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FOODS FOR KIDS: A WEB-BASED INTERVENTION PILOT STUDY

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ABSTRACT

Purpose

The Food for Kids (FFK) website was created as a novel tool for children to compare differences for total calories, total fat, sugar and dietary fiber in foods. The feasibility of using the tool was tested in 7-11 year old children (n=25). FFK is a visual display using Dust and Magnet (DnM) technology, which “pulls” food towards the constituent (in this case total calories, total fat, sugar and dietary fiber) each in one corner of a square by the foods concentration of these items. This pilot study tested participant’s abilities to distinguish between foods characteristics as either “healthy” or “less healthy” based on FFK. The objectives for this study were (1) teaching comparative nutrition, (2) assessing FFK’s user friendliness and comprehension and (3) observing the potential change of food choices before and after the intervention.

Methods

Snacks were served buffet-style and children’s selection was recorded at baseline and after the intervention (at study day three). A 10- to 15-minute teaching session was provided to highlight the importance of total calories, total fat, sugar and dietary fiber in the diet. Following the teaching session, children were given access to FFK on three separate occasions for up to 30 minutes, allowing children to look up foods at leisure and explore the site. At the conclusion of the study participants were asked to rate the effectiveness and usability of FFK. Time spent on FFK and changes in snack food choices were measured and analyzed. A generalized linear model was used to test the effects of sex, age, and study day number on the time spent using FFK. A mixed effects model was used to test the effects of sex, age, and study day number on the proportion of healthy foods selected. A regression analysis was also used to test the

relationship of the total number of foods selected and the difference in “healthy” and “less healthy” foods selected. Statistical significant at $P < 0.05$.

Results

One hundred percent of participants indicated the ability to identify a snack as “healthy” or “less healthy;” 88% reported to completely understand how to use FFK and 12% partially understood the website. Controlling for child’s age and study day, males spent significantly more time on the website than the females (p-value 0.0223). Males spent 22.43 minutes versus 18.19 minutes for females. There was no significant difference between the average proportion of healthy foods selected due to gender, age or study day number.

Conclusions

Food for Kids is a novel learning tool that is a feasible method to teach comparative nutrition to children between the ages of 7 and 11 years old. There was no significant difference between the average proportion of healthy foods selected before and after intervention. For future studies, participants suggested that a spell-check function be added to FFK.

INTRODUCTION

Evidence suggests that children prefer sweet and salty foods and avoid bitter foods from birth on, likely as a survival mechanism. However, a diet high in these foods is not conducive to a healthy lifestyle and may lead to adverse health outcomes (Mennella, 2014). Food intake tracks from childhood into adulthood, such that food choices chosen early in life are similar to choices later in life (Mikkila et al., 2005), thus, it is extremely important to teach children about healthy nutrition and how to make informed food decisions. This pilot study was designed to test the feasibility of using a researcher-maintained website, with “Dust and Magnet” (DnM) technology (Yi et al., 2005), to teach comparative nutrition to children ages 7-11 years.

Food for Kids (FFK) was created and tailored to elementary aged children based on an earlier version for adults, namely “Food for the Heart” (FFH), which was used to assist patients suffering from coronary heart disease with dietary decisions and planning (Yehle et al., 2012). On the “Food for Kids” website, DnM technology visually displays foods based on their content of four nutrients (total calories, total fat, sugar and dietary fiber). The higher a food in a particular nutrient, the more it is “pulled” away from the center of the display to the corner representing the nutrient. To our knowledge, this is the first time that DnM technology has been used as a nutrition education tool for a sample of elementary-school children. Studies in children suggest that technology-based delivery of information is appropriate for this age group and may contribute to effective learning (USDA Nutrition Evidence Library, 2013) and increased engagement in the subject matter (Peterson & Fox, 2007). Furthermore, children’s learning at this age proceeds at a high level (Janacek et al., 2012) and attention span, although rather short in the early years, is thought to increase between ages 6 and 10 years (Trautmann & Zepf, 2012). Thus, the FFK website is likely an acceptable and efficient teaching tool in this age group.

One of the strengths of FFK is that the nutrients comprising the magnets in each corner of the display can be changed by the administrator. For this study, they were chosen according to their relevance to pediatric health. Dietary intake analysis from the National Health and Nutrition Examination Survey (NHANES) suggests that children in the 6-11 year age group consume insufficient dietary fiber (United States Department of Agriculture and United States Department of Health and Human Services [USDA and HHS], 2009-2010). The Dietary Guidelines for Americans 2010 (USDA and HHS, 2010) recommends reducing the consumption of added sugars. A study published in the Journal of the Academy of Nutrition and Dietetics estimates that 205 calories, 10% of total calories per day or 10.5 teaspoons of added sugar could be eliminated from the diet of 6-18 year olds just by replacing sugar-sweetened beverages (Briefel et al, 2013). Additionally, the Centers for Disease Control and Prevention (CDC) recommends limiting foods that are high in total calories, total fat and sugar (Centers for Disease Control and Prevention [CDC], 2013). Therefore, the nutritional components total calories, total fat, sugar and dietary fiber were selected for this study.

