FOOD Fits: A Pediatric Office Waiting Room Pilot Intervention Targeting Parental Nutrition Literacy and Child Health

By

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Abstract

FOOD Fits: A Pediatric Office Waiting Room Pilot Intervention Targeting Parental Nutrition Literacy and Child Health

Objectives: This pilot, cross-sectional study assessed whether nutrition education videos viewed in a pediatric waiting room were effective at improving parent nutrition literacy. A secondary objective was to assess the feasibility of this intervention for future research.

Methods: Parents of children aged 1-17 years were recruited from two pediatric clinics and assigned to view one of three nutrition videos. Demographic data and baseline nutrition literacy scores were collected before viewing the video; nutrition literacy was assessed immediately after viewing the video. A qualitative improvement survey was given to assess opinions regarding the nutrition videos.

Results: Twenty-one participants were recruited between the three groups. The highest scores possible for Food Groups, Consumer Skills and Nutrition Label tests were 29, 22, and 11 points respectively. Median score for Food Groups increased from 24.0 (IQR 23.0-27.0) to 26.0 (IQR 24.0-27.0) (p=0.051). Median score for Consumer Skills remained relatively constant from 20.0 (IQR 18.0-21.0) to 20.0 (IQR 17.0-21.0) (p=0.867). Median score for Nutrition Label increased from 6.0 (IQR 3.0-8.0) to 7.0 (IQR 4.0-10.0) (p=0.215). There was a non-significant increase from 81.8 (IQR 62.1-90.9) to 86.4 (IQR 72.7-90.9) (p=0.143) in median percentage of questions answered correctly across the three groups. Those with no more than a high school education were more likely (p=0.052) to have an improved nutrition literacy score after watching the video than those participants who had higher levels of education. Sixty-seven percent (n=14) of participants felt watching the video improved their experience at KUMC and 81% (n=17)

responded favorably to the idea of the nutrition videos playing in the clinic waiting rooms. Seventy-one percent (n=15) of participants stated they would be likely to change how they chose foods or fed their family after watching this video.

Conclusion: This study provides preliminary data that can be used to help create an evidence-based intervention that can easily be incorporated into pediatric clinic visits to target parental nutrition literacy and positively influence child health. An intervention of this nature may help decrease childhood obesity by increasing nutrition skills in parents that are important for making healthful food choices for the home environment.

Acknowledgements

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Chapter 1 Justification

Obesity continues to be a major public health concern in the United States (U.S.) [1-3] and is associated with an increased risk of many adverse health consequences [4]. Consequently, education and interventions that target obesity reduction are important; however they can require individuals to understand and apply complex health information. It has been suggested that a major contributor to obesity in the United States is inadequate health literacy [5]

Health literacy is defined by the Institute of Medicine and the Department of Health and Human Services as "the degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions," and over 90 million American adults struggle with health literacy [6]. The Committee on Health Literacy found that several problems are associated with low literacy and health literacy, including decreased knowledge of behaviors to promote health or manage diseases [6,7].

Similarly, nutrition literacy can be defined as "the degree to which people have the capacity to obtain, process and understand basic nutrition information [8]." Patients without adequate literacy may have poorer health outcomes, especially for certain health conditions that require health and nutrition knowledge and skills [9]. It is important for dietitians to have a variety of educational materials available that are sensitive to clients' varying levels of nutrition literacy [9] based on nutrition literacy assessments such as the Nutrition Literacy Assessment Instrument [10], and employ a variety of education techniques when needed [11].

Nutrition skills, such as identifying portion sizes and interpreting nutrition labels, are important for choosing healthful foods and following special diets. Low literacy skills have been associated with overestimation of portion sizes when individuals are asked to serve a single portion of a food item [12]. Lack of mathematical skills can often be a barrier [13] for following

quantitative nutrition tasks, such as label reading, even in patients with adequate literacy [14, 15]. Studies have shown that participants are able to use nutrition labels to compare products [13, 15] but struggle with more complex tasks such as calculating a product's contribution to daily nutrition requirements [13].

Health-related tasks are significantly more difficult for parents with low health literacy [16]. Yin and colleagues [16] found that over 28% of parents had below basic or basic health literacy skills, while less than 16% had proficient skills. Factors such as income, ethnicity, occupation [16, 17] and education [14] have been found to be predictors of low health literacy. Low parental literacy has been associated with many adverse consequences for children including an increased risk of obesity [18-20]. Many children are not following current recommendations for healthy lifestyle habits [21] that can help prevent obesity. Since children are usually reliant on their parents for obtaining food, it is important to understand the role that parental health literacy may have on physical activity and dietary adherence in children.

Primary care settings have been found to be a preferred avenue for parents to receive health-related information [14]. Video interventions in clinic settings [22-25] have effectively increased patient knowledge in both low and high literacy patients. Although these studies have targeted health literacy rather than nutrition literacy, they give direction for future nutrition literacy studies.

Lack of health and nutrition literacy in parents may lead to negative health consequences in children, such as obesity and unhealthy food intake. There is a need for additional evidence-based interventions and strategies to educate parents in ways that continually improves the health of their child [14]. This study sought to apply the concept of video intervention in the context of parental nutrition literacy. The purpose of this study was to explore if nutrition literacy videos

were effective in improving parental nutrition literacy, and to assess parents' opinions and likeability of the videos.

The study's research question was as follows: Are nutrition education videos viewed in a pediatric waiting room effective at improving parent nutrition literacy as seen in significant improvements in pre-test to post-test scores ($p<0.05$)?

Chapter 2 Review of Literature

Introduction

Obesity continues to be a major public health concern in the United States (U.S.). Over 34.9% of adults [1] and 17% of children and adolescents [2] are obese. A 2013 Behavioral Risk Factor Surveillance System survey [3] found that every state in the US had an obesity rate of at least 21%, and twenty states had an obesity rate of at least 30%. Obesity is associated with an increased risk of type 2 diabetes, hypertension, cardiovascular disease, sleep apnea, respiratory problems, cancer and gallstones [4]. Because of this association, education and interventions that target obesity reduction are important. Education and interventions come from a variety of avenues, including public health campaigns and appointments with health care providers, but can require individuals to understand and apply complex health information. Rising incidence of "nutrition-related chronic diseases" may be related a lack of understanding and ability to apply this health information [8]. It has further been suggested that a major contributor to the United State's "epidemic of overweight and obesity" is inadequate health literacy [5].

Health literacy, which is foundational to health, is defined by the Institute of Medicine and the Department of Health and Human Services as "the degree to which individuals have the capacity to obtain, process and understand basic health information and services needed to make appropriate health decisions [6]." Our current health care system requires individuals to navigate complex processes and information. Additionally, many health conditions require extensive self-care [26]. However, it is estimated that over 90 million American adults struggle with health literacy [6]. Proficient literacy does not equate to proficient health literacy [6] and the reading level of patient educational materials often exceeds the patient's actual reading level [27]. Barrett and Puryear [26] noted that individuals with adequate literacy and education, but without

understanding of medical and health medical "jargon", share the same risk for misunderstanding health information, and thus adverse health consequences, as those without adequate literacy and education.

The Committee on Health Literacy found that several problems are associated with low literacy and health literacy, including patient feelings of stigma and shame, less use of preventive services, decreased knowledge of behaviors to promote health or manage diseases and poorer self-reported health status [6]. The cost of low health literacy has been estimated to be $106-238 billion per year to the health care industry [7].

Nutrition literacy is a component of health literacy and can be defined as "the degree to which people have the capacity to obtain, process and understand basic nutrition information [8]." More simply, it consists of nutrition knowledge and the skills for using that knowledge [9]. Those with lower levels of nutrition literacy are less likely to seek out nutrition information and have less confidence and more barriers to obtaining this information [8]. Both health literacy and nutrition literacy involve more than reading literacy [9] and require skills such as conceptual knowledge and numeracy [6].

The purpose of this review is to evaluate the evidence on health and nutrition literacy in the field of dietetics, its effects in parents and children and previous interventions to increase health and nutrition literacy. Inadequate health and nutrition literacy can result in many health issues, as described in this review. Effective interventions to improve health and nutrition literacy may be key to improving health.

Importance in Dietetics Practice

It is important for dietitians to understand the role of health literacy in dietetics practice and be aware that patients may have varying health literacy levels. Studies have found that patients without adequate health literacy may have poorer health outcomes, especially for certain health conditions requiring health and nutrition knowledge such as diabetes [9]. Dietitians often educate patients on nutrition skills such as label reading that require literacy skills, numeracy skills and application of nutrition knowledge [6]. These nutrition skills are important for patients to master in order to achieve better health outcomes. Dietitians should be educated in techniques for effectively educating patients with varying literacy levels [11] and apply these techniques when needed.

Formal assessments of nutrition literacy should be conducted for patients and can be incorporated into a nutrition assessment [9]. This helps nutrition professionals avoid making incorrect assumptions about a patient's literacy based on factors such as socioeconomic status [11, 26] or the relationship between literacy and specific nutrition factors [9, 11]. Although there are tools to assess health literacy in patients, Gibbs and Chapman-Novakofski [9] suggested they are insufficient for use by dietitians. The tools measure reading level [6, 28] and may be useful for creating educational materials with an appropriate reading level for patients [9]. However, these health literacy tools do not assess whether or not a patient has the skills required for health [6, 28] or nutrition-related tasks [9]. A tool that specifically assesses nutrition literacy, such as the Nutrition Literacy Assessment Instrument, should be used [10].

