning in children has been widely researched [1-3]. Since play is undoubtedly a favorite activity for children, it is believed that optimal learning takes place in the play environment. Not only is play fun for young children, but it is also challenging. It can stimulate intellect and imagination in numerous ways and can aid youngsters in discovering things at a comfortable and non-stressful pace [2].

According to the National Association for the Education of Young Children (NAEYC), play results in cognitive, social and emotional benefits. NAEYC's position statement, "Play is an important vehicle for developing self-regulation as well as for promoting language, cognition and social competence", demonstrates the association's value of play. All children love to play. It is how they make sense of the world, interact with peers, express and control feelings, enhance problem-solving techniques and practice emerging skills [4].

Piaget identified four different types of play [1]. The first and most basic is functional play. This play begins in the earliest ages and pertains to motor activities that involve repetition of motions such as rolling a ball or running and laughing. The second is called symbolic play. It can be described as pretend, imaginative or dramatic play. This type involves creativity and imagination. Children engaging



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in symbolic play might create a setting where they pretend to be characters taking on roles and acting out impromptu scripts. The research of White and Carlson indicates that pretend play improves performance on subsequent tasks and may assist children to successfully control future behaviors and actions [5]. The third is constructive play. Common in the preschool age child, it is signified by using objects or materials to create a new entity. Examples of this would be drawing with crayons or building with blocks. The highest and most complex type of play would be formal games. This would include games with rules such as board games, hopscotch, ball games, or video games. Chiong and Shuler found that in children as young as three years of age, play with an educational iPhone application increased children's vocabulary [6]. According to Rathus, this type of play can have impact into adulthood and throughout a lifetime [7].

The American Academy of Pediatrics reports that play is of such importance in the lives of children that it is to be considered a basic human right of all [3]. In young children, the world revolves around their play. It is their work. It is their fun. It is how they learn.

Although there are numerous studies demonstrating the utility of play in the learning process of children, no significant studies were identified that examine the use of play as a mechanism for learning about nutrition in preschool populations. In addition, much of the available information concentrates on using theoretical constructs [8] to teach nutrition to preschool children or the evaluation of nutrition education programs [9] involving caretakers of small children.

The bulk of the available statistical data on the efficacy of nutrition education programs is conducted with older subjects. In a study conducted with fourth graders, DeVault et al. utilized a pretest/posttest design to determine the efficacy of *It's All About Kids*, a six-week school-based nutrition education program [10]. Results indicated that the intervention groups showed significant improvement in nutrition knowledge. In a similar study conducted by Wall, Least, Gromis, and Lohse [11], comparing vegetable-related attitude, self-efficacy, preference, and knowledge of an intervention group versus a control group in fourth grade students, it was determined that "a defined intervention" can have a positive effect on vegetable intake.

Table 1: Nutritional Analysis of Children's Food Choices for Mock Grocery Shopping Activity.

Subject	Calories (kcal)		Total Carbohydrates (g)		Simple Carbohydrates (g)		Dietary Fiber (g)		Fat (g)	
	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test	Pre-test	Post-test
1	1501	584	192.8	93.6	49.2	36.2	13.7	7.6	60.9	15.2
2	830	267	120.1	52.8	24.1	7.9	10.5	12.0	32.0	3.9
3	832	834	157.1	158.1	68.9	84.0	8.6	8.6	16.6	17.5
4	847	460	153.1	129.5	84.0	77.0	10.5	15.1	23.0	1.0
5	659	386	90.0	33.4	37.9	12.4	3.0	7.3	25.4	16.3
6	596	720	108.3	116.1	47.5	28.6	3.8	8.0	13.8	24.0
7	812	535	87.0	98.0	49.5	52.0	6.7	3.8	40.6	13.0
8	757	603	141.5	133.2	68.7	43.8	19.4	18.5	8.1	6.2
9	694	590	90.0	79.6	56.0	22.0	5.0	4.5	30.9	20.5
10	558	785	75.4	117.0	18.0	31.4	2.9	7.1	24.4	30.6
11	506	368	69.5	86.6	17.6	73.6	7.0	2.2	19.8	2.7
12	488	511	117.9	94.0	69.9	87.0	9.3	0.0	7.6	8.8
Mean	756.7*	553.6*	116.9	99.3	49.3	46.2	8.4	7.9	25.3*	13.3*
SD	268.00	170.60	37.77	34.68	21.72	28.05	4.82	5.28	14.87	9.14

Means with asterisk within columns are significantly different ($p \leq 0.05$).
SD= Standard Deviation.

Materials and Methods

A convenience sample of twelve pre-school children (7 males and 5 females) ages 3 to 5 years, attending a half-day child study program at a regional university, participated in a study to test the effect of a nutrition education program on the subjects' food choices. A classic pretest/posttest design was applied to measure changes in food choices after a nutrition education intervention.

For the pretest component of the study, a mock grocery store, offering a wide variety of foods and beverages, was set up in a location adjacent to the child center.

Each child was given an opportunity to "grocery shop" and instructed to choose any five items from the mock grocery store. The food choices of each child were recorded and evaluated for the following nutritional components: kilocalories; grams of carbohydrate; grams of fiber; grams of fat; and servings of fruits and vegetables.

The intervention component of the study consisted of a six-week nutrition education program (delivered in 15 minute increments for a total of 1 hour per week and 6 hours total over the six week program) introduced in an age-appropriate format using puppetry, stories, and songs designed by the researchers. Emphases were placed on the health benefits of: consuming low fat and low sugar foods; increasing foods with fiber; and increasing intake of fruits and vegetables. In addition, examples of foods chosen by the subjects in the pretest component of the study were identified as "good choices" or "sometimes foods" (foods that should be consumed occasionally).

During the posttest component of the study, the mock grocery store activity was repeated, and the children were instructed to choose five items. Once again, the food choices of each child were recorded and evaluated for the following nutritional components: kilocalories; grams of carbohydrate; grams of fiber; grams of fat; and servings of

fruits and vegetables. This part was followed by comparison of the nutritional components of the pretest food choices versus the posttest food choices.

Statistical Analysis

A paired t-tests was used to evaluate differences in mean pretest and posttest nutritional data with the same group of children. The level of significance established at $p \leq 0.05$. The data was analyzed using SPSS, Statistical Package for Social Sciences, Release 22 (2013, SPSS, Inc., Chicago, IL) [12].

Results

The six-week study included twelve children (7 males and 5 females) of average age of 3.83 with a range of 3 to 5 years. The majority of children were Caucasian (83.3%) with 16.7% children of mixed ethnicity. During the study, the children participated in a mock grocery shopping activity, selecting items from a wide variety of typical supermarket foods for their shopping carts (baseline pretest) followed by a six-week follow-up (posttest) after the nutrition education intervention. Nutritional content of the children's food choices is presented in Table 1. Comparison of pre- and posttest means found a significant decrease ($p \leq 0.05$) in Calories (203 kcal) and fat (12 grams). Although not significant there was a decrease in total and simple carbohydrates of 17.6 and 3.1 grams, respectively. The children were not able to distinguish high-fiber foods. It is worth noting the children did increase selection of fruits and vegetables with 50% (n=6) choosing 2 or more foods posttest vs 17% (n=2) pretest. The results show that nutrition education is effective in teaching young children healthy food choices while grocery shopping.

Discussion

Overall, the results of this small pilot study are promising and suggest that age-appropriate nutrition education programs may be effective with regard to improving the food choices of preschool

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children. The nutrition education program appears to be particularly effective in teaching children to choose foods with fewer calories and fewer grams of fat. In order to fully validate these findings, additional studies utilizing a larger sample is necessary.

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