The hypothesis tested in this study was that children would be able to learn comparative nutrition using FFK. The primary aim was to test children's comprehension of FFK and their self-reported ability to differentiate between a "healthy" food and a "less healthy" food. For the purpose of this study, "healthy" was defined as a food that was low in total calories, total fat, and added sugars but high in dietary fiber. A second aim was to determine the user-friendliness of FFK and its appearance. A secondary outcome of this study was to describe the potential for a change in the food choices at snack time before and after children used FFK. A systematic examination of this outcome was not pursued as the study design was intentionally focused on the feasibility of using the tool, not the direct measurement of children's food choices.

METHODS

Participants

Children were recruited from a local after-school care program. Parents were given a packet with parental consent and child assent forms to sign before the start of the study. Exclusion criteria included children who had food allergies, digestive diseases and severe learning disabilities. Of the 28 recruited children, one was excluded due to food allergies and two were absent from the program during data collections. Therefore, a total of 25 participants completed the study. The protocol for this study was approved by the Institutional Review Board of Purdue University.

Study Design

Each child participated in a series of three days for data collection, with at least one day between data collection days. Four children participated in the procedures described on each study day (See Figure 1). On day one, participants chose snacks from a buffet. Snack time was followed by a 10- to 15-minute teaching session and approximately 30 minutes on FFK allowing participants to search for foods. On day two, participants observed the same 10- to 15-minute teaching session and 30 minutes on FFK. On day three, participants again heard the same 10- to 15-minute teaching session followed by 30 minutes on FFK and then snack time. After completion of day three activities, questionnaires and an open discussion were conducted. The study procedures and components of each teaching session (lesson) are explained below. On each study day, participants were encouraged to peruse FFK for approximately 30 minutes by exploring different foods as search teams.

Snack time

Snack time consisted of buffet-style served snacks, which were arranged on a table such that individual snack types were placed randomly, with like foods grouped together. Children were invited to select as many snacks as desired, provided that they ate only one snack food at a time. Researchers recorded the participant's total number and order of snack choices. Snack time took place pre- and post-intervention (time spent searching foods on FFK).

Food offered as snacks

The food choices and serving size served during the snack time of the data collection days are reflected in Table 1. Before serving the snacks, all foods were removed from the original packaging and placed in generic, clear plastic bags to remove all possible branding information. Each bag contained one serving of the snack food (see Table 1). Six “healthy” and six “less healthy” snack options were offered on each study day. The type, number, and order in which the snacks were chosen were recorded by the researchers. The snack foods offered were selected based on how they ranked according to total calories, total fat, sugar and dietary fiber using the FFK. Each food was easily identified as “healthy” or “less healthy” based on depiction using FFK.

Teaching session

Children participated in a 10- to 15-minute long teaching session on the importance of total calories, total fat, sugar and fiber for health (see lesson plan in Appendix A) either before or after consuming their snack. In short, children were informed that a moderate amount of total calories and total fat were beneficial because they provide energy and promote brain development without promoting overweight or obesity. Foods that were high in total calories and high in total fat were labeled “less healthy” (CDC, 2013). Added sugar was described as providing no particular benefit to health (Briefel, 2013), so foods high in sugar were also labeled

as “less healthy”. To avoid confusion, the difference between eating sugar in fruit (naturally occurring sugar in a nutritious food) and sugar in soda (non-nutritious added sugar) was explained. Dietary fiber was explained as a natural food constituent that helped the children feel full and promote digestion. The lesson further included specific instructions on the use of FFK.

Intervention

The “Food for Kids” website was housed on a secured Purdue University maintained platform that was password protected and completely devoid of advertising. The “Food for Kids” website was adopted specifically for use in young children from the original website “Food for the Heart,” which was developed and used in adult cardiac rehab patients (Yehle et al., 2012). The main purpose of the website is to visually display nutrient content of foods. As shown in Figures 2a and 2b, search terms are displayed based on their content of total calories, total fat, sugar or dietary fiber. Higher concentrations lead to the placement of the food closer to the corners. Thus, foods that cluster in the center of the interface are moderate in all nutrients (Figure 2a). While the “pulling” towards the dietary fiber corner was considered an indication of a healthier food, foods that were pulled towards the total calories, total fat or sugar corners were considered “less healthy” options, see Figure 2b.

A researcher sat next to each participant while they were using FFK to provide help with spelling and technical assistance as needed. To encourage children’s initial use of the website, the list of foods served as snacks was provided. Research assistants documented participant’s search terms and time spent searching the site. Furthermore, the FFK website tracked all search terms submitted to the website as well as the duration for which the site was used. One user account was created for all study participants to use. The website was accessed on a portable

electronic device via wireless internet. FFK can be found using the following address:

https://www.hivelab.org/FFK/users/sign_in.