It is important for dietitians to have a variety of educational materials available that are sensitive to clients' varying levels of nutrition literacy [9]. If patients are unable to understand the information presented to them, they will be unable to implement the information or make diet changes. A preliminary survey [9] was given to dietitians in three Academy of Nutrition and

Dietetics Dietetic Practice Groups. The survey found only 21.3% of respondents "always have written materials available to meet different levels of understanding [9]." These results show that dietitians need to make a greater effort to have educational materials available that are effective for, or tailored to, various literacy levels. This can help to effectively educate all patients on improving their health through nutrition-related behaviors and skills.

Parental Literacy and Effect on Child Health

For dietitians working in pediatrics, health literacy is an important concern as nutrition education often targets both parents and children. Parents, or primary caregivers, may be making choices or taking actions on behalf of their child such as providing direct care, grocery shopping, implementing special diets and following recommendations from health care providers. As the child ages, he or she should be involved in making these decisions when developmentally appropriate [28, 29] to begin learning good habits early on. Since many health-related tasks can be detrimental if executed incorrectly, or not executed at all, it is important that health care providers present information in a manner parents and children can understand to help prevent negative health consequences [29]. Suggested methods for presenting information include lower-literacy print materials and/or videos, audiotapes, verbal directions and pictures [17].

Health Literacy of Parents

In parents, health literacy plays a role in common tasks such as health promoting behaviors [29], caring for their child's acute or chronic illness [29], correctly understanding medication labels, using nutrition labels to choose foods, interpreting growth charts and procuring health insurance [16]. These tasks are significantly more difficult for parents with low

health literacy [16]. Yin and colleagues [16] used data from over 6,100 parents across the U.S. that participated in the 2003 National Assessment of Adult Literacy and found over 28% of parents had below basic or basic health literacy skills, while less than 16% had proficient skills. Predictors of lower health literacy in adults and parents include factors such as lower educational attainment [8, 15-17], lack of "English proficiency [16]," age [15, 17], obesity [15], female gender [15], low income [8, 15, 16], foreign birth [16], minority ethnicity or race [15-17], certain occupations [17] and certain types of medical insurance [15, 17]. These results can provide dietitians with an insight into parent populations that may have low health literacy, although no assumptions should be made.

Formal assessments of parental health literacy should evaluate functional literacy due to the nature of health-related tasks parents perform. Betz and colleagues [29] noted that many studies' and tools' assessments of parental health literacy were based on word recognition or comprehension rather than knowledge application. This is consistent with Gibbs and Chapman-Novakofski's findings, as previously described [9]. To our knowledge there is no health literacy assessment tool for children under sixteen [29], nor a tool to assess nutrition literacy in children. Both of these issues are concerning because many children begin making health-related decisions or participating in self-management of health conditions at a young age. A validated tool to assess nutrition literacy in children is needed to help direct nutrition education for the child.

Effect on Child Health

Health literacy of parents is a concern of patient safety and can be related to the health of the child [16]. It is important that parents are able to comprehend and apply information related to their child's health [14]. Parents with no more than a high school education are significantly

more likely to have trouble understanding their child's health information [14], but this can occur at all levels of literacy [17]. These parents with no more than a high school education have also been found to receive and seek out health information from different sources than parents with higher levels of education [14]. For example, those with no more than a high school education were more likely to receive or want to receive health advice from a family member than those with higher education (LE= 40.4% received advice, 25% wanted advice; HE= 34.8% received advice, 4.3% wanted advice) while those with a higher education were more likely to receive or want to receive information from a doctor (LE= 76.9% received advice, 82.7% wanted advice; HE= 78.3% received advice, 95.7% wanted advice). Additionally, those with higher education obtained health information from more professional organizations than those with less education (LE=0.81 organizations, HE=2.21 organizations) [14]. This could have implications on child health if the health information was obtained from an inaccurate source.

Low literacy in parents may be associated with many pediatric health-related concerns. Parents with low literacy are more likely to have at least one uninsured child [16] and perceive their child as being sicker than he or she actually is [17]. Studies have found mixed results for associations between parental literacy level and use of preventive services for children [14, 17], as well as proper understanding and administration of medications [14, 16, 17]. Moon and colleagues [17] did not find an association between literacy level of parents and keeping their child's appointments up-do-date or understanding information related to a diagnosis. The authors noted that their findings were consistent with previous studies and that other factors, such as medical staff being aware of parent literacy status and subsequently modifying education, could have influenced the results. As many studies have found varying associations

between low literacy and suboptimal health outcomes in children, this association may be weak and situation-specific [28].

Effect on Child Obesity

Many children are not following current recommendations for healthy lifestyle habits. A recent study [21] assessed physical activity and dietary adherence in 421 children, five to ten years old, with an obesity risk (70-95th BMI percentile) in the Minneapolis-St. Paul area. Variables included screen time, physical activity, intake of sugar-sweetened beverages and intake of vegetables and fruit. Adherence to all four guidelines was 2% of participants; non-adherence to all four guidelines was 19% of participants [21]. Lack of adherence to healthy lifestyle habits can contribute to obesity. Since five to ten year old children are usually reliant on their parents for obtaining food, it is important to understand the role that parental health literacy may have on physical activity and dietary adherence in children.

Low parental health literacy has been associated with an increased risk of childhood, but not adolescent, obesity [18]. Parents with low literacy may unintentionally create a weight-gain promoting environment because they lack the skills needed, such as understanding food labels, to make healthy food choices for their children or adhere to nutrition recommendations from their child's health care provider [19]. Additionally, parents may not understand growth charts and be unaware their child is overweight or obese [19].

Parental perceptions of children's weights are often inaccurate and related to a parent's level of health literacy [20]. Garrett-Wright studied 120 parents of preschoolers, from a private clinic and a health department in Kentucky, and found that only 6% of parents thought their child was overweight when in fact 17.5% of the children were overweight [20]. Thirty percent of the

parents were incorrect in their opinion of the weight status of their child [20]. Overall, there was somewhat of an unconcern about child weight and this was a nonsignificant predictor for parental accuracy of their child's weight. The authors stated that due to their findings, and that it is common to see an association between childhood overweight and obesity and lower parental concern for weight of children, health practitioners have an important role in intervening and educating parents about this topic as applicable [20]. Education about a child's weight status and interventions for childhood obesity should be tailored to the health literacy of the parents in order to positively impact the health of their child [14, 20]. Parents may be less likely to follow recommendations if they are not aware of their child's weight status or do not understand why they should follow an intervention [19, 20].

Parental health literacy is one aspect of the myriad of factors influencing childhood obesity [18]. Dietitians should take care to place emphasis on the health of the child rather than weight in pounds or kilograms to avoid potential unintended consequences such as child or parent preoccupation with the child's weight, negative body image or unhealthy relationship with food. Evidence-based interventions for decreasing childhood obesity, which are also tailored to parental health literacy level, should be used.

Effective Interventions for Increasing Nutrition Literacy

Nutrition skills, such as identifying portion sizes and interpreting nutrition labels, are important for choosing healthful foods. These skills are also important for following special diets for conditions such as obesity, hypertension and diabetes [15, 26], as well as renal disease. Huizinga and collegues [19] note that these skills require an individual to both know and use "complex, multistep, math-related tasks." A lack of these skills can result in negative health

consequences for patients. Many studies have found effective interventions to increase nutrition skills in patients.

Portion Sizes

Accurate estimation of portion sizes is important for meeting nutrient needs and goals. It is well known that consuming appropriate portions is one important aspect for achieving or maintaining a healthy weight. Knowledge of portion sizes is also important for certain health conditions where nutrients must be balanced with medications or nutrients need to be limited to reach health goals [12]. Huizinga and colleagues [12] sought to assess the effect of numeracy and literacy skills of 164 primary care clinic patients on accurate estimation of portion sizes. Participants were asked to serve a standard portion of four items. Sixty-five percent of participants correctly measured all four items, and accuracy for each item was 34-56% [12]. The participants were subsequently told what the standard portion of the item was and were asked to serve that amount. Results were similar, with 62% correctly measuring all four items. Accuracy for each item was 30-53% [12].

Associations were seen between low literacy skills and overestimation of portion sizes when serving one portion [12]. No association was found between low literacy and accuracy of correctly serving a specific amount. While 91% of participants had completed high school, 24% had literacy skills below a ninth grade level and 67% had numeracy skills below a ninth grade level. Results of the study indicate education on portion sizes should be incorporated into nutrition education because this is a skill that many patients may not be competent in. The use of divided plates and measuring cups [12] may be helpful in teaching patients correct portions of

foods. This may help counterbalance overestimation of portion sizes, especially in patients with low literacy.

Nutrition Labels

Nutrition labels are another means by which individuals receive nutrition information. Lack of mathematical skills can often be a barrier [13] for following quantitative nutrition tasks, such as label reading, even in patients with adequate literacy [14]. Studies have shown that participants are able to use nutrition labels to compare products [13] but struggle with more complex tasks such as evaluating the overall health of the product when it went against previous or popular beliefs [13], calculating a product's contribution to daily nutrition requirements [13] and completing calculations that involve more complex math skills, such as decimals or fractions [15]. Less education completed [13, 15], lower literacy and numeracy skills [15], minorities [13, 15] and "diet-related health conditions [13]" or chronic illnesses [15] have been associated with decreased likelihood of accurately completing tasks. This is fairly consistent with the aforementioned predictors of low health literacy. Rothman and colleagues [15] noted that participants with more education also struggled to complete nutrition label tasks.

These results show that current food labels are difficult for many individuals to understand and it has been noted [15] its "complexity" can be confusing. It will be of interest to see if proposed changes to labels [30] increase consumer understanding and accurate use of labels. Until then, it is suggested that nutrition educators can more effectively educate individuals by teaching simpler tasks such as product comparisons [13] that do not use difficult quantitative skills.

Nutrition Literacy in Children and Parents

The Nutrition Detectives[TM] Program [31] is an example of an effective intervention to increase nutrition literacy in students and parents. This program consists of a 90 minute in-school intervention that teaches skills in label reading and knowledge of nutrition. A study by Katz and colleagues [31] was conducted to assess the efficacy of the program in 1,180 second through fourth grade students. The students in the study attended the interventions during the school day; parents received information about the program at school functions and through take-home written materials. Pre and posttests were given to both students and parents. An 18.1% increase in student scores and 7.9% increase in parent scores from baseline showed a statistically significant increase ($p<0.001$ for both) in nutrition knowledge [31]. A follow-up session was given to the students 3 months later and a 20% total knowledge increase from baseline was found [31].

An abbreviated version [32] of the program was studied in 212 fifth graders and yielded similar results. There was a 16.2% increase in overall scores from pre to posttest, indicating the shortened version to be comparably effective to the original in increasing food-label literacy [32]. The combined results from both studies demonstrate this is an effective intervention in teaching students at a young age how to choose healthful foods. Additionally, both versions can be incorporated in schools without the use of much time [32]. A strength of this program is that it involves parents, who are most likely purchasing the students' foods at home [31]. This combined school and home program helps create continuity in changing the food environment for children [31].

Effective Interventions for Increasing Health Literacy

Although the following studies targeted health literacy rather than nutrition literacy, they give direction for future nutrition literacy studies.

Primary Care as a Preferred Setting for Education

Primary care settings are an important place where patients receive health related information. Primary care is also a common place for clinicians to educate patients on self-care for their health conditions. It is important that the information given to patients is presented in a manner patients can understand in order to positively influence health outcomes [11, 20, 26]. Davis and colleagues [14] surveyed seventy-five parents of 18-36 month old children in pediatric primary care waiting rooms regarding the preferred delivery of health information. The parents were asked if they would prefer to receive information from sources such as their pediatrician, group classes, the internet, DVDs or handouts. The results were separated by parental education level between those with and without post-secondary education. Results were similar for both levels of education. A total of 82.3% of parents in the lower education group and 87% of parents in the higher education group preferred receiving health information from doctors at well-child visits as compared to the other modes of receiving health information [14]. These results suggest that the focus should be placed on primary care settings as an effective avenue to deliver health-related information.

Video Interventions

Video interventions in clinic settings have effectively increased patient knowledge. For those with low literacy, this can be an alternative to written educational materials. It is suggested that for those with low literacy who are also television reliant for information, videos might be a

well-accepted avenue for delivering health messages [19]. Many studies found an improvement in patient knowledge with the use of a video intervention [22-25], even though the interventions and populations varied. Participant characteristics varied by studies however, average education completed was high school [23-25] and average reading level in all studies was seventh to eighth grade or below.

Studies [23, 25] in patients with limited literacy have compared the effectiveness of video interventions to brochures on increasing patient knowledge and have found videos to be most effective. A study seeking to increase colon cancer knowledge in 1100 primary care adult patients [25] found a significant increase in score improvement between intervention and control groups (26% videotape, 23% booklet; 3% control), indicating knowledge improvement as a result of the intervention. No significant difference between intervention groups was found when analyzed by reading level. Another study to increase knowledge about sleep apnea in 192 sleep disorder patients [23] found similar results with the exception that participants in the video group correctly answered some, but not all, questions significantly more often than the brochure group.

Video interventions have been shown to sustain improvements in outcome variables for several months following the intervention [22, 24]. In a study of 51 HIV patients [22], participants took a pre-survey on a Personal Data Assistant (PDA), watched a video and then completed a post-survey in the same clinic visit. A second post-survey was given at the participants' next clinic visit. The intervention resulted in a significant increase in both knowledge and self-reported medication adherence at the subsequent clinic visit following the intervention. The authors of the study noted that most participants stated that their participation in the study "optimize[d] the use of time typically spent in idle waiting" while at the clinic [22].

A video and text intervention in 170 Coronary Artery Disease (CAD) patients [24] increased weight loss and exercise, and a greater, albeit non-significant, improvement in knowledge of CAD as compared to a text only intervention. Both CAD intervention groups had significant improvements in amount of cigarettes smoked, diet and CAD knowledge [24]. Of note, associations were seen between lower levels of health literacy and greater improvement in knowledge scores.

These results show that videos can be a beneficial and well-liked [22] mode to deliver information to patients and can increase short-term knowledge [25]. The interventions can be effective in both high and low health literacy patients [24]. In some cases [23], videos can be more effective than print materials and can be more impactful through the use of personal testimonies [22] or patient interviews [24]. In other cases [24, 25], videos and print materials can be comparatively effective. In contrast, Davis and colleagues' study [14] found DVDs to be preferred the least as a method to receive health information. This is inconsistent with the aforementioned studies on video interventions.

As with written materials, clinics can create several versions of videos that are tailored to various populations within one clinic. Videos can also be a way for clinics to provide additional education to patients outside of a clinic setting or reinforce topics discussed during an appointment. When used, videos should be one of many strategies to increase patient knowledge rather than a stand-alone method of education [22-24]. Videos should also be tailored to the audience to be most effective [23, 25]. This is evidenced by Murphy and colleagues [23] who found their intervention's literacy level was too high for 40% of the participants, making the intervention "less effective than desired [23]." When the audience is kept in mind, video

interventions are a promising method of education, and may have potential to be effective in future nutrition literacy interventions.

Conclusion

Health and nutrition literacy is important in the field of dietetics. Lack of health and nutrition literacy in parents can lead to negative health consequences in children, such as obesity and unhealthy food intake. Many interventions have been successful in increasing health and nutrition knowledge and skills shortly following an intervention, however no studies assessed long-term effects of the interventions beyond a few months [22, 31]. Due to this and the fact that many health and nutrition literacy studies are cross-sectional in nature, knowledge of the effectiveness of interventions long-term is unknown. There is a need for additional evidence-based interventions and strategies to educate parents in ways that continually improves the health of their child [14]. Additionally, no studies were found that specifically used video interventions to increase parental nutrition literacy.

This review was done in preparation for our pilot study that assessed parent opinions and likeability regarding nutrition literacy videos, and the effectiveness of the videos in increasing parental nutrition literacy. It was hypothesized that the videos would not only be well-liked among parents but will also improve parent nutrition literacy. This project sought to be a way to educate parents about nutrition-related skills, such as grocery shopping and reading labels, which can have a long-term positive impact on their child's health while making efficient use of wait time before or after their child's appointment.

Chapter 3 Methods

Overview

FOOD Fits, a nutrition education video series created by the University of Kansas Medical Center (KUMC)'s Department of Dietetics and Nutrition and Department of Pediatrics, was designed to target key nutrition literacy skills that parents need in order to make healthy food choices for their children. The series includes the following four videos: Food Groups, Nutrition Facts Label, Consumer Skills (Grocery Store Tour) and Food Portion Sizes. The Food Groups video teaches the viewer about the plate model, the concept of nutrient dense foods and examples of healthful foods in each food group, including healthy fats. Consumer Skills uses the help of a registered dietitian (RD) to take the viewer on a tour of a grocery store, highlighting more healthful foods in each food group and how to compare foods using a food label. Nutrition Facts Label walks the viewer through how to read a label, emphasizing that fats and cholesterol should be lower and dietary fiber should be higher in order to positively influence heart health. It also incorporates computational problems using the label and teaches the viewer how to calculate nutrients if two servings were consumed or how much fat one serving contributed to overall daily fat requirements. The Food Portion Sizes video was excluded from this study due to the fact that it educates parents on portion sizes for children and our current nutrition literacy assessment tool is not designed to measure knowledge on portion sizes for children.

The videos were a way to educate parents about nutrition-related skills that can have a long-term positive impact on their child's health, and make efficient use of wait time before or after appointments. The purpose of this pilot, cross-sectional, observational study was to see if nutrition literacy videos were effective in improving parental nutrition literacy, and to assess the parents' opinions and likeability of the videos. Parents who participated in the study were asked

to fill out a demographic survey, take a pre-test to assess baseline nutrition literacy, watch one of three videos, take an identical post-test to assess improvements in nutrition literacy and complete a Quality Improvement (QI) survey. The results of the pre-tests, post-tests and QI surveys were used to ensure video effectiveness for future in-depth research.

Setting of the study

All portions of the study, including recruitment of participants and administration of videos and surveys, were conducted at two clinics of the University of Kansas (KU) Pediatrics from December 2015-February 2016. Please see Appendix A for the letter of approval from KU Pediatrics.

Sample

Inclusion criteria were parents who were English speaking, >18 years old and had children 1-17 years old. A potential participant was excluded if s/he did not meet the inclusion criteria, had an overt cognitive or psychiatric illness, was illiterate or had visual impairments that precluded reading survey instruments. If a participant previously thought to meet above criteria, but for which was found after consent to not meet criteria, the participant was withdrawn from the study.