Questionnaire

At the conclusion of the third study day, participants completed two questionnaires and participated in an open discussion about the study. The first questionnaire was designed to assess the website's appearance and user friendliness, as well as the comprehension of the teaching session and the participant's ability to use the website to identify a healthy food choice (see Appendix A). An additional questionnaire was completed to report how well the participants understood the first questionnaire. This survey was used to determine if participants understood the questions, had any comments or would be willing to use the website again and answer additional questions. Finally, each participant was encouraged to engage in an open discussion with the researcher to comment on the FFK website, the lesson plan, or any other aspect of the study they cared to comment on. The responses were documented by researchers and summarized.

STATISTICAL ANALYSIS

A mixed effects model was used to test the effects of age, sex, and study day on the proportion of healthy foods that were selected using the SAS procedure Mixed. Interactions between the explanatory variables were also tested. Interactions were not significant and were removed from the model. A generalized linear model was used to determine the effect of age, sex, and study day number on the time spent using FFK using the SAS procedure GLM. Interactions between the explanatory variables were also tested and were not found to be significant. Adjusted means were calculated for the average amount of time spent using FFK for males and females when controlling for age and study day number. A simple linear regression

analysis was used to determine if the total number of foods a participant selected was associated with the number of “healthy” and “less healthy” foods selected. Statistical significance was defined as $p < 0.05$. All analyses were performed using SAS, Version 9.3, 2010, SAS Institute Inc., Cary, NC.

RESULTS

Demographics

Results of this study are based on the 25 participants, between the ages of seven and 11 years of age, who completed all three data collection days. Almost half of the participants were nine years old. Eighty-eight percent of children were white/Caucasian and 92% were non-Hispanic/Latino; this distribution of the children’s characteristics reflects the population participating in the after-school program. One participant had a food restriction and one participant indicated an allergy to medicine; however, there were no foods served or medications offered that interfered with these restrictions. Two participants had attention deficit hyperactivity disorder (ADHD), but that did not seem to affect the time spent on FFK or looking up foods. These four participants were included in the study. Results are summarized in Table 2.

Website Evaluation (Table 3)

All participants reported to understand that they were using the website to look up food and reported that the website did help them compare a “healthy” snack with a “less healthy” snack. Eighty percent of participants thought that the website was either a little fun or very fun to use and 75% thought that the website visuals were appealing. One hundred percent of the participants understood how to use the website at a level of at least “a little” understanding and 88% reported complete understanding. Ninety-two percent of participants identified fiber as the best nutrient compared to calories, fat and sugar. Effectiveness of the teaching component was

rated high in that 40% of participants correctly reported how to identify a “healthy” snack as, “Close to the fiber corner or in the middle (both of the first two choices),” and 60% answered either “Close to the fiber corner” or “In the middle.” None of the participants chose the incorrect option of “away from the fiber corner.” Approximately half of the participants thought that just the right amount of time was spent using the website, almost 50% indicated that they would use it sometimes during their free time and 20% indicated they would use the website all of the time during their free time. All participants reported that FFK was easy to use and understood questions one, three, four, seven and nine; one participant each did not understand questions two, five and six and two participants did not understand question eight. Refer to Table 3 for a summary of questions.

Post-Intervention Discussion Questions

Most of the children chose to participate in the open discussion about the study. The majority of responses to the question about how FFK could be improved were the inclusion of a spell-check. Also, most participants stated that FFK experience had not been related to the food they chose for snack. Finally, examples of responses to what they remember to have learned in the lessons included the following: fat is good for the brain, dietary fiber is good and excess calories, fat and sugar are unhealthy.

Time Spent Using Food for Kids

Table 4 shows the distribution of time spent on the website by each study day. There were no significant differences between the mean amounts of time spent during each study day. Controlling for child’s age and study day number, males spent significantly more time (22.43 minutes versus 18.19 minutes for males and females respectively) on the website than females

(p-value 0.0223). The interaction between sex and age group had no-significant effect on the time spent using FFK.

Snack Consumption Analysis

The average proportion of healthy foods chosen pre-intervention and post-intervention were not significantly different (p-value .2822). The difference in the average proportion of healthy foods was also non-significant for age group (p-value .5764) and sex (p-value .8767). The total number of foods selected was negatively correlated with the difference in the number of “healthy” and “less healthy” foods selected (p-value <0.0001, slope -0.614, R^2 0.58). Refer to Figure 3 for a visual representation of this data. A summary of total foods selected pre- and post-intervention can be seen in Table 6.