Data Collection Methods

This project was submitted to the Human Subjects Committee for exempt status; the project was not covered under an existing approved protocol. A consent form was not used as there was no personal or identifying information collected from participants, apart from that

required for remuneration purposes (participants were offered a $10 gift card upon completion of the surveys). However, this personal information was not retained in the study database. Consent was obtained through answering a consent question in REDCap as outlined below. Please see Appendix B for the consent question.

The study involved a one-time encounter with participants. Due to logistics and preferences of clinic staff, recruitment methods were different between the two clinics. At one of the clinics, participants were recruited by a research team member from the waiting room while waiting for their child's appointment. Due to short wait times, potential participants were informed of the study and invited to participate after their child's appointment. At the other clinic, participants were recruited from their exam rooms after meeting with their child's physician and all parts of the study were conducted in the exam room. Flyers were given to the front desk staff at both locations to advertise the videos and the study (see Appendix C).

Individuals interested in participating in the study were either screened for eligibility by their physician, front desk staff or the research team. Caregivers such as grandparents were also allowed to participate.

The primary and co-investigators gave potential participants detailed and comprehensive information about the study before participation and obtained their consent immediately prior to participation in the study. Potential participants were given a verbal explanation of the study and were allowed to independently consider participating in the study.

Individuals who agreed to participate were given the iPad to access the survey and videos via REDCap. At the beginning of the survey, participants were presented with a consent question (non-anonymous survey format) during which time a research team member was present to answer any questions from the participant.

After obtaining informed consent, participants completed a demographic survey and pre-test of nutrition literacy. They were then assigned to one of three nutrition videos. After watching the video, the participant had the opportunity to complete the post-test and QI survey. The length of the videos was four to seven minutes; the tests and survey took approximately 10-15 minutes total to complete. The duration of each encounter was estimated to be no longer than 15-25 minutes. Our methods for delivering the video intervention were similar to Brock and Smith's approach to increasing knowledge and medication adherence in HIV patients [22] as previously discussed.

Personnel responsibilities were as follows: determining eligibility, Melissa Newmaster, D&N Student; obtaining informed consent, administered through REDCap; providing on-going information to the study sponsor and the IRB, Heather Gibbs, PI; maintaining participant's research records, Melissa Newmaster and Heather Gibbs; administering videos and surveys, Melissa Newmaster; completing study data forms, Melissa Newmaster; and managing the study database, Melissa Newmaster and Heather Gibbs.

Description of data collection instruments

The study and all data collection were done through REDCap. Data collected included responses to the demographic survey, Nutrition Literacy Assessment Instrument (NLit) and the QI survey. Demographic data collected included child age and parent age, highest level of education completed, gender, ethnicity, race, marital status, employment and occupation, hours worked per week, total household income, history of a previous appointment with a registered dietitian, primary source of obtaining information about nutrition, if their child currently followed a special diet and if they currently participated in any public food assistance programs.

The NLit is used to test knowledge of nutrition and ability to apply nutrition knowledge through tasks such as being able to determine which food group a particular food belonged to, choosing a more healthful form of a food and performing computations using a nutrition label [33]. Questions from the original NLit were divided to create three different surveys, one for each of the videos, so each test included items that related to the respective content of each video. Qualitative data collected included parental opinions regarding the videos and the concept of using nutrition videos in a waiting room setting. The QI survey also asked parents' confidence in achieving the videos' pre-determined objectives after viewing the video (see Table 4 for video objectives). Food Groups objectives included confidence in knowing the different kinds of foods needed on their child's plate and confidence in choosing whole grains for meals and snacks. Consumer Skills objectives included confidence in selecting nutrient dense foods for their family and confidence in selecting leaner sources of meat for their family. Nutrition Label objectives included confidence in knowing how to read a nutrition facts label and confidence in reading labels for heart health. An open-ended comments box was provided at the end of the survey to gather participants' opinions that may have not been gathered otherwise.

Survey results were stored in REDCap and analyzed data were kept in a password-protected file. Data will be maintained in a password-protected file of KUMC's encrypted network for 7 years after completion of the research. See Appendices D-F for a copies of the demographic survey, pre-tests, post-tests and QI survey.

Methods of analyzing data

Data were analyzed using Microsoft Excel 2010 and 2013; SPSS Statistics for Windows, versions 22 and 24.0 (IBM Corp, Armonk, NY, 2016); and R version 3.2.1 (The R Foundation,

Vienna, Austria, 2015). Improvement between pre- and post-tests was evaluated through paired

t-tests (Wilcoxon Signed Rank Test for non-parametric data, one sample, repeated measures).

One point was given for each correct response. If a participant did not choose an answer for a

question, it was scored as incorrect. Total scores were calculated for each participant and

median scores were calculated for each video. Changes in scores from pre-test to post-test were

then calculated; p-value <0.05 indicated a statistically significant change. A one-sided p-value

was used as our hypothesis was to see an improvement in scores. As each survey had a different

number of questions, overall change in score for the study sample was calculated as median

change in percentage points of correct responses.

Fisher's exact test was used to look for trends in relationships between demographic data

and nutrition literacy scores. This test was used to look for associations between the categories

of variables in a small sample size. Median nutrition literacy scores were calculated (percentage

of correct responses) as equal to or greater than median vs less than median. Demographic

variables were categorized as follows: education as no more than high school education vs higher

levels of education, income as <$25,000 vs $25,000+ (rounded estimation of federal poverty

level for average household size in the United States) [16, 34, 35], ethnicity as Hispanic vs not

Hispanic, race as minority vs not minority and those who had a previous appointment with a

registered dietitian (RD) vs those who had not.

Kruskal-Wallis Test was used to look for trends in relationships between demographic

data and changes in nutrition literacy scores. This test for nonparametric data was used to assess

differences between three or more independent demographic characteristics on a dependent,

continuous variable (change in scores). Change in scores was determined by change in

percentage points of correct responses. Demographic variables were categorized the same as

listed in Table 1 and included education, income, ethnicity, race and previous RD appointment.

For variables with less than three categories, Mann-Whitney U Test (nonparametric, differences

between two independent demographic characteristics on continuous variable [change in scores])

was performed by default.

Responses to the demographic and QI surveys addressing likability of the videos were

evaluated through descriptive statistics and content-analysis for themes in response to open-

ended questions. For demographic data, numerical values were analyzed for mean and standard

deviation; categorical variables were analyzed for frequency and percentages. If a participant did

not select an answer for a question, the participant was eliminated from the analysis for that

question. Most QI questions were designed to be a 4-point hedonic scale ranging from "very

[likely or confident]" to "not very [likely or confident]". Criteria for success of the quality of the

videos included a mean score of 3 out of 4 on a survey question (excluding questions about

previous knowledge). This meant that, for example, participants needed to respond that they

were either "somewhat likely" (score of 3) or "very likely" (score of 4) to change their eating

pattern instead of "a little likely" (score of 2) or "not at all likely" (score of 1).

Chapter 4 Results

As aforementioned, this study sought to explore if nutrition literacy videos were effective in improving parental nutrition literacy, and to assess parents' opinions and likeability of the videos. A power analysis was performed with a specified power of 80% and alpha of 0.05. This study would have required 1989 participants at an effect size of 0.2, 34 participants at an effect size of 0.5 and 15 participants at an effect size of 0.8. While we would ideally want to see large improvements in knowledge, we would also want to detect small changes in improvements in knowledge; thus would want an effect size of 0.2. Since this was a pilot study, we were unable to recruit enough participants to see statistically significant results at an effect size of 0.2, however trends in the data were found.

Establishing the Basis for Nonparametric Statistics

It was assumed that nonparametric statistics would be appropriate for this study due to the small sample size (n=21) however, descriptive statistics were performed on the nutrition literacy pre-scores to confirm this. Mean, median and mode for the Food Groups pre-scores were fairly similar (23.9, 24.0, 23.0 respectively) however scores were skewed to the left with a kurtosis of 1.7 (Figure 1). Mean, median and mode for the Consumer Skills pre-scores were not as similar (18.4, 20.0, 18.0 respectively) and scores were skewed to the left with a kurtosis of 4.3 (Figure 2). Mean and median for the Nutrition Label pre-scores were similar but mode was not (5.9, 6.0, 8.0 respectively); scores were slightly skewed to the left with a kurtosis of -1.5 (Figure 3). For overall percentage of correct responses between the videos, the mean (73.1) was fairly different than the median and mode (82.0, 82.0 respectively), resulting in a skew to the left and a kurtosis of 0.6 (Figure 4).
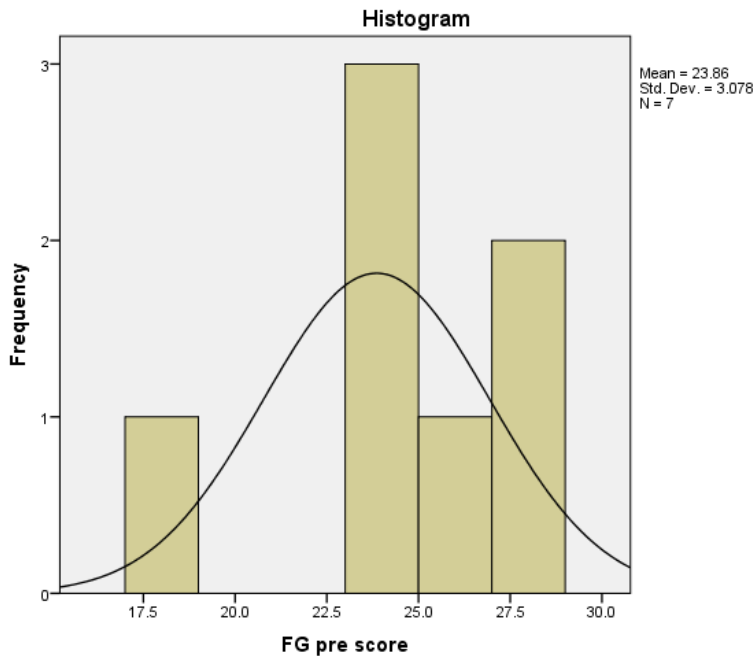
Figure 1: Food Groups Pre-Scores
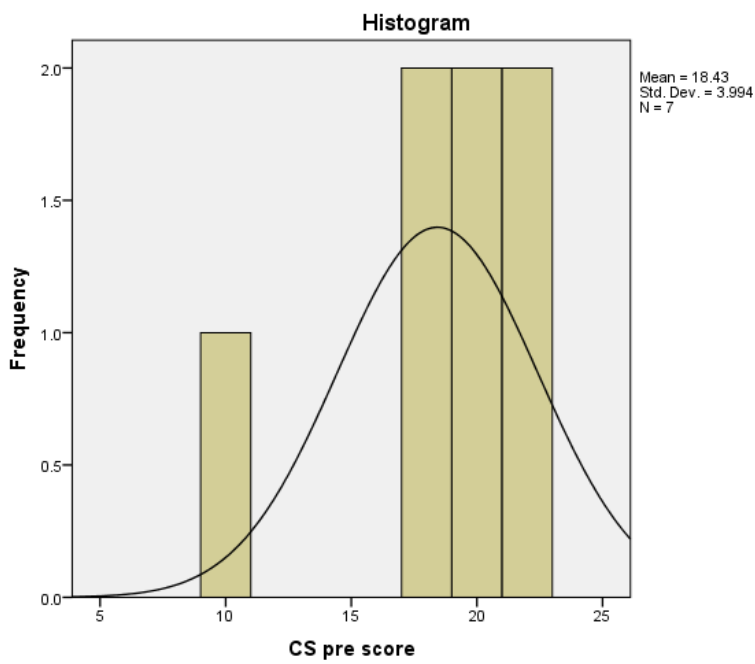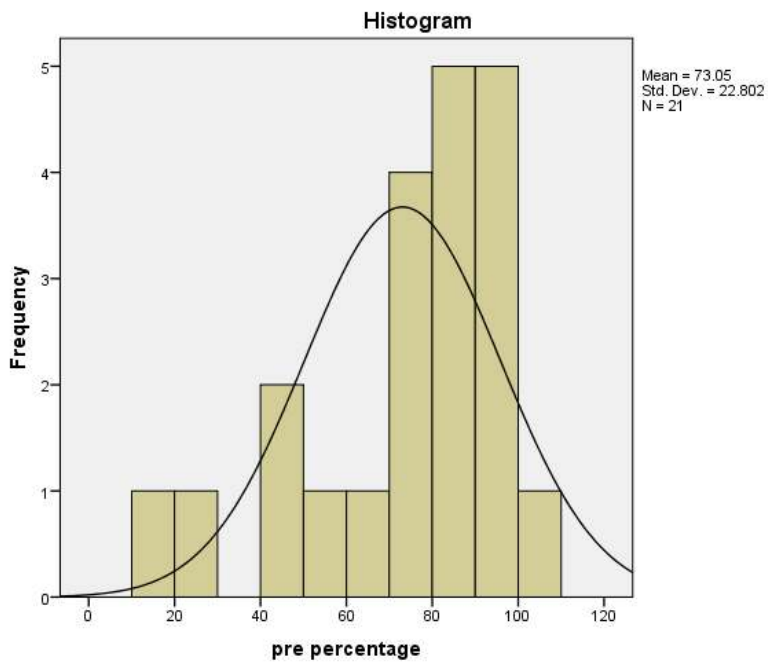

Figure 2: Consumer Skills Pre-Scores

Figure 3: Nutrition Label Pre-Scores

Figure 4: Overall Percent Correct Pre-Scores

Demographic Data

See Table 1 for demographic data. Twenty-one participants were evenly distributed between the three videos (seven participants in each group). Twenty-three participants originally completed the study, however two participants' responses were removed from the study database because they did not want to watch the video before taking the post-test. Mean parental age of the study sample was 36±10.6 years and mean age of their child was 5±4.4 years. A majority (90%, n=19) of participants were female and 67% (n=14) were not Hispanic. Participants who were married was 57% (n=12). Only 24% (n=5) of participants had no more than a high school education and 19% (n=4) had completed a graduate degree. Sixty-two percent (n=13) of participants were employed and mean hours worked per week was 27±18.0. Thirty-five percent (n=7) of participants had a total household income of <$25,000 per year. Common occupations included nurse, supervisor/manager and housewife.

Only 24% (n=5) of participants had a previous appointment with a dietitian for either themselves or their child. Most common avenues for obtaining nutrition information included internet (29%, n=6), doctor (29%, n=6) and other (33%, n=7). Only 15% (n=3) of participants stated their child followed a special diet. Current participation in public food assistance programs was 14% (n=3).

Nutrition Literacy Scores

The maximum scores possible for Food Groups, Consumer Skills and Nutrition Label tests were 29, 22, and 11 points respectively (Table 2). Median score for Food Groups increased from 24.0 (IQR 23.0-27.0) to 26.0 (IQR 24.0-27.0) (p=0.051). Median score for Consumer Skills remained constant from 20.0 (IQR 18.0-21.0) to 20.0 (IQR 17.0-21.0) (p=0.867). Median

score for Nutrition Label increased from 6.0 (IQR 3.0-8.0) to 7.0 (IQR 4.0-10.0) (p=0.215).

Overall change in scores cannot be determined due to differences in the number of questions for

each video. However, changes in percentage of questions answered correct can be determined.

There was an overall non-significant increase from 81.8 (IQR 62.1-90.9) to 86.4 (IQR 72.7-90.9)

(p=0.143) in percentage of questions answered correctly.

When testing differences of demographics in relation to nutrition literacy scores in our

study, no variables were significantly associated with either higher or lower nutrition literacy

scores (Table 3). Similarly, there were no differences in change in nutrition literacy score based

on income (Kruskal-Wallis Test, p=0.119, df=2), ethnicity (Mann-Whitney U Test, p=0.353,

df=1), race (Kruskal-Wallis Test, p=0.802, df=2) or previous RD appointment (Mann-Whitney U

Test, p=0.548, df=1) . However, while level of education was not associated with a statistically

significant difference in change in nutrition literacy scores (Kruskal-Wallis Test, p=0.052, df=3),

there was a trend that those with no more than a high school education were more likely to have

an improved nutrition literacy score after watching the video than those participants who had

higher levels of education (Figure 5).

Quality Improvement Results

Overall quantitative results for all three groups are presented as follows. A breakdown of

results for each video can be found in Table 4. Sixty-seven percent (n=14) of participants felt

watching the video improved their experience at KUMC and 81% (n=17) responded favorably to

the idea of the nutrition videos playing in the clinic waiting rooms. For 52% (n=11) of the

participants, their child watched at least half of the video with them. Eighty-six percent (n=18)

of participants stated they had previous knowledge of their respective video's topic before

watching the video, and 71% (n=15) of participants stated they would be likely change how they chose foods or fed their family after watching this video. For both Food Groups and Consumer Skills, 100% (n=7, n=7) of participants in each group felt confident that they could achieve the video's objectives after watching the video while only 86% (n=6) of participants in the Nutrition Label group felt confident they could achieve the video's objectives.

As for the logistics of the videos, 100% (n=21) felt the videos were of appropriate length, 90% (n=19) felt it was both easy to watch the videos on the tablet and watch the videos while waiting, 100% (n=21) felt it was easy to understand the video's storyline and sound, 95% (n=20) liked the pop-ups in the videos, 76% (n=16) did not need an accompanying paper handout over the topic and 52% (n=11) did not need an accompanying cooking segment in the video.

Only three of the 21 participants provided comments about the study in the comments section of the survey. These comments included the following: "going to be better if [it] is in Spanish too," "I have been reading nutritional labels for a long time" and "already pretty informed on nutrition, I think this video could help those who are not." Many participants provided verbal comments about the videos which included several stating that the videos were interesting, one stated that reading nutrition labels was a difficult task and one participant found it particularly helpful to learn that grocery stores often have dietitians. Several participants complained about the total length of time and having to complete the same questions during the identical post-test.