FFK Search Terms

In total, 1,600 searches were conducted using FFK; 65.63% of the searches were foods and 12.56% were attempts to look up a food. Searches were considered an attempt to look up a food, if the word was misspelled. Therefore a total of 78.19% of the search terms on FFK were related to the study (i.e. looking up food). Of the total number of food-related searches, 16.07% were misspelled. Only 21.81% of the searched items were words that were not related to food, such as (yeti, fish food and barracudas). Results are summarized in Table 5.

DISCUSSION

The goal of this pilot study, the evaluation of the use of FFK as a comparative tool for children to differentiate between foods was accomplished. FFK was rated feasible and fun by children 7-11 years old after using FFK for three study days because 80% of participants thought that the website was either a little fun or very fun to use and 100% reported the ability to compare “healthy” and “less healthy” foods. Participants reported understanding how to use the

FFK website and gave positive feedback regarding the appearance and user-friendliness of the food decision support system. To our knowledge, this is the first use of DnM technology in a food decision support system for children. Therefore, this study may inspire future research to use FFK as a decision making tool and to improve food choices. A similar version of the tool, Food for the Heart, has been shown in the past to help adults diagnosed with coronary heart disease to make food decisions that adhere to their specific diets (Yehle et al., 2012).

Participants provided consistently positive feedback on usability of the site, as appeal was an extremely important aspect for this feasibility study. Lessons learned from the “Food for the Heart” site, which had been revised multiple times to accommodate for user preferences (Yehle et al., 2012; Kwon et al., 2012), led to the design of a version of FFK that allowed for both, fun and colorful visual display of food characteristics as well as the provision of accurate nutrition data. In the future, it would be beneficial to collect information from the sample population to identify additional preferences for FFK, such as increasing certain food types or implementing a child-friendly spell check. Participants also suggested that it would be helpful if the website provided a list of common foods to search.

The majority of participants stated that the use of FFK had not influenced their food decision at snack time. This observation is consistent with existing evidence that food choices have less to do with education, but with other factors, such as peer influence (Salvy et al., 2007; Greenhalgh et al., 2009) or taste preferences (Mennella, 2014; Fildes et al., 2014).

Participants in this study were able to correctly state the importance of total calories, total fat, sugar and dietary fiber on health; however, they continued to consume the “less healthy” snacks. This finding may be explained by the unlimited free access to the snacks offered during the study. Evidence suggests that high energy density leads to increased energy consumption in

adults (Duncan et al., 1983) and children (Fisher et al., 2007; Leahy et al., 2008a; Leahy et al., 2008b). In future studies, the amount and type of foods offered as snacks should be modified to quantify the effect of variety on the children's food choice.

Recent nutrition education interventions for children were conducted in schools (Fahlman et al., 2008 and Powers et al., 2005), primary care settings (Jacobson & Melnyk, 2012), assistance programs (Wall et al., 2012), and summer camps (Tilley et al., 2014). These studies shared two main outcomes: increase in nutrition knowledge (Fahlman et al., 2008; Jacobson et al., 2012; Powers et al., 2005; Wall et al., 2012; Kesten et al., 2011) and/or positive change in eating behavior (Fahlman et al., 2008; Jacobson & Melnyk, 2012; Tilley et al., 2014). None of the aforementioned studies assessed the long-term effect of the nutritional improvements. Future research on child nutrition education, such as this feasibility study, should aim to compare snack choices before and after using the website along with the teaching sessions. Limitations of this study include the representativeness of the study population. The participants reflected that of the local population, which is limited in ethnic representation, and therefore, future studies should be conducted in larger samples with higher levels of diversity to improve generalizability of results. Also, there was no follow up to this study, so the impact of immediate learning, boredom using the site over time, and other factors predicting the use of educational tools were not assessed. Likewise, retention of the nutrition education knowledge was not assessed. Overall, in this study and previous studies there is a lack of information regarding long term effects of nutrition education on knowledge and food choice.