Table 1: Demographic Data

Variable	Total (n=21)	Food Groups (n=7)	Consumer Skills (n=7)	Nutrition Label (n=7)
Parent Age: mean (SD), years	36 (10.6)	31 (6.6)	38 (12.3)	41 (11.8)
Child Age: mean (SD), years	5 (4.4)	2 (2.2)	8 (5.2)	5 (3.9)
Education: *n* (%)				
No More Than High School	5 (24%)	2 (29%)	1 (14%)	2 (29%)
Some College/Associate's Degree	7 (33%)	1 (14%)	3 (43%)	3 (43%)
Bachelor's Degree	5 (24%)	2 (29%)	2 (29%)	1 (14%)
Graduate Degree	4 (19%)	2 (29%)	1 (14%)	1 (14%)
Gender: *n* (%)				
Female	19 (90%)	6 (86%)	6 (86%)	7 (100%)
Male	2 (10%)	1 (14%)	1 (14%)	0 (0%)
Ethnicity: *n* (%)				
Hispanic	6 (29%)	2 (29%)	2 (29%)	2 (29%)
Not Hispanic	14 (67%)	5 (71%)	4 (57%)	5 (71%)
Race: *n* (%)				
African American	5 (25%)	3 (43%)	1 (14%)	1 (17%)
Caucasian	10 (50%)	2 (29%)	4 (57%)	4 (67%)
Other	5 (25%)	2 (29%)	2 (29%)	1 (17%)
Marital Status: *n* (%)				
Married	12 (57%)	3 (43%)	5 (71%)	4 (57%)
Not Married	9 (43%)	4 (57%)	2 (29%)	3 (43%)
Employed: *n* (%)	13 (62%)	6 (86%)	4 (57%)	3 (43%)
Hours/Week: mean (SD)	27 (18.0)	26 (16.7)	26 (19.9)	31 (21.7)
Household Income: *n* (%)				
<$25,000	7 (35%)	4 (57%)	2 (29%)	1 (17%)
$25,000-49,999	5 (25%)	2 (29%)	0 (0%)	3 (50%)
$50,000+	8 (40%)	1 (14%)	5 (71%)	2 (33%)
Previous appointment with dietitian: *n* (%)	5 (24%)	3 (43%)	1 (14%)	1 (14%)
Primary source of nutrition information: *n* (%)				
Television	1 (5%)	0 (0%)	1 (14%)	0 (0%)
Internet	6 (29%)	1 (14%)	4 (57%)	1 (14%)
Magazines	0 (0%)	0 (0%)	0 (0%)	0 (0%)
Friends/Family	1 (5%)	1 (14%)	0 (0%)	0 (0%)
Doctor	6 (29%)	3 (43%)	0 (0%)	3 (43%)
Other	7 (33%)	2 (29%)	2 (29%)	3 (43%)
Child Follows Special Diet: *n* (%)	3 (15%)	1 (14%)	1 (17%)	1 (14%)
Current Participation in Public Food Assistance Programs: *n* (%)	3 (14%)	1 (14%)	1 (14%)	1 (14%)

Table 2: Nutrition Literacy Scores

Video (max score)	n participants	Pre-Test Scores		Post-Test Scores		p-value[a]	Confidence Interval[b]
		Median Score (IQR)	Median Percentage Correct (IQR)	Median Score (IQR)	Median Percentage Correct (IQR)		
Food Groups (max score=29)	7	24.0 (23.0-27.0)	82.8 (79.3-89.7)	26.0 (24.0-27.0)	89.7 (84.5-93.1)	0.051	(0.5, infinity)
Consumer Skills (max score=22)	7	20.0 (18.0-21.0)	90.9 (81.8-93.2)	20.0 (17.0-21.0)	90.9 (81.8-93.2)	0.867	(-2.0, infinity)
Nutrition Label (max score=11)	7	6.0 (3.0-8.0)	54.5 (36.4-72.7)	7.0 (4.0-10.0)	63.6 (50.0-81.8)	0.215	(-1.0, infinity)
Overall Percentage Correct	21		81.8 (62.1-90.9)		86.4 (72.7-90.9)	0.143	(0, infinity)

a. one-sided p-value with continuity correction
b. 90% Confidence Interval (CI) for shift of median from pre-test to post-test

Table 3: Relationship of Demographics on Nutrition Literacy Score

Variable		Pre-Test Score			Post-Test Score		
		<Median Percentage Correct	≥Median Percentage Correct	Fisher's p-value[a]	<Median Percentage Correct	≥Median Percentage Correct	Fisher's p-value[a]
Education	≤High School	4	1	0.149	3	2	0.611
	>High School	6	10		6	10	
Income	<$25,000	4	3	0.642	3	4	1.000
	≥$25,000	5	8		5	8	
Ethnicity	Hispanic	3	3	1.000	4	2	0.161
	Not Hispanic	6	8		4	10	
Race	Minority	5	3	0.342	3	5	1.000
	Not Minority	3	7		3	7	
Previous RD Appointment	Yes	3	2	0.635	2	3	1.000
	No	7	9		9	12	

a. df=1

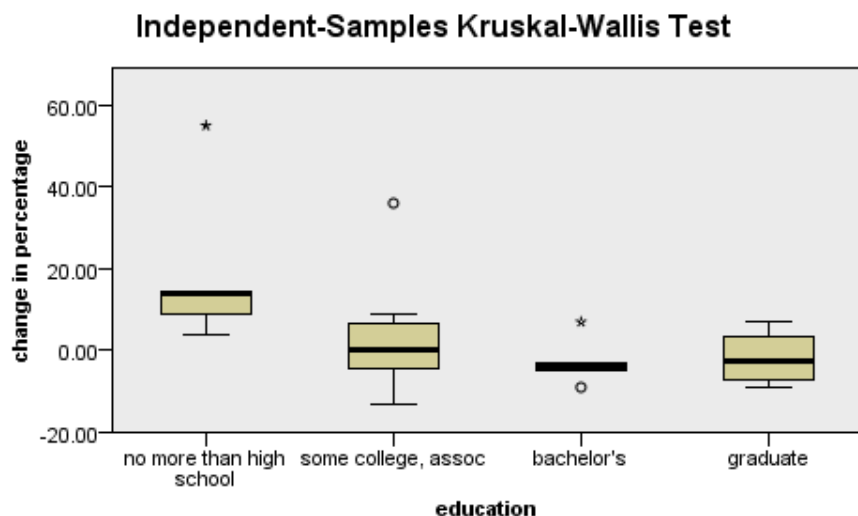Figure 5: Differences in Change in Percentage Correct by Education Level

Table 4: Quality Improvement Survey Results

Variable	Total (n=21)	Food Groups (n=7)	Consumer Skills (n=7)	Nutrition Label (n=7)
Improved experience	14 (67%)	5 (71%)	3 (43%)	6 (86%)
Appropriate length	21 (100%)	7 (100%)	7 (100%)	7 (100%)
Easy to watch while waiting	19 (90%)	7 (100%)	5 (71%)	7 (100%)
Child watched at least half of video	11 (52%)	5 (71%)	3 (43%)	3 (43%)
Nutrition videos playing in waiting room	17 (81%)	7 (100%)	5 (71%)	5 (71%)
Easy to watch on tablet	19 (90%)	7 (100%)	6 (86%)	6 (86%)
Understand video's story and sound	21 (100%)	7 (100%)	7 (100%)	7 (100%)
Do not need an accompanying paper handout	16 (76%)	6 (86%)	6 (86%)	4 (57%)
Video pop-ups	20 (95%)	7 (100%)	7 (100%)	6 (86%)
Do not need an accompanying cooking segment	11 (52%)	4 (57%)	4 (57%)	3 (43%)
Previous knowledge of topic	18 (86%)	6 (86%)	7 (100%)	5 (71%)
Likeliness of changing foods eaten	15 (71%)	7 (100%)	4 (57%)	4 (57%)
Video Objectives	20 (95%)			
Confidence in knowing foods to build plate model		7 (100%)		
Confidence in choosing whole grains		7 (100%)		
Confidence in selecting nutrient dense foods			7 (100%)	
Confidence in selecting lean meats			7 (100%)	
Confidence in reading nutrition facts label				6 (86%)
Confidence in reading labels for heart health				6 (86%)

Chapter 5 Discussion

Demographic Data

Due to the small sample size limitations of our pilot study, we were unable to tell if our intervention was effective. In some respects, our participants were fairly similar (90% females, 53% Caucasians, 60% had <$50,000/year in income and 76% had more than a high school education). Because of the similarities among the sample, our results are not generalizable.

Nutrition Literacy Scores

Because validation of the Nutrition Literacy Assessment Instrument is not complete, it is currently unknown what score would be associated with varying levels of nutrition literacy (low, marginal, adequate). Overall, we saw an increase in percentage of correct responses across the three groups, however some things should be noted. In the Food Groups video, median score increased by 2 points with four participants having an improved score, two participants with no change in score and one participant with a decreased score. This seemed to be the more successful video of the three videos at increasing nutrition literacy because improvement in scores from pre-test to post-test trended towards significance (p=0.051). In the Consumer Skills video, there was no change in median scores, with two participants having an improved score, one participant with no change in score and four participants with a decrease in score. Interestingly, all (n=7) of the participants in this group responded they had previous knowledge of the topic. In the Nutrition Label video, median score increased by 1 point, with four participants having an improved score and three participants with a decrease in score. Improved scores ranged from 1-6 point increase while decrease in scores was -1.

While we saw an improvement in scores for both the Food Groups video and Nutrition

Label video, it is encouraging that there was an increase in nutrition literacy scores in the Nutrition Label video group. Using nutrition labels have already been shown to be a hard task for participants [13] and during this study, one parent commented that reading nutrition labels was a hard task. This skill is important for the general population when it comes to comparing food products and evaluating the overall healthfulness of the item [13, 15]; however, it is critical for patients who have conditions, such as diabetes [15, 26] and kidney disease, which require accurate use of labels to maintain health status. Our data suggests that the Nutrition Label video may be an effective intervention for teaching parents how to read a nutrition label.

Many studies have found various demographic factors that are associated with lower health and nutrition literacy. These include lower education [8, 13, 15-17], lower income [8, 15, 16] and certain races and ethnicities [13, 15-17]. In this study, demographic factors were not associated with nutrition literacy, however there was a trend that those with lower levels of education had a larger increase in nutrition literacy scores after watching the videos (p=0.052) when compared to those with higher levels of education, consistent with a previous video study [24]. These individuals in our study also often started with lower nutrition literacy scores before watching the video (Table 3). It is encouraging that the videos can be an effective source of nutrition education for those who have lower educational attainment and poorer nutrition literacy because this suggests the messages of the videos are appropriately targeted.

Several questions of the Nutrition Literacy Assessment tool seemed to be problematic for participants (<50% responded correctly). These questions included those that were related to the ability to identify energy dense foods and beverages, calculating nutrient values (such as calories or carbohydrates) for portion sizes other than what was listed on the label and calculating how much a food would contribute to a daily nutrient requirement. These themes are similar to

results found in another study that tested participants' ability to use a nutrition label [13]. Future research can address this by incorporating an additional aspect into the research experience that uses questions missed to re-educate parents and children on nutrition topics they may struggle with.

There are a variety of factors that influence an individual's knowledge and opinions about nutrition as well as willingness to accept and implement new nutrition information that may be presented to them. Levy and Fein [13] found that many of their participants followed "general dietary recommendations" even when presented with contrary information, suggesting "either computational and/or conceptual skills are lacking to make the translation from the product to the total diet." In today's society of instant news, biased media and bloggers there are many opportunities and avenues for nutrition information to reach the public, however ensuring that this information is accurate is hard. While many of these provide accurate nutrition information, it may not be presented in a manner that the consumer can understand and apply. Additionally, there is a plethora of sources that provide nutrition advice that is inaccurate, biased and/or not scientifically based. It is the goal of studies such as this to not only create an intervention that is effective at increasing nutrition knowledge and literacy but is in a form that can be easily disseminated, even beyond a clinic setting and into a wider community setting [11].

Quality Improvement Results

Overall, participants responded positively to the intervention. Of note, over half of the participants in the Consumer Skills group (57%, n=4) responded that the video did not improve their experience at the clinic. There were no subjective comments from the participants about this issue. Due to this and the fact that this was the only video where post-test scores did not

increase from pre-test scores, it would be necessary to determine the cause of these in order to improve the effectiveness of the video. One hypothesized explanation is that this was the lengthiest of the three videos and participants may have disliked this aspect of the video. A focus group may be beneficial for determining the cause of this.

A secondary purpose of this pilot study was to assess the feasibility of an intervention study such as this one. Total time recruiting was approximately 66 hours with an average of 3.1 hours of recruitment time per participant, most of which was spent waiting for physicians to finish seeing patients or waiting for eligible participants to show up for their child's appointment. Most common reasons for an individual being unable to participate included Spanish-speaking and lack of time due to other responsibilities. Future research should be mindful of parents' busy schedules; scheduled research appointments may be more time-efficient on both the parents and research team members. Several participants complained about the length of time it took to complete the study. Future research should also seek to address this through strategies such as increasing participant engagement. Noteworthy is that the research team is currently working on ways to make this intervention available in Spanish.

From the research team's observations, using a tablet seemed to be a feasible method for the participants to take the surveys and watch the videos. Due to the nature of REDCap and the file size of the videos, the only feasible way to incorporate them directly into the surveys was through a link that took participants to an external site to watch the videos. Clicking on the link and then navigating back to the survey after the video was complete seemed to be difficult for many participants and several accidentally skipped over the video, possibly because it was only a link rather than an image as well, and had to go back to view it. Ideally there needs to be a better way to incorporate the videos directly into the surveys.

Several parents used their participation in the study as a learning opportunity for their children. By guiding their child through the questions and watching the video, the child was able to learn about nutrition in a unique and fun way. It has been recommended [28, 29] that children and adolescents be involved in care related to their health as developmentally appropriate. While many younger children's food choices are often determined by parents, there are still many opportunities for them to make food-related decisions, such as school lunch [18]. Future research should take advantage of this by incorporating child-friendly aspects such as interactive games to both teach and test nutrition knowledge of children.

Limitations, Implications and Conclusions

There are several limitations to this study in regard to score outcomes. The small sample size (21 participants between three groups) limits results that can be concluded. Statistically significant results were not seen in either of the two video groups with score improvements; it is unknown whether significant changes would have been seen if a larger sample size would have been used. Exact randomization was not used to assign participants to video groups that could have eliminated any potential biases between group scores. Ceiling effects could have also played a role in post-test nutrition literacy scores. Many participants had fairly high scores to begin with (57% of participants scored at or above the median score for their video group) and any improvement in scores may have not been large enough to result in a significant increase, even if a larger sample would have been used. Additionally, the videos may have covered topics that these participants were already knowledgeable about and thus resulted in maintaining their pre-test score rather than improving it. However, the trends that were found in this study are still useful for further research in this area.

Some similarities in participant demographics is a limitation in generalizing the results to other populations. Our inclusion criteria created a limited pool of potential participants. Additionally, lack of time on behalf of a potential participant was a deterrent for many individuals which further decreased the number of potential participants. Those who decided to participate could have had different demographics than those who declined due to lack of time. Because of this, future studies and interventions should seek to optimize time and benefit for the participant.

Lastly, the national dietary guidelines have changed several times since the initial development of the Nutrition Literacy Assessment Instrument and changed once during the course of the *FOOD Fits* project. This is important because the content of some questions are based upon the dietary guidelines. While a majority of the guidelines remain fairly similar, aspects such as a de-emphasis on dietary cholesterol have already changed [36] and a change to the design of nutrition labels are proposed [30]. These factors may impact future use of the instrument. Of note, in this study when participants were asked to identify that cholesterol is a nutrient that should be limited in a healthful diet, the second most common answer, after cholesterol, was carbohydrate. Many current and popular diet trends advocate a lower or low carbohydrate diet for weight loss. Although not investigated in this study, it is possible that the de-emphasis of dietary cholesterol in the dietary guidelines coupled with the popularity of consuming low carbohydrate diets could explain the responses to this particular question.

We believe our nutrition videos are in a form that can be easily disseminated, and was well liked by our participants, but it is unknown how interventions like these influence actual food choices long term and thus future health outcomes. Many studies [22, 31] have not assessed long-term effects of video interventions for improving patient knowledge. While

interventions such as this are useful in that they at least plant the seed of knowledge of healthful eating, it is unknown whether this or a different strategy would be better at positively influencing health. Additionally, it is unknown if nutrition literacy scores are reflective of actual eating habits and if improvements in scores are indicative of subsequent changes in eating habits and health [11, 26, 28]. Future pilot studies should be done to provide evidence as to whether or not these are related and how best to target improvements in eating habits and health [11, 28].

Despite these limitations, this study provides preliminary data that can be used to help create an evidence-based intervention that can easily be incorporated into pediatric clinic visits to target parental nutrition literacy and positively influence child health. In a review of literature on childhood obesity and parental numeracy and literacy, Huizinga and colleagues [19] found that historically, interventions that are effective at improving child weight are "time- and resource-intensive and therefore impractical for inclusion in routine primary care…There are likely untapped (and better) opportunities to address obesity in clinic-based interventions via prevention" that provide parents with "practical tools" for making food choices for their child [19]. With a larger sample size and potential modifications to the intervention (in regards to things such as length and interactiveness), these videos can be a potentially effective intervention to help improve child health and prevent chronic disease by increasing nutrition skills in parents that are important for making healthful food choices for the home environment.

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Appendix A – Letter of Approval

KU THE UNIVERSITY OF
KANSAS
Medical Center

September 11, 2015

Dr. Heather Gibbs
Dr. Susana Patton

Dear Doctors:

I give my consent to allow your team to recruit and enroll families from the waiting rooms of the KU General Pediatrics Clinic into your new Nutrition Literacy Pilot Education Program and I trust that you and your team will cooperate with clinic staff to ensure that patient flow is not disrupted when you are recruiting families.

This looks like an interesting project. I wish you the best of luck in completing it.

Sincerely,

Stephen Lauer, MD, PhD
Vice Chairman for Pediatrics
Associate Professor of Pediatrics

Appendix B – Consent Question

Dear potential participant,

We are researchers from the University of Kansas Medical Center (KUMC) Department of Dietetics and Nutrition. We are contacting you because you are a parent of a child who attends KUMC Pediatrics. We are recruiting research participants to help us test nutrition videos that can be played in clinic waiting rooms. Participation involves watching a video and completing a survey that will take a total of about 20-25 minutes.

There are no personal benefits or risks to participating in this study. Participation is voluntary, and you can stop taking the survey at any time. If you decline to participate or stop taking the survey, it will not impact your child's care at KUMC Pediatrics.

You will be paid a total of $10 for participating in this study. You will be given a ClinCard, which works like a debit card. Payment will be added onto your card by computer. The money will be available within 1 business day. You can use the ClinCard at an ATM or at a store. No one at KUMC will know where you spent the money.

You will be given one card during the study. If your card is lost or stolen, please call (866) 952-3795.