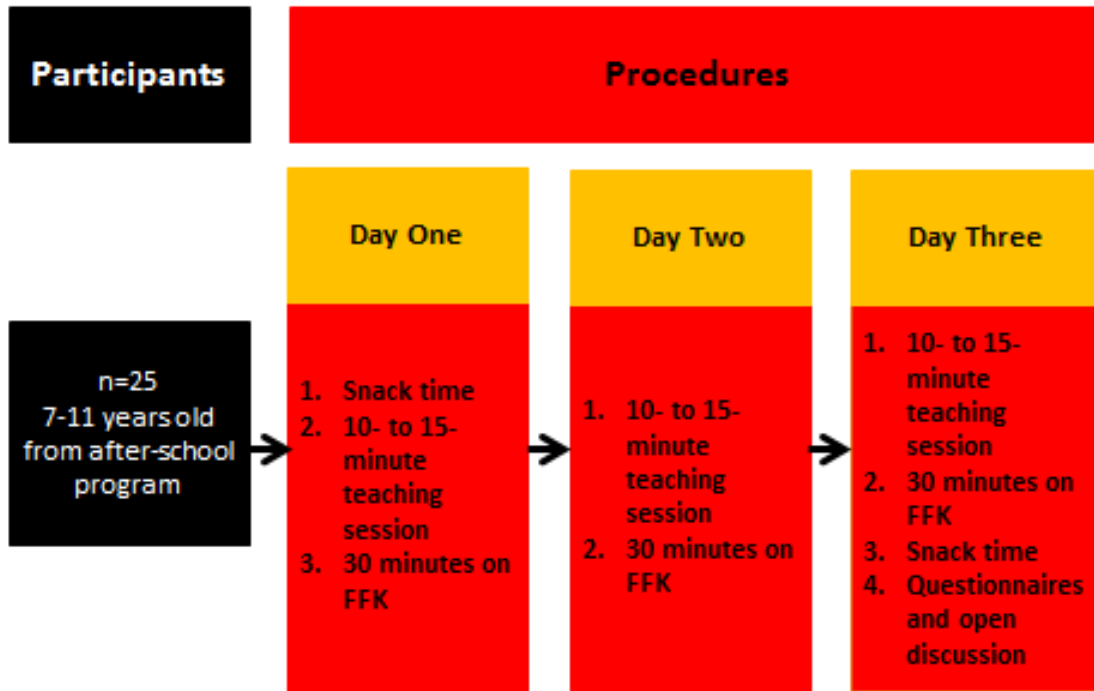
The absence of a control group limited the conclusions that could be drawn from the snack choices before and after using the website. However, snack choice was only a tertiary outcome. A control group should be included in future studies to allow comparison of children's

food choices using FFK to children's food choices without using FFK. The strength of this study includes the development of a comparative nutrition education tool, specific to young children. Unlike other studies, which are based on paper versions of nutrition education materials or oral presentations, this study combined children's curiosity associated with the use of electronics with an educational component. Also, a gender-specific difference in the time spent using FFK was shown, thus, it may be beneficial if nutrition education in children ages 7-11 years old is gender specific.

CONCLUSION

Food for Kids is a novel learning tool that can be used to teach comparative nutrition to children between the ages of 7 and 11 years old. This study suggested that FFK is visually appealing and was understood as a decision-making tool. However, using FFK as an intervention was not associated with a change in healthy food selection among the child participants of this study. Future studies in larger and more diverse populations should focus on the effect of FFK to improve food choices in different meal/snack settings and long-term follow up.

Figure 1: Study Design



FFK = Food for Kids

Figure 2 (a-left, b-right)



Figure 3: Difference in Food Choice for Gender

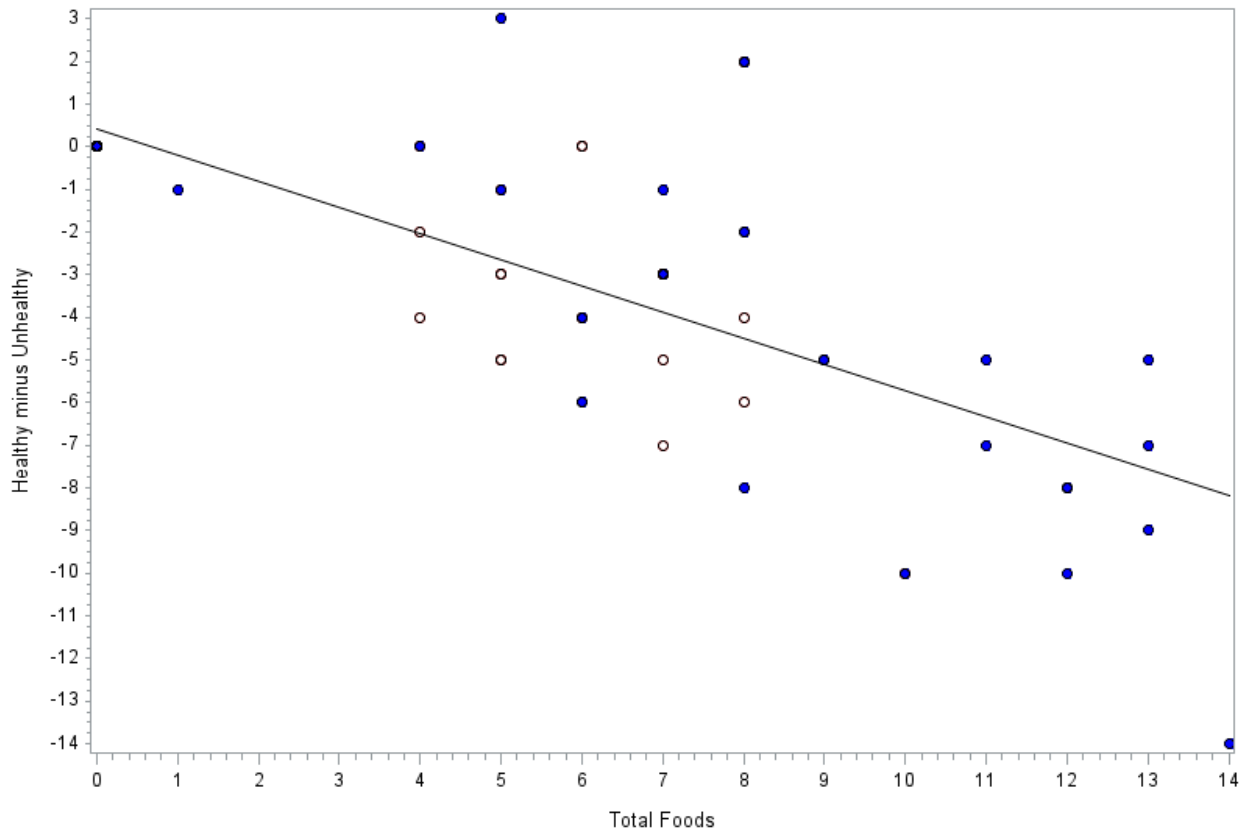


Table 1: Snack Choices and Serving Size

Snack Food	Serving Size
Fat Free Milk	8 oz
Low-fat (1%) Chocolate Milk	8 oz
Sparkling Water	8 oz
Orange Soda	8 oz
Sweet Rolls	66 g
Whole Wheat Waffles	35 g
Fruit Snacks	25.5 g
Whole Red Raspberries	140 g
Strawberry Toaster Pastries	52 g
Whole Wheat Mini Bagels	43 g
Baby Carrots	85 g
Cheese Chips	28 g

Table 2: Demographics

Demographics	Percent of Participants (%)
Age	
7	32
8	8
9	44
10	12
11	4
Sex	
Male	60
Race	
White/Caucasian	88
Asian	8
Black/African American	4
Ethnicity	
Not Hispanic/Latino	92
Allergies	
Food Restriction	4
Medicine	4
Learning Disabilities	
ADHD	8

Table 3: Website Evaluation

	Percent of participants (%)
Q1: Was the website fun to use?	
Very fun	40
A little fun	40
I don't know	12
Not very fun	4
Not fun at all	4
Q2: Did the website look good?	
Very good	68
A little good	8
I don't know	20
Not very good	0
Bad	4
Q3: Did you understand how to use the website?	
Yes	88
A little	12
I don't know	0
Not very much	0
No	0
Q4: What did you look up on the website?	
Games	0
Sports	0
Food	100
Books	0
Q5: On the website there were four nutrients. Which nutrient is best for you?	
Fiber	92
Sugar	0
Total fat	0
Calories	8
Q6: For a healthy snack, where did you want the food to be in the box?	
Close to the fiber corner	24
In the middle	36
Away from the fiber corner	0
Close to the fiber corner or in the middle (both of the first two choices)	40
Q7: Would you use the website during your free time?	
All the time	20
Sometimes	44
I don't know	16
Not very much	4
None of the time	16
Q8: Did the website help you compare a healthy snack with an unhealthy snack?	
Yes	100
I don't know	0
No	0
Q9: How was the amount of time you spent on the website?	
Very short	4
A little short	8
Good	56
A little long	28
Very long	4

Table 4: Time Spent on FFK

Day	Minimum time spent (minutes)	Mean time spent (minutes)	Maximum time spent (minutes)
1	7	23.25	34
2	6	22.08	30
3	5	18.64	29

Table 5: Search Terms

Type of Search Term	Frequency	Percent (%)
Food	1050	65.63
Attempt to look up a food (misspelling)	201	12.56
Nonsense/not food	349	21.81

Table 6: Snack Food Consumption

Snack Food	Day 1 n (%)	Day 3 n (%)
Fat Free Milk ¹	2(1.0695)	8(4.10)
Low-fat (1%) Chocolate Milk ²	11(5.8824)	8(4.10)
Sparkling Water ³	6(3.2086)	11(5.64)
Orange Soda ⁴	18(9.6257)	14(7.18)
Sweet Rolls ¹²	39(20.8556)	44(22.56)
Whole Wheat Waffles ⁷	7(3.7433)	4(2.05)
Fruit Snacks ⁶	46(24.5989)	58(29.74)
Whole Red Raspberries ⁵	16(8.5562)	11(5.64)
Strawberry Toaster Pastries ⁸	3(1.6043)	5(2.56)
Whole Wheat Mini Bagels ¹¹	6(3.2086)	3(1.54)
Baby Carrots ⁹	11(5.8824)	5(2.56)
Cheese Chips ¹⁰	22(11.7647)	24(12.31)

n=number of specific snack foods chosen on day 1, %= percent of total day 1 snack foods

Appendix A

Lesson Plan: Food for Kids

Introduction-

Hello. My name is (YOUR NAME HERE), and I am working on a research project at Purdue University. That's why you are here. You all signed up to help me! Each one of you gets to use an iPad to look up different foods. On the iPad, you will see this box (show Picture 1, and point accordingly). When you play on the iPad, you will look at these (point) four different things that are in foods; they are (continue pointing) calories, fat, sugar and fiber.

Food components-

Calories are important because they give you energy. If you eat too many or too little your body won't feel good. You need to eat just the right amount to give you enough energy to listen in school, play at recess and have fun during the day. Foods that are very high in calories are considered less healthy foods.

Fat is important because it helps your brain develop and helps your brain send messages to other parts of your body. Just like calories, eating too much or too little fat is bad. But, most kids eat too much fat. Foods like chips have too much fat and are considered less healthy foods.

Sugar is a part of food that many kids, just like you, eat too much of. When sugar is added to your food it does not provide any benefit for your body. An example of a food that has sugar added to it is chocolate milk. Chocolate milk is considered a less healthy food because sugar is added to it. Low-fat or non-fat white milk does not have sugar added to it. This makes low-fat or non-fat milk a healthier choice.

Fiber is the last thing in the food that we will look at. Most kids your age don't eat food with enough fiber in it. Fiber helps to make you feel full, and it also helps food move through your stomach. So we want to pick more foods that are high in fiber. Foods high in fiber are considered healthier foods.

Interpreting the iPad-

Healthy: When you are looking at the iPad, a healthy food is one that has all the black dots in the middle of the page, just like this picture (point to Picture 2) or has the dots pulled toward the fiber corner (motion with hand towards the fiber corner). Healthy means that it is good for your body and has the best amounts of calories, fat, sugar and fiber.

Less healthy: A less healthy food is one that has the black dots pulled toward the fat, sugar or calories corners of the page. If we look at Picture 3 (point to Picture 3), we can see that all of the black dots are being pulled towards the fat corner. This means that the food has too much fat.

So healthy foods have black dots in the center of the page or pulled toward the fiber corner of the page. Less healthy foods have black dots pulled to the corners of calories, fat or sugar (Motion and point to everything on the page as you go).

In between foods: Not every picture has all of the black dots in one area. Some of the dots are spread across the page. If the food you look up looks something like this (point to Picture 4), you can see that most of the black dots are in the center. This means that the food is a healthy food. But, if you look at this picture (point to Picture 5), you can see that most of the black dots are by the sugar corner. This would be a less healthy food. So, if most of the dots are in the center it is a healthy food, but if most of the dots are towards a corner it is a less healthy food.

iPad time-

Now it is time to go play on the iPads. Are there any questions? (Answer any questions.) You can play on the iPad for as long as you like, but you have to stay on the Food for Kids website. We will be behind you to answer any questions you have or help you spell the names of food on the iPad if you need help. All you have to do is type in names of food in the bar that says "Search Food or Restaurant." The researchers will show you where this box is when you get to the iPad. Next to the iPad is a list of foods that you should look up; just type in the name of the food that is written in the box. The list will always be available to you. You should look these foods up.

References

- Briefel, R. R., Wilson, A., Cabili, C., & Dodd, A. H. (2012). Reducing Calories and Added Sugars by Improving Children's Beverage Choices. *Journal of the Academy of Nutrition and Dietetics*, 113(2), 269-275. doi: 10.1016/j.jand.2012.10.016.
- Centers for Disease Control and Prevention. (2013). *Overweight and Obesity: A growing Problem*. Retrieved from <http://www.cdc.gov/obesity/childhood/problem.html>.
- Duncan, K. H., Bacon, J. A., & Weinsier, R. L. (1983). The effects of high and low energy density diets on satiety, energy intake, and eating time of obese and nonobese subjects. *Am J Clin Nutr*, 37, 763-767.
- Fahlman, M. M., Dake, J. A., McCaughtry, N., & Martin, J. (2008). A Pilot Study to Examine the Effects of a Nutrition Intervention on Nutrition Knowledge, Behaviors, and Efficacy Expectations in Middle School Children. *Journal of School Health*, 78(4), 216-222.
- Fildes, A., Jaarsveld, C. H. M., Llewellyn, C. H., Fisher, A., Cooke, L., & Wardle, J. (2014). Nature and nurture in children's food preferences. *Am J Clin Nutr*, 1-7. doi: 10.3945/ajcn.113.077867.
- Fisher, J. O., Liu, Y., Birch, L. L., & Rolls, B. J. (2007). Effects of portion size and energy density on young children's intake at a meal. *Am J Clin Nutr*, 86(1), 174-179.
- Greenhalgh, J., Dowey, A. J., Home, P. J., Lowe, F., Griffiths, J. H., & Whitaker, C. J. (2009). Positive- and negative peer modelling effects on young children's consumption of novel blue foods. *Appetite*, 52, 646-653. doi: 10.1016/j.appet.2009.02.016.
- Jacobson, D., & Melnyk, B. M. (2012). A Primary Care Healthy Choices Intervention Program for Overweight and Obese School-Age Children and Their Parents. *J Pediatr Health Care*, 26(2), 126-138. doi: 10.1016/j.pedhc.2010.07.004.

- Janacek, K., Fiser, J., & Nemeth, D. (2012). The Best Time to Acquire New Skills: Age-related Differences in Implicit Sequence Learning across Human Life Span. *Dev Sci*, 15(4), 496-505.
- Kesten, J. M., Griffiths, P. L., & Cameron, N. (2011). A systematic review to determine the effectiveness of interventions designed to prevent overweight and obesity in pre-adolescent girls. *Obesity Reviews*, 12, 997-1021. doi: 10.1111/j.1467-789X.2011.00919.x.
- Kwon, B. C., et al. (2012). *Advances in Human Aspects of Healthcare*. Boca Raton, FL: CRC Press.
- Leahy, K. E., Birch, L. L., & Rolls, B. J. (2008a). Reducing the Energy Density of an Entrée Decreases Children's Energy Intake at Lunch. *J Am Diet Assoc*, 108, 41-48. doi: 10.1016/j.jada.2007.10.015.
- Leahy, K. E., Birch, L. L., & Rolls, B. J. (2008b). Reducing the energy density of multiple meals decreases the energy intake of pre-school age children. *Am J Clin Nutr*, 88, 1459-1468. doi: 10.3945/ajcn.2008.26522.
- Mikkila, V., Rasanen, L., Raitakari, O.T., Pietinen, P., & Viikari, J. (2005). Consistent dietary patterns identified from childhood to adulthood: The Cardiovascular Risk in Young Finns Study. *British Journal of Nutrition*, 93, 923-931. doi: 10.1079/BJN20051418.
- Mennella, J. A. (2014). Ontogeny of taste preferences: basic biology and implications for health. *Am J Clin Nutr*, 99(suppl), 704S-711S. doi: 10.3945/ajcn.113.067694.
- Peterson, KE, Fox, MK. (2007). Addressing the Epidemic of Childhood Obesity Through School-Based Interventions: What Has Been Done and Where Do We Go From Here? *Journal of Law, Medicine & Ethics*, 35(1): 113-130.

- Powers, A. R., Struempfer, B. J., Guarino, A., & Parmer, S. M. (2005). Effects of a Nutrition Education Program on the Dietary Behavior and Nutrition Knowledge of Second-Grade and Third-Grade Students. *Journal of School Health*, 75(4), 129-133.
- Salvy, S.-J., Romero, N., Paluch, R., & Epstein, L. H. (2007). Peer influence on pre-adolescent girls' snack intake: Effects of weight status. *Appetite*, 49, 177-182. doi: 10.1016/j.appet.2007.01.011.
- United States Department of Agriculture and United States Department of Health and Human Services. (2009-2010). *What We Eat in America, NHANES 2009-2010*. Retrieved from http://www.ars.usda.gov/SP2UserFiles/Place/12355000/pdf/0910/tables_1-40_2009-2010.pdf.
- United States Department of Agriculture and United States Department of Health and Human Services. (2010). *Dietary Guidelines for Americans 2010* (7th ed., pp. 95). Washington, DC: U.S. Government Printing Office.
- U.S. Department of Agriculture Nutrition Evidence Library. (2013). *The Effects of Delivering Nutrition Education Using the Computer or Internet on What Children Eat*. Retrieved from <http://www.nel.gov/tmp/NEL-7B72F8985D8BD99A09936EB497F52D38.pdf>.
- Tilley, F., Weaver, R. G., Beets, M. W., & Turner-McGrievy, G. (2014). Healthy Eating in Summer Day Camps: The Healthy Lunchbox Challenge. *J Nutr Educ Behav*, 46(2), 134-141.
- Trautmann, M., & Zepf, F. D. (2012). Attentional Performance, Age and Scholastic Achievement in Healthy Children. *PLoS ONE*, 7(3), e32279. doi: 10.1371/journal.pone.0032279 .
- Wall, D. E., Least, C., Gromis, J., & Lohse, B. (2012). Nutrition Education Intervention

Improves Vegetable-Related Attitude, Self-Efficacy, Preference, and Knowledge of Fourth-Grade Students. *J Sch Health*, 82, 37-43.

Yehle, K. S., Chen, A. M. H., Plake, K. S., Yi, J. S., & Mobley, A. R. (2012). A qualitative analysis of coronary heart disease patient views of dietary adherence and web-based and mobile-based nutrition tools. *J Cardiopulm Rehabil Prev*, 32(4), 203-209. doi: 10.1097/HCR.0b013e31825b4e6a.

Yi, J. S., Melton, R., Stasko, J., & Jacko, J. A. (2005). Dust & Magnet: multivariate information visualization using a magnet metaphor (pp. 1-18). *Information Visualization Journal*.