The KUMC Research Institute will be given your name, address, social security number, and the title of this study to allow them to set you up in the ClinCard system. Study payments are taxable income. A Form 1099 will be sent to you and the Internal Revenue Service if your payments are $600 or more in a calendar year.

Your personal information will be kept on a secure computer. It will be removed from the computer after the study is over and the money on the card has been used. Your information will not be shared with other businesses. It will be kept completely confidential.

If you have any questions, please contact Heather Gibbs (hgibbs@kumc.edu). For questions about the rights of research participants, you may contact the KUMC Institutional Review Board (IRB) at (913) 588-1240 or humansubjects@kumc.edu.

Sincerely,
Heather Gibbs, Assistant Professor
Melissa Newmaster, Graduate Student
Department of Dietetics and Nutrition

I agree to participate in this study []

Appendix C – Recruitment Flyer

Would you like to learn more about how to help your child or adolescent eat healthfully?

Then consider participating in our study

FOOD FITS: A PEDIATRIC OFFICE WAITING ROOM PILOT INTERVENTION TARGETING PARENTAL NUTRITION LITERACY AND CHILD HEALTH

What do I have to do? Watch an intriguing video about nutrition and complete 3 short surveys.

———

How long does it take? 20-25 minutes

———

Am I Eligible? You are eligible if you are English-speaking, 18 years or older and the parent of a child 1-17 years old.

———

What are the benefits to me? Gain knowledge and awareness about nutrition and healthy lifestyle behaviors that can positively improve your child's health, and earn $10—all while waiting for your child's appointment.

FOR MORE INFORMATION, PLEASE CONTACT

KUMC Department of Nutrition and Dietetics

Dr. Heather Gibbs
hgibbs@kumc.edu
Melissa Newmaster
mnewmaster@kumc.edu

Appendix D – Demographic Survey

Please answer the following demographic questions. Your answers should reflect yourself unless the question specifically asks you for information about your child. Your answers will not be used to identify you in any way and will be combined with everyone else's. You do not have to answer a question if you do not wish to disclose the information

1. What is your age in years (parent/guardian)? _____
2. What is the age (in years) of your child who is visiting with the doctor today? _____
3. What is the highest level of education you have completed?
    ◦ Less than high school
    ◦ High school/GED
    ◦ Some college or associate's degree
    ◦ Bachelor's degree
    ◦ Graduate degree
4. What is your gender?
    ◦ Female
    ◦ Male
5. What is your ethnicity?
    ◦ Hispanic or Latino
    ◦ Not Hispanic of Latino
    ◦ Unknown
6. What is your race*?
    ◦ African American
    ◦ American Indian or Alaskan Native
    ◦ Asian
    ◦ Native Hawaiian or other Pacific Islander
    ◦ Caucasian/white
    ◦ Unknown
7. What is your marital status?
    ◦ Married
    ◦ Divorced or separated
    ◦ Single
    ◦ Widowed
    ◦ Other
8. Are you currently employed?
    ◦ Yes
    ◦ No
9. What is your occupation? _____
10. How many hours per week do you work at your primary job? _____
11. What was your total household income before taxes during the past 12 months?
    ◦ Less than $25,000
    ◦ $25,000-$34,999
    ◦ $35,000-$49,999
    ◦ $50,000-$74,999
    ◦ $75,000-$99,999
    ◦ $100,000-$149,999
    ◦ $150,000 or more

12. Have you ever had an appointment with a registered dietitian for you or your child?
    ◦ Yes
    ◦ No
    ◦ I don't know

13. Where do you get most of your nutrition information? (Please check one)
    ◦ Television
    ◦ Internet
    ◦ Magazines
    ◦ Friends/Family
    ◦ Doctor
    ◦ Other

14. Does your child currently follow, or previously followed, any of the following special diets? (Check all that apply)*
    ◦ My child does not follow a special diet
    ◦ Diabetes/carbohydrate-controlled
    ◦ Allergen-free such as gluten-free, milk/dairy-free or other food elimination diet
    ◦ Vegetarian or vegan
    ◦ Heart healthy such as low fat, low cholesterol, low sodium
    ◦ Low calorie
    ◦ Modified consistency such as liquid diet, pureed, blenderized, soft, thickened liquids
    ◦ Tube feeding (enteral nutrition) or TPN (parenteral nutrition)
    ◦ High calorie, high protein
    ◦ High fat
    ◦ Renal diet such as low sodium, low potassium, low protein
    ◦ Ketogenic, modified Atkins
    ◦ Inborn errors of metabolism such as PKU
    ◦ Other

15. Do you currently participate in any of these public assistance food programs? (Check all that apply)*
    ◦ I do not participate in any public assistance food programs
    ◦ Supplement Nutrition Assistance Program (SNAP or food stamps)
    ◦ Special Supplemental Program for Women, Infants and Children (WIC)
    ◦ Commodity Supplemental Food Program (CSFP)
    ◦ Temporary Assistance for Needy Families (TANF)
    ◦ Head Start
    ◦ I prefer not to answer

*Indicates response choices were multiple response/checkbox format

Appendix E – Nutrition Literacy Assessment Instrument Questions Used

Due to copyright, the actual questions used from the NLit cannot be included. Following is a summary of topics used in each of the pre- and post-tests.

Food Groups:

- o Choosing foods included in a healthful diet or that are good sources of particular nutrients
- o Identifying energy-dense vs. nutrient dense foods, beverages and meals
- o Associating foods with nutrients or food groups

Consumer Skills:

- o Identifying energy-dense vs. nutrient dense foods, beverages and meals
- o Identifying nutrients that should be lowered to positively influence heart health and foods that are high sources of these nutrients
- o Identifying food sources of protein and those higher in protein
- o Choosing the more healthful food (in regards to concepts such as nutrients or sodium content) when given pictures of two different options or forms of a food

Nutrition Label:

- o Identifying nutrients that should be lowered in a healthful diet
- o Identifying nutrient amounts on a nutrition label
- o Performing calculations using a nutrition label for serving other than that listed on the label and calculating a nutrient's contribution to daily nutrition needs

Appendix F – Quality Improvement Survey

HELP US IMPROVE YOUR EXPERIENCE
Please answer the following questions to help us gain a better understanding of your opinion of the videos.

1. Do you feel that watching this video improved your experience at KUMC?
   ◦ Very much improved my experience
   ◦ Somewhat improved my experience
   ◦ Improved my experience a little
   ◦ Did not improve my experience
2. How do you feel about the length of the video?
   ◦ Adequate
   ◦ Too long
   ◦ Too short
3. How easy was it for you and your child to watch the video while waiting?
   ◦ Very easy
   ◦ Somewhat easy
   ◦ Somewhat difficult
   ◦ Very difficult
4. How much of this video did your child watch with you?
   ◦ All
   ◦ Half
   ◦ Less than half
   ◦ None
   ◦ My child was not in the waiting room with me
5. How do you feel about videos like this playing on TVs in the waiting room every time you visit KUMC?
   ◦ I would very much enjoy it
   ◦ I would somewhat enjoy it
   ◦ No opinion
   ◦ I would not like it
6. How easy was it for you to see the videos on the iPad?
   ◦ Very easy
   ◦ Somewhat easy
   ◦ Somewhat difficult
   ◦ Very difficult
7. How easy was it to understand the video's story and sound?
   ◦ Very easy
   ◦ Somewhat easy
   ◦ Somewhat difficult
   ◦ Very difficult
8. Was the video enough to learn about this topic or would you want a paper handout?
   ◦ No paper handout needed
   ◦ I would like a paper handout
9. What did you think about the pop-ups in the video?
   ◦ Very much liked
   ◦ Somewhat liked

◦ Somewhat disliked
◦ Strongly disliked

10. Would a cooking segment in the video help you better understand the lesson?
    ◦ Not needed
    ◦ Would not really help
    ◦ Would somewhat help
    ◦ Would definitely help

11. How much did you know about this topic before watching the video?
    ◦ A lot
    ◦ Some
    ◦ A little
    ◦ Nothing

12. How likely are you to change how you feed your family or change the foods you obtain after watching this video?
    ◦ Very likely
    ◦ Somewhat likely
    ◦ A little likely
    ◦ Not at all likely

13. (Food Groups) How confident are you in knowing the different kinds of foods your child needs on his/her plate after watching this video?
    ◦ Very confident
    ◦ Somewhat confident
    ◦ A little confident
    ◦ Not very confident

14. (Food Groups) How confident are you in choosing whole grains for meals and snacks after watching this video?
    ◦ Very confident
    ◦ Somewhat confident
    ◦ A little confident
    ◦ Not very confident

13. (Consumer Skills) How confident are you in selecting nutrient dense foods for your family after watching this video?
    ◦ Very confident
    ◦ Somewhat confident
    ◦ A little confident
    ◦ Not very confident

14. (Consumer Skills) How confident are you in selecting leaner sources of meat for your family after watching this video?
    ◦ Very confident
    ◦ Somewhat confident
    ◦ A little confident
    ◦ Not very confident

13. (Nutrition Label) How confident are you that you know how to read a nutrition facts label after watching this video?
    ◦ Very confident
    ◦ Somewhat confident

- ◦ A little confident
- ◦ Not very confident

14. (Nutrition Label) After watching this video, how confident are you that you can now find items on a nutrition facts label that are less healthful for your heart?
- ◦ Very confident
- ◦ Somewhat confident
- ◦ A little confident
- ◦ Not very confident

15. Please provide any additional comments you have: