HEALTH LITERACY INTERVENTION TO INFLUENCE CHOICES BY STUDENTS IN A TITLE I SCHOOL WHO RECEIVE FREE LUNCH

by

MELISSA KENT
B.S. University of Central Florida, 2017

A thesis submitted in partial fulfillment of the requirements
for the degree of Master of Science
in the School of Teacher Education
in the College of Community Innovation and Education
at the University of Central Florida
Orlando, Florida

Summer Term
2019

Major Professor: Judith Levin

ABSTRACT

This study seeks to influence choices made by Kindergarten students in a Title I school who receive free breakfast and lunch through a health literacy intervention with the intent of decreasing daily added sugar consumption. Fruit and milk choices, either with naturally occurring sugar (NOS) or added sugar (AS), were recorded for 70 Kindergarten students among six classes in a Title I school for ten days before a four-week health literacy intervention. Three of the classes were randomly selected to learn about 'sometimes' and 'anytime' choices through the Healthy Habits for Life curriculum delivered by representatives from Nemours Children's Hospital. Following the intervention, milk and fruit choices were recorded for ten more school days to determine differences among the control and intervention groups. Pearson Chi Square test results concluded that the health literacy intervention lead to statistically significant improvements in milk choices for the intervention group, but fruit choices were inconclusive due to inconsistencies in significance. Hierarchical log-linear analyses were run to determine if there was a difference in response to intervention between male and female students, and the results indicated that the effectiveness of the intervention was not moderated by gender. The success of this intervention for milk choices will help students who receive free school breakfast and lunch to decrease their daily consumption of added sugars, and additional research needs to be done to help students make choices that will further decrease their daily added sugar consumption.

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CHAPTER ONE: INTRODUCTION

Children do not have the luxury to choose the family, socioeconomic status, or the opportunities into which they are born. A child cannot provide for him or herself financially or otherwise. Children trust that their parents, schools, and communities will be serving them in their best interests. However, a child born into generational poverty will most likely not be served in his best interest by his parents, school, or community based on current statistics of obesity in those living in poverty (Center for Disease Control and Prevention [CDC], 2018 b).

All parents want for their children to have a healthy, happy life; however, parents who were never taught what a healthy life looks like, but were taught where the closest fast food dollar menu is out of necessity for low cost, may not be able to pass on habits for healthy living. Furthermore, parents trust that meals at school will be of proper nutrition for their children regardless of whether or not they can afford healthy options on their own. Currently, in a school district in Central Florida, the average amount of sugar per day children will consume during breakfast and lunch is about three times the 25-gram or less per day recommendation made by the American Heart Association for children and adolescents from 2-19 years of age (American Heart Association, 2018). With the proper education on what choices to make, students may be able to reduce that amount, but the problem is, there is a lack of education for children from populations at high risk for poor nutrition regarding how to choose healthier food options.

Significance of the Study

The current study works under the theoretical framework of Bronfenbrenner's Ecological Systems Theory. Bronfenbrenner theorizes that children are influenced by their environments and are also contributors to their environments. Each individual is directly influenced by and

influences his microsystem, including his family, school, and neighborhood (Paquette & Ryan, 2001). Beyond the microsystem, the layers of impact grow to interactions between entities not directly related to the individual; further to the impact on individuals by societal norms, religion, and culture; and finally, to the macrosystem of global issues (Paquette & Ryan, 2001). This layered framework gives individuals potential power to cause positive changes in their lives and the lives of those around them.

This study, based on Bronfenbrenner's Ecological Systems Theory, has the potential to impact childhood obesity and overweight within the impoverished community of the participants (Paquette & Ryan, 2001). If children who grow up eating free breakfast and lunch provided by the National School Lunch Program (NSLP) can make the healthiest choices possible through education, they can continue those habits beyond the school years. The child has the potential to influence his or her family, school, and neighborhood with his healthy choices. Based on this layered influence, if district food distribution numbers show that an entire school is not drinking milk with added sugar, perhaps they will stop offering that choice at the school.

There are several studies around this specific topic of nutrition (Dallacker et al., 2018; Farris et al., 2014; Flora & Polenick, 2013; Hur et al., 2011; Rogers & Motyka, 2009; Tucker & Lanningham-Foster, 2015; Tucker et al., 2010; Welsh et al., 2018), but this study is unique in that it focuses on reducing added sugar intake for young children living in poverty by teaching them to make small changes with the options they already have. Many studies focus on older children or bring in outside sources such as water coolers to promote healthy habits (Kenney et al., 2015), but this study is seeking sustainability in its intervention method by only using options students already have and will continue to have throughout their schooling in the same district.

Purpose of the Study

The purpose of this study is to determine if intentionally teaching health literacy will empower young children to make healthier choices leading to a reduction in daily consumption of added sugars. This study also examines if there is a difference between female and male students in response to health literacy intervention in making food and drink choices at school.

Need for the Study

There is a need to bring health to the attention of those consuming free breakfast and lunch at school. In particular, students consuming free school meals should be taught how to make the best possible selections in the school cafeteria in order to stay within the 25 grams or less of added sugar per day that the American Heart Association recommends (2018).

Research Questions

1. Can intentional teaching of health literacy influence children in Title I schools who receive free lunch to make fruit and milk choices in school that will decrease the daily amount of added sugar consumed?
2. Is there a difference between Kindergarten males and females regarding their response to intervention for fruit and milk choices at lunch in a Title I school?

Definitions of Terms and Acronyms

- Intentional teaching- “educators being thoughtful, purposeful and deliberate in their decisions and actions” (Queensland Curriculum & Assessment Authority (QCAA), 2014, p. 3)
- Health literacy- “degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health

decisions" (United States Department of Health and Human Services (USDHHS), 2018, p. 1)

- Title I School- "provides financial assistance to local educational agencies (LEAs) and schools with high numbers or high percentages of children from low-income families to help ensure that all children meet challenging state academic standards" (US Department of Education, 2018, p.1).
- Free Breakfast and Lunch- breakfast and lunch provided by NSLP at no cost to student
- Daily added sugar consumption- daily total of "sugars and syrups that are added to foods or beverages when they are processed or prepared" (United States Department of Agriculture (USDA), 2016, p. 1)
- NSLP- National School Lunch Program
- SBP- School Breakfast Program
- NOS- naturally occurring sugar
- AS- added sugar
- USDA- United States Department of Agriculture
- 5-2-1-0- 5 fruits and vegetables, 2 hours or less of screen time, 1 hour of physical activity, 0 sugar drinks (i.e. soda, juice, sports drinks)
- SNAP- Supplemental Nutrition Assistance Program
- REDI- REsearch-based, Developmentally Informed
- WIC- Women, Infants, and Children Program
- BMI- Body Mass Index

Limitations

Based on limitations with the Healthy Habits curriculum, this study could only involve children up to five years of age, so the study only includes Kindergarten students. There was no funding for this study, so no compensation was given to incentivize research team members; members on the research team volunteered their time. Due to availability of the members of the research team, only lunch options were recorded instead of collecting data at breakfast and lunch school meal times.

CHAPTER TWO: LITERATURE REVIEW

The National School Lunch Program (NSLP) has been providing free or subsidized school breakfasts and lunches across the United States since 1946 (USDA, 2018). A program with intentions of nourishing children who cannot otherwise afford regular meals, is in today's times, failing to provide the adequate nutritional value to create a community of healthy learners.

The American Heart Association recommends that children between the ages of two and 19 consume no more than 25 grams of added sugars per day (American Heart Association, 2018). The goal of 25 grams or less of added sugars is currently not possible on any given day in a school district in Central Florida, based on the district's publicly accessible menu website. However, there are choices students can make in order to vastly decrease the amount of sugar they consume at school.

Much of the available research on the topic of healthy eating in schools focuses either on older children, fourth grade through high school, or it narrows in on just the beverages available at school (Hur et al., 2011; Kenney et al., 2015; Tucker et al., 2010). There is a gap when it comes to young children's total added sugar intake.

Flora and Polenik (2013) report that it is a myth that sugar causes hyperactivity. Readers of this study may come to the false conclusion that the aim of reducing sugar consumed at school is to decrease hyperactivity in class, yet that is not the case. Consumption of added sugars is a contributing factor to obesity and other health issues, and it is recommended by the Center for Disease Control and Prevention (CDC) to reduce the amount of added sugar a person consumes each day (CDC, 2016). According the CDC's website, one in every five children are considered obese (CDC, 2018 a), one in every ten Americans has Type II Diabetes, and one in every three

Americans has prediabetes (CDC, 2018 a). With these statistics in mind, it should be the priority of every caregiver and policy maker to ensure children are not on the path to obesity or diabetes.

Gender and Health

Taber, Robinson, Bleich, and Wang (2016) examined data from the 2010 National Youth Physical Activity and Nutrition Study (NYPANS) that had 11,458 student responses for trends in adolescent obesity. The sample was made up of high school students. The researchers focused on differences in rates of obesity and habits of white males and white females compared to black males and black females based on the responses from the NYPANS (Taber et al., 2016). Overall, white females had a higher percentage of obesity than white males, and black females had the highest rate of obesity for all four groups with 29.9% obesity compared to 18.7% for black males, 18.1% for white females, and 16.7% for white males (Taber et al., 2016).

According to a report from the CDC, obesity is more prevalent in boys than girls from ages 2-11, but starting in adolescence (age 12) and beyond to the 60-over age group, obesity is more prevalent in women based on 2015-2016 data (Hales, Carroll, Fryar & Ogden, 2017). The CDC also reported that in 2005-2008, 16% of total daily calories for children from 2-19 years of age came from added sugars for boys and girls (CDC, 2016).

National School Lunch Program

The National School Lunch Program was launched as a section of President Truman's 1946 National School Lunch Act (USDA, 2018). Children who receive free or reduced lunches at school are children whose family income is close enough to the current poverty line that it would be reasonable to conclude they could not afford daily breakfast and lunch on their own. Today, a family of four is considered impoverished if the annual household income falls below

$25,100 (Federal Register, 2018). For a child to qualify for a reduced meal price, the annual income for a family of four would have to be below $46,435, and to qualify for free meals, a family of four would have to earn less than $32,630 annually (Federal Register, 2018). Other qualifiers for receiving free lunch in public schools include children of families who participate in the Supplemental Nutrition Assistance Program (SNAP), foster children, and homeless or runaway children (Federal Register, 2018).

Komro, Flay, and Biglan (2011) presented a study on children living in poverty and a plan in place in New York to combat the negative by-products of living in poverty. The study reports that people living in poverty have higher rates of obesity and type II diabetes among many other ailments (Komro et al., 2011). The study documents the efforts of a neighborhood center called Harlem Children's Zone whose mission is to help the youth of an impoverished neighborhood live a safe, healthy lifestyle (Komro et al., 2011). Komro et al (2011) concluded that the Harlem Children's Zone had a positive impact on the children's eating habits by educating the parents of the children in the program about healthy foods. This implies that even those with limited access to healthy foods, can still become more health literate through school or community intervention.

Another program with the intent of helping children born into poverty is Head Start. Head Start is a pre-Kindergarten program for three and four-year-olds of low-income families, and Early Head Start serves mothers and children under three years old (Office of Head Start, 2018). Head Start was created as a part of President Lyndon B. Johnson's "War on Poverty" in the 1960s (Office of Head Start, 2018) with intentions to decrease the education gap between the affluent and the poor. In each Head Start center across the United States, one will notice the healthy meals being served as well as a focus in the curriculum about healthy eating or even

gardening programs to promote fresh ingredients. Head Start meals are funded by the Child and Adult Care Food Program (Office of Head Start, 2018). Head Start meal time is required to be served “family style” with children serving themselves and practicing mealtime conversation whenever possible (Office of Head Start, 2018). Meals at Head Start adhere to the message of “eat the rainbow” with a variety of fruits and vegetables that can connect to educational topics about colors or where food comes from (Office of Head Start, 2018). Children who attend Head Start programs are receiving a great foundation for healthy food habits, but when they transition to regular public schools with food from the NSLP, educators and parents need to ensure those messages of health are continuing to be conveyed.

Kimbro and Rigby (2010) examined federally funded food programs to see which ones contribute most to childhood obesity. Kimbro and Rigby (2010) used the following programs that affect young children in their analysis: Special Supplemental Nutrition Program for Women, Infants, and Children (WIC), SNAP, Child and Adult Care Food Program, School Breakfast Program (SBP), and NSLP. The WIC and SNAP programs allow families to purchase their own food items from participating grocery stores via a prepaid card issued by the government (Kimbro & Rigby, 2010). The Child and Adult Care Food Program provides meals for institutions that provide daycare for either children or adults (USDA, 2018). The School Breakfast Program, and the NSLP provide meals for children in public schools. The study found that programs that offer a full meal include foods that promote a healthier BMI than programs that allow families to purchase their own food items with government funding (Kimbro & Rigby, 2010). This indicates a need for health literacy among federally funded food program participants, so they can purchase more nutritious foods on their own.

Health Literacy

When thinking of literacy, the ability to read and write comes to mind. More recently, there has been a focus on emotional literacy as well. Emotional literacy being the ability to recognize and handle emotions within ourselves and in others. Perhaps health literacy of children can be improved just like improvements in reading or self-regulation skills. Health literacy is defined by the United States 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" (USDHHS, n.d., p. 1). Being health literate can be as simple as a child in school choosing white milk over chocolate milk, and as complicated as navigating hospital bills, insurance coverage, and medication dosages (USDHHS, n.d., p. 1). The important piece of health literacy is that people feel empowered to make decisions that will best benefit their health and well-being.

Intervention may be the best route to increasing health literacy. Nix, Bierman, Domitrovich, and Gill (2013) designed an intervention program to target both emergent literacy and emotional literacy in Head Start preschools to determine Kindergarten readiness. Nix et al (2013) implemented an intervention program called REDI (REsearched-based, Developmentally Informed) with 356 students enrolled in 25 different Head Start programs and followed the students through the end of their Kindergarten year at 202 different schools. The intervention was a supplement to Head Start's regular instruction, not in place of it. REDI targeted dialogic reading activities, phonological awareness games like rhyming games and alphabet awareness activities (Nix et al., 2013). The dialogic reading activities were to be done four times per week, and the phonological awareness and alphabet games were to be facilitated three times per week (Nix et al., 2013). For emotional literacy, REDI used the program called Preschool PATHS and

requested that teachers complete one lesson and one activity per week of the social curriculum (Nix et al., 2013). A baseline assessment was done prior to intervention, and two post-assessments were conducted: one at the end of the Head Start preschool year, and for 95% of the original participants, again at the end of the student's kindergarten year (Nix et al., 2013). As a result of this intervention targeting emergent literacy and emotional literacy, Nix et al (2013) found a statistically significant increase in literacy among the students who participated in the REDI intervention at the end of their Head Start year and again in the 1-year follow-up in kindergarten. This study shows the power of intentional teaching when it comes to literacy in different areas that may also successfully be applied to health literacy.

Ritchie, Whaley, Spector, Gomez, and Crawford (2010) measure the effects of nutrition education for WIC participants. Ritchie et al (2010) ran their intervention two times, with 3,015 randomly selected participants in the first round, and 3,004 participants in round two. This large sample supports a strong study. The goal of the study was to see if providing a 6-month intervention of nutritional education, or health literacy, would improve the nutritional consumption of the WIC participants (Ritchie et al., 2010). Some of the messages participants heard over the 6-month period were about increasing whole-grain intake, choosing low fat milk, increasing frequency and variety of fruits and vegetables, and more. The study found that after intervention, there was an increase in family consumption of whole grains, fruits and vegetables, and low-fat milk (Ritchie et al., 2010). There was even an increase in the types of fruits and vegetables eaten, not just more of the same options--this, the researchers believe, is due to the message of "eating the rainbow," meaning eating all colors of fruits and vegetables (Ritchie et al., 2010).

Interventions

Many of the relevant studies found on the topic of health in school meals imposed an intervention program with participants. Tucker et al (2010) utilized an intervention to increase physical activity levels and promote healthy eating with 4th and 5th grade students (n=99) to combat obesity. The researchers took a baseline report of the children's physical activity and healthy eating habits, split the students into an intervention group and a control group at each of the two schools, and took an end of the year post survey of the children's physical activity and healthy eating habits to note any significant changes (Tucker et al., 2010). The intervention used is called *5-2-1-0 Let's go*, which stands for five servings of fruits and vegetables, less than two hours of TV/screen time, one hour of physical activity, and zero sugary drinks like soda per day (Tucker et al., 2010). In Tucker et al's (2010) study, local University of Minnesota nursing students delivered the 5-2-1-0 program to the participants. Rogers and Motyka (2009) also used the 5-2-1-0 method in their study, *5-2-1-0 Goes to School*, but with teachers delivering the curriculum with hopes of sustainability for the program. The teachers who participated expressed that using the program kit was easy and effective in enacting small changes in habits of both students and teachers when it came to eating healthier and becoming more active (Rogers & Motyka, 2009).

Nemours Children's Hospital created a curriculum with Sesame Street called Healthy Habits for Life in 2007 to act as a school-based intervention program to instill lifelong healthy habits starting at a young age (Sesame Workshop, n.d.). The program can be taught by a school nurse, a representative from Nemours, or a classroom teacher. The program uses child-friendly figures, the Sesame Street characters, to make learning healthy habits fun, engaging, and the results long-lasting. The Healthy Habits for Life program also uses the 5-2-1-0 method to help

children remember the different healthy amounts of fruits and vegetables, screen time, physical activity, and sugar beverages, respectively (Sesame Workshop, n.d.). The program teaches children what foods are okay to eat "anytime" versus foods that should only be consumed "sometimes," as well as "anytime" or "sometimes" activities to participate in (Sesame Workshop, n.d.).

The study by Tucker and Lanningham-Foster (2015) tested to see if a nurse-led, school-based program using the 5-2-1-0 method would be effective. The study had a sample size of 72 children from two different elementary schools. The school nurse from each school along with nursing students from two different programs delivered the intervention (Tucker & Lanningham-Foster, 2015). The school nurse delivered whole-group lessons about healthy habits and physical activity, and the nursing students were each assigned to a small number of children to meet with and reinforce the 5-2-1-0 method in a 1-on-1 setting (Tucker & Lanningham-Foster, 2015). The intervention lasted for three months of teaching healthy habits and tracking the students' physical activity levels through a step counter, and then a post survey and measurements were taken (Tucker & Lanningham-Foster, 2015). The results indicated that the intervention did, indeed, improve healthy eating habits based on survey results, and measures of physical activity increased based on readings from the step counters in children from both schools (Tucker & Lanningham-Foster, 2015).

Food and Beverage

The study by Hur, Burgess-Champoux, and Reicks (2011) and the study by Farris et al. (2014) both explored whether school lunches or packed lunches had better nutritional value. Hur et al. (2011) collected data from two suburban schools in Minnesota, targeting n=129 fourth and fifth grade students on the content of their home-packed or school lunches. The

children were observed for a baseline of the lunches they consumed, enrolled in a whole grain intervention program, and observed for one session following the intervention by a trained observer (Hur et al., 2011). Compensation of $10 to $50 was given to the participating children and consenting parents for taking part in the study (Hur et al., 2011).

Farris et al. (2014) set their study in Virginia with three participating elementary schools. The schools in the study had 33.3%, 46.6%, and 52.7% of students qualifying for free or reduced lunch (Farris et al., 2014). Unlike Hur et al. (2011), Farris et al. (2014) researched students in Pre-K and Kindergarten, an age group lacking as much representation in the research topic of nutrition. The researchers recorded the choices of the children for five consecutive school days using a paper with the current school lunch menu and a list of commonly packed lunch items from home for the researchers to check off quickly (Farris et al., 2014). In this study, there were ten children for every one person observing to collect data (Farris et al., 2014), whereas in Hur et al's (2011) study, there were three children for every one observer. Both studies had proper tests of reliability to ensure consistency with observations of packed lunches.

After all the data was collected by Hur et al (2011) and Farris et al (2014), both studies concluded that home-packed lunches had less nutritional value. There was more sugar in a home-packed lunch, more saturated fats, more sodium, and fewer vegetables than school lunches (Hur et al., 2011, & Farris et al., 2014). Interestingly, Farris et al (2014) reported that even the home-packed lunches that were proven to have less nutritional value still met all of the nutritional value requirements based on NSLP guidelines.

Healthy lunches packed from home rely on parents ensuring healthy options for their children. However, it seems from the results of Farris et al (2014) that parents are unaware of healthy items to put in a packed lunch, or simply do not prioritize a healthy lunch. The study

by Dallacker, Hertwig, and Mata (2018), surveyed 305 German parents to see how well they knew or could estimate the sugar contents of the following common foods: orange juice, cola, pizza, yogurt, granola bar, and ketchup. The researchers gave questionnaires to the parents in the study and recorded the Body Mass Index (BMI) scores of the corresponding children in the study to determine if parental knowledge about sugar was any indication of the child's BMI (Dallacker et al., 2018). Dallacker et al (2018) controlled for both the education level and BMI scores of the parents to focus solely on the parent's estimation of sugar content. In result, of the 305 parents questioned, 92% vastly underestimated the amount of sugar in each item in question, especially the sugar in orange juice and yogurt (Dallacker et al., 2018). Furthermore, the results did show a correlation between the parental sugar knowledge and the child BMI score (Dallacker et al., 2018). The results from the three studies, Hur et al. (2011), Farris et al. (2014), and Dallacker et al. (2018) provide reason for why the National School Lunch Program should not merely feed our students, it should properly nourish them, setting them up for a lifetime of healthy habits that they may not learn from their parents.

It is highly agreed upon that children should not be consuming sugary drinks like soda; but there needs to be a larger focus on sugar in other beverages as well. The official government website for the United States Department of Agriculture (USDA), which oversees the NSLP, references a 1965 survey that indicated a lack of calcium in the diets of children at the time, thus the solution was for children to drink more milk (USDA, 2018). Since 1966, the School Milk Program is still a key component of school meals despite the dated information (USDA, 2018). The 8-ounce cartons of milk that public schools provide with breakfast and lunch contain 12, 18, and 18 grams of sugar in white milk, chocolate milk, and strawberry milk, respectively (Orange County Public Schools (OCPS), 2018). Children could exceed the American Heart Association's

25-gram recommendation for sugar intake just in the two cartons of milk they are served each day.

Welsh, Wang, Figueroa, and Brumme (2018) conducted a study to determine how different types of sugar, added or naturally occurring and liquid or solid, affected child weights. The study followed a large sample of 8,136 children between the ages of two and 19 (Welsh et al., 2018). The researchers employed a self-reporting method for data collection with parents reporting or helping to report the sugar intake from children ages 2-12, and 13-19-year-old participants reporting on their own behalf (Welsh et al., 2018). Self-reported data is not typically the most reliable, but with such a large sample size, it would not be feasible for the researchers to observe the sugar intake and record as a third-party observer.

The study found that most of the children consumed a total of 118.1 grams of sugar per day with 46.7 of those grams being from naturally occurring sugars like those found in fruit, and 71.5 of the total grams being from added sugars, almost three times more than the amount recommended by the American Heart Association (Welsh et al., 2018). Welsh et al (2018) found that 58.8 grams of the total average sugar intake were from beverages, with 6% of the consumed added sugars being from milk alone. The study did not conclude that a child's weight was a strong predictor of his or her average sugar intake, but that the total sugar consumption across all weight groups was rather similar (Welsh et al., 2018). Welsh et al., (2018) report that more than a quarter of the daily calories consumed by children come from sugar. Welsh et al., (2018) also indicate that liquid added sugars have the most impact on a child's BMI.

With so many added sugars and calories known to be in beverages, some researchers set out to introduce water to the school lunch room. The study titled, *Grab a Cup, Fill It Up!* by Kenney, Gortmaker, Carter, Howe, Reiner, and Cradock (2015) implemented an intervention

program to promote drinking water at school meal times. Kenney et al (2015) randomly assigned ten different willing Boston Public Schools, three Elementary, four K-8, and four High Schools to a control or intervention group. The control group had no change in their water supply, simply having a water fountain in the cafeteria to meet NSLP regulations of having water available (Kenney et al., 2015). The students in the participating schools were surveyed for a baseline of their water consumption, the intervention lasted from January to April 2013, and a post-evaluation for water consumption was performed to record any changes (Kenney et al., 2015). The schools in the intervention group participated in *Grab a Cup, Fill it Up!*, which consisted of schools providing coolers of water with cups in the cafeteria to make water-consumption more accessible (Kenney et al., 2015). The intervention schools also posted attention-grabbing, informational, visual posters throughout the cafeteria depicted where and how to get water to drink at school (Kenney et al., 2015). The baseline and post-intervention observations were done as a compilation of 5 consecutive days, and the baseline showed that the randomly assigned control schools consumed significantly more water than the intervention schools (Kenney et al., 2015). After the three-week intervention, the students in the intervention group increased water consumption in ounces by three times the amount they drank at the baseline and decreased the amount of juice and other sugar sweetened beverages drank (Kenney et al., 2015). Making water drinking more accessible and more appealing to the students proved to have a positive impact on water consumption.

Conclusions

In conclusion, there is ample research on the topic of nutrition on a grand scale, but not enough regarding reducing added sugar intake in young children. In order to reduce the amount of added sugar young children consume in school, there are several programs and interventions

that seem to be effective. Teaching children the method of 5-2-1-0 is a popular, reliable intervention for school-based studies (Tucker & Lanningham-Foster, 2015; Tucker et al., 2010; Rogers & Motyka, 2009; Healthy Habits, n.d.). Promotion of drinking water inherently decreased added sugars as indicated in the Grab a Cup, Fill it Up! intervention (Kenney et al., 2015). In addition to school-based interventions, partnerships with parents and community programs promoted better nutrition for children.

Most of the studies mentioned have a focus on older school aged children, so more research needs to be done on the effects of sugar in young children as well as the effectiveness of nutrition intervention in young children. Additionally, it would be beneficial to determine if there is a critical period, like that of language acquisition, where it is most effective to learn and practice health literacy for lifelong impact. If young children learning healthy nutritional habits is proven to be sustainable, it could potentially change the statistics of childhood obesity and children with type II diabetes.

CHAPTER THREE: METHODOLOGY

Introduction

This study began with drafting a Memorandum of Understanding (MOU) between the University of Central Florida (UCF) and the Nemours Foundation to establish when and how Nemours would deliver the Sesame Street "Healthy Habits for Life" program. The study was approved by both the UCF Institutional Review Board (IRB) (Appendix A), and the principal of the participating school. A written letter approving this study, that is signed by the principal of the participating school was obtained prior to starting any research activities. Simultaneously, the researcher recruited a three-person research team for data collection comprised of UCF undergraduate students. Once the team was assembled and approval was granted, the members of the research team were trained to use the data collection tool with at least 80% accuracy.

Participants

The participants in this study were Kindergarten students in a Title I school in Central Florida. All the children in the study receive free lunch from the NSLP. The demographics of the school include 76.9% black students, 20.2% Hispanic students, 1.7% white students, and 22.5% of the students are English Language Learners. The identities of the participants remained anonymous throughout the entirety of the study.

Data was collected before and after the intervention for students in six Kindergarten classes, three control classes, and three classes that took part in the Healthy Habits for Life curriculum intervention. Classes were randomly assigned to either the control or intervention group. The milk and fruit choices were only recorded for students whose parents signed a letter of informed consent indicating their approval for their child to participate in the

study. All parents were given the informed consent form in a language they could comprehend and given the contact information of the researcher if there were any questions.

Consent was granted for 70 students, but due to student attendance, each day of data collection has a sample size between n=55 and n=65.

Instrument

The research team used a checklist tool created by the researcher to record gender and student milk and fruit choices (Appendix B). The research team was trained to use the tool using videos of students selecting milk and fruit in the school lunch line. Videos of students did not include any faces, names, or other identifying criteria. Acceptable interrater reliability was set at 80% agreement using the checklist during the video practice, which was achieved. Since all three research team members met (and exceeded) the 80% interrater reliability, this gives the tool acceptable face validity even though the tool has not been used in other studies. The checklist indicates if the student is male or female, which class they are in, and whether the student chose naturally occurring sugar (NOS) milk or added sugar (AS) milk and NOS fruit or AS fruit. The research team was blinded to which classes were in the intervention group to reduce any biases.

Procedures

The research team recorded student fruit and milk choices during school lunch for ten school days prior to intervention. Only students whose parents gave consent are included in this study.

A representative from Nemours provided a four-week intervention delivering the Sesame Street “Healthy Habits for Life” curriculum to the three Kindergarten classes in the randomly selected intervention group. The Nemours representative delivered an hour-long Healthy Habits lesson a week to each of the three intervention classes for four weeks. Children learned the

difference between foods filled with nutrients that can be eaten ‘anytime,’ and foods that do not serve our bodies well that should only be eaten ‘sometimes.’ Children learned to ‘eat the rainbow’ and were able to taste new fruits and vegetables that they had never encountered before.

Following the intervention, the research team recorded student fruit and milk choices during school lunch for ten school days for all students who took part in pre-intervention data collection.

Data Collection

Data for both research questions was collected using the researcher-created checklist tool to record gender of the students and milk and fruit choices during school lunch. Data was collected by a member of the research team who was trained and blinded to which classes received intervention.

Data Analysis

RQ1: Inferential statistics were run in SPSS for each day of data collection to see if there was a statistically significant difference between the choices made by the two groups. Milk and fruit choices were separated for each calculation, and the criteria for significance was $p < 0.05$ based on Pearson Chi Square results.

RQ2: To determine if there is a difference in response to the intervention between male and female students, a hierarchical (or three-way) log-linear analysis was run. The three-way log-linear analysis determines the interaction between three or more variables. In this case, two hierarchical log-linear analyses were run: gender*group*milk and gender*group*fruit.

Since $p > .050$, the genders did not have a difference in response to the intervention and it has potential to be equally effective for both males and females in this sample.

CHAPTER FOUR: RESULTS

RQ1: Can intentional teaching of health literacy influence children in Title I schools who receive free lunch to make fruit and milk choices in school that will decrease the daily amount of added sugar consumed?

Fruit

Based on the Pearson Chi Square test, the control and intervention groups show inconsistent results for fruit choices both before and after the health literacy intervention. Before the intervention, the results should show that on every day, the groups are making nearly the same choices, however, on four of the ten data collection days prior to the intervention, there were statistically significant differences in the groups' fruit choices. Following the intervention, there were only two out of ten days with statistically significant results. Table 1 reports the Pearson Chi Square results for all 20 days of data collection, and the figures to follow provide a visual representation of the inconsistencies in the fruit choices.

Figure 1 shows that on Day 4, the control group was significantly more likely to choose one fruit with added sugar than the intervention group. Figure 2 shows that on Day 7, the intervention group chose two added sugar fruit options significantly more than the control group. Figure 3 shows the control group on Day 9 choosing one fresh fruit option significantly more than the intervention group. Day 10 shows the control group as more likely to choose one added sugar fruit, while the intervention group chose one of each of the fruit options significantly more often (Figure 4).

Since these days with significant differences before the intervention have their differences within varying categories, this verifies that although the groups did not start off

exactly the same, the groups did not start with bias that may have hindered the effectiveness of the intervention.

Figures 5 and 6 show the only two days following the intervention that had significant differences between the fruit choices of the control and intervention groups. On both days, (14 and 17), the intervention group chose one of each of the fruit options significantly more than the control group. Overall, the effectiveness of the health literacy intervention is inconclusive for the fruit category.

Table 1:

Pearson Chi Square Results for Fruit Choices

Day	Before or After Intervention	Pearson Chi Square	df	*p*
1	Before	3.008	3	0.390
2	Before	2.831	4	0.586
3	Before	8.522	4	0.074
4	Before	11.177	4	0.025
5	Before	7.478	3	0.058
6	Before	3.737	3	0.291
7	Before	15.442	4	0.004
8	Before	2.118	4	0.714
9	Before	11.433	4	0.022
10	Before	18.628	4	0.001
11	After	7.893	5	0.162
12	After	2.124	4	0.713
13	After	7.071	3	0.070
14	After	9.448	4	0.051
15	After	6.152	4	0.188
16	After	4.412	4	0.353
17	After	14.218	4	0.007
18	After	7.998	4	0.092
19	After	8.333	5	0.139
20	After	3.368	4	0.498

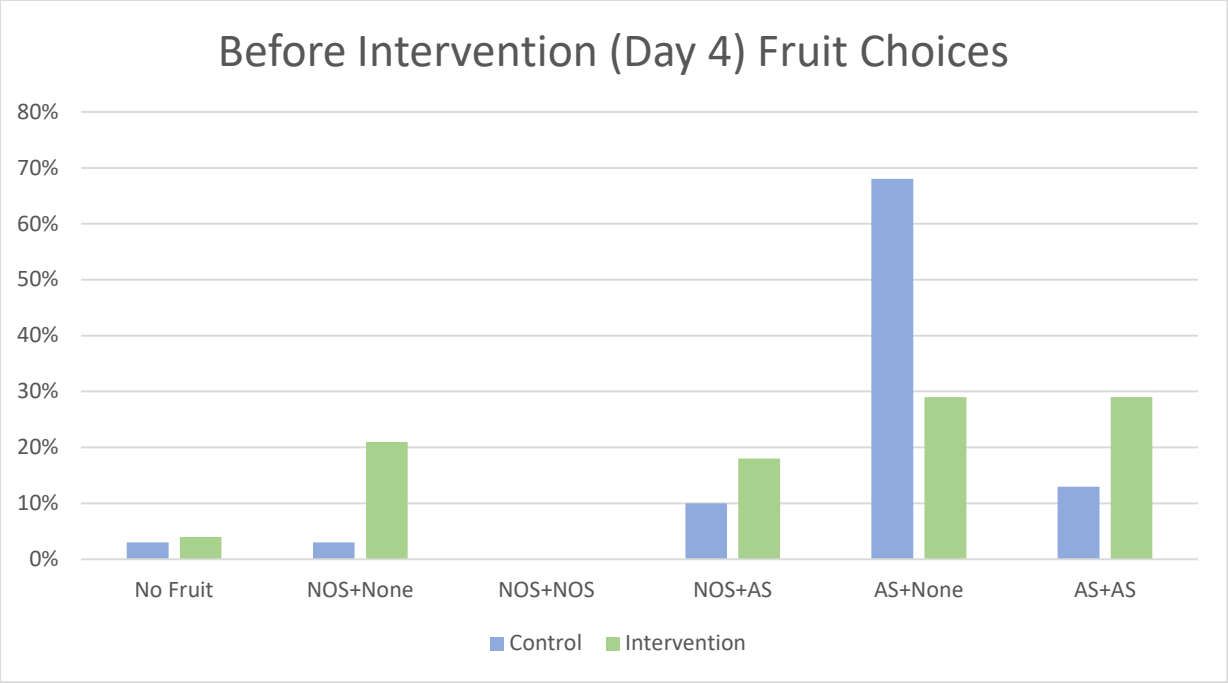

Figure 1: Percentages of Fruit Choices Before Intervention (Day 4)

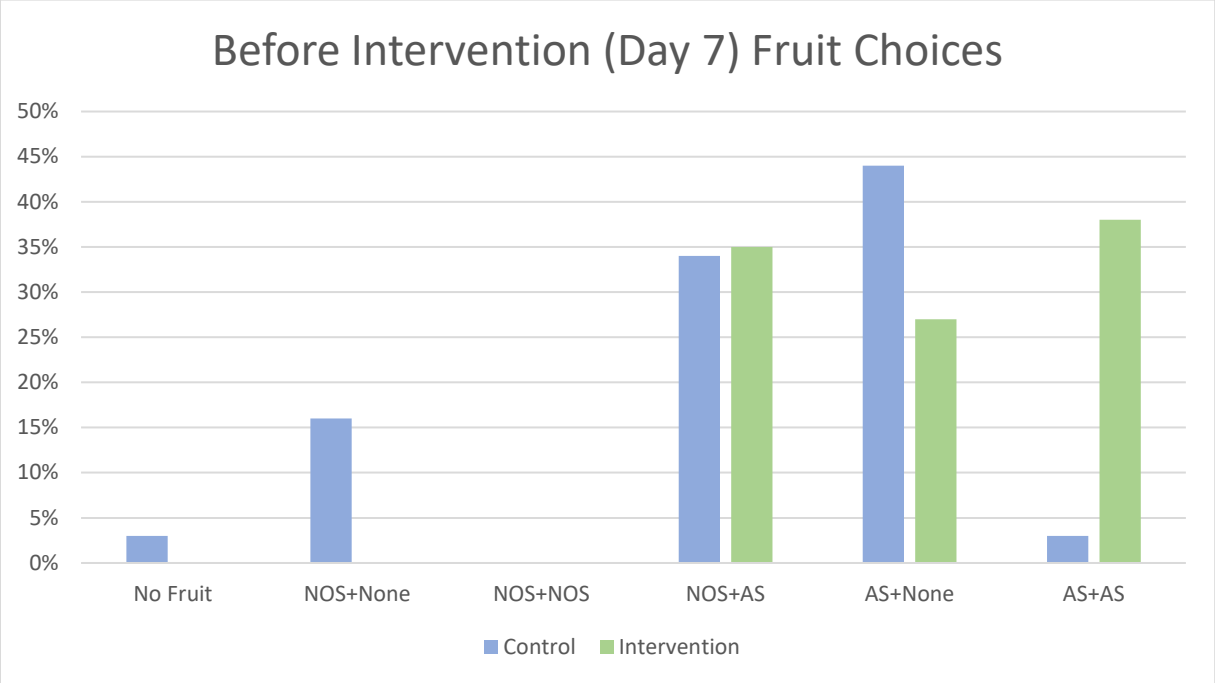

Figure 2: Percentages of Fruit Choices Before Intervention (Day 7)

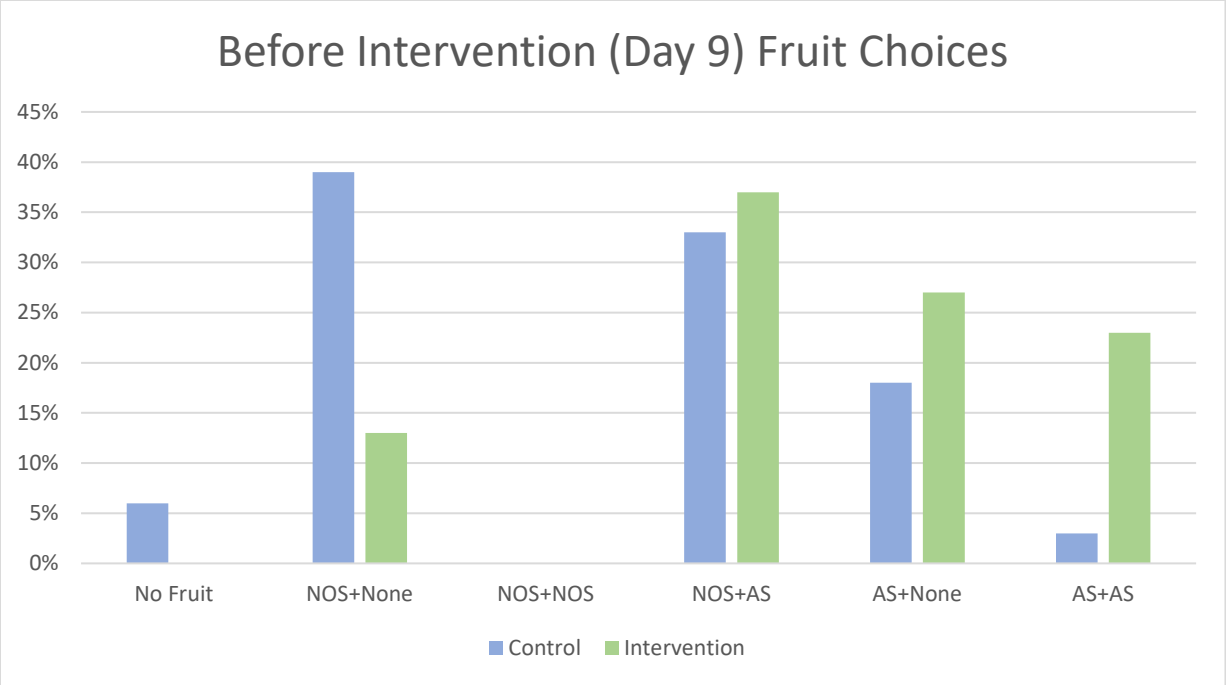

Figure 3: Percentages of Fruit Choices Before Intervention (Day 9)

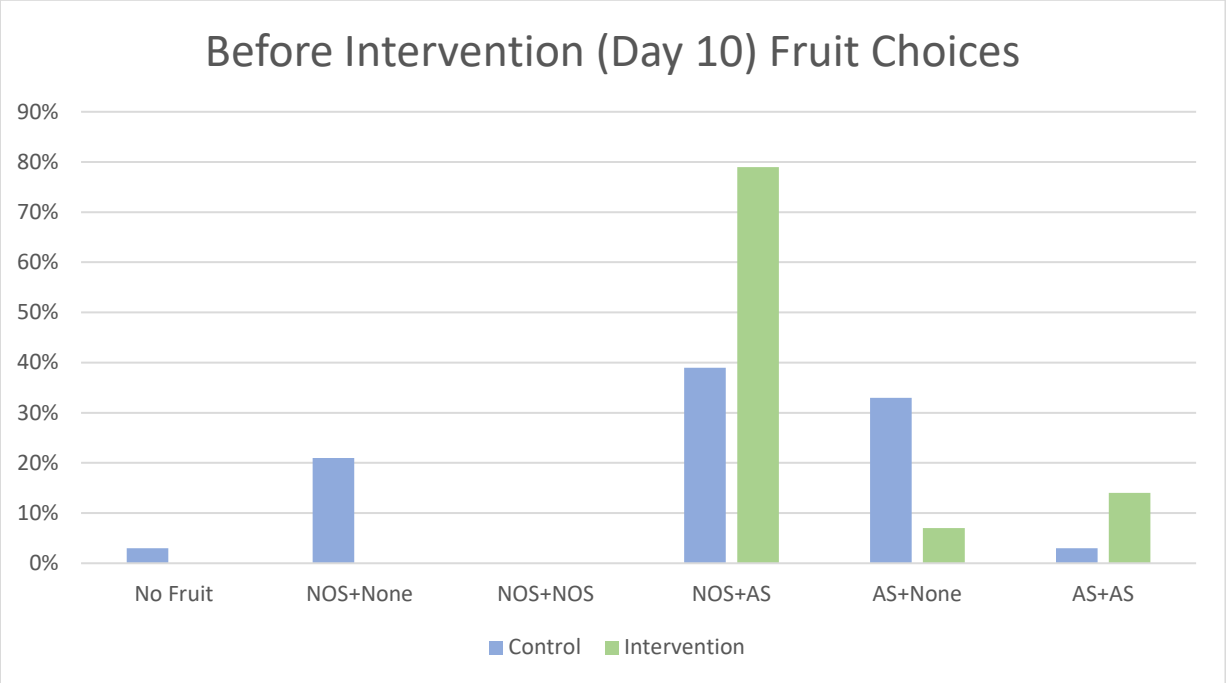

Figure 4: Percentages of Fruit Choices Before Intervention (Day 10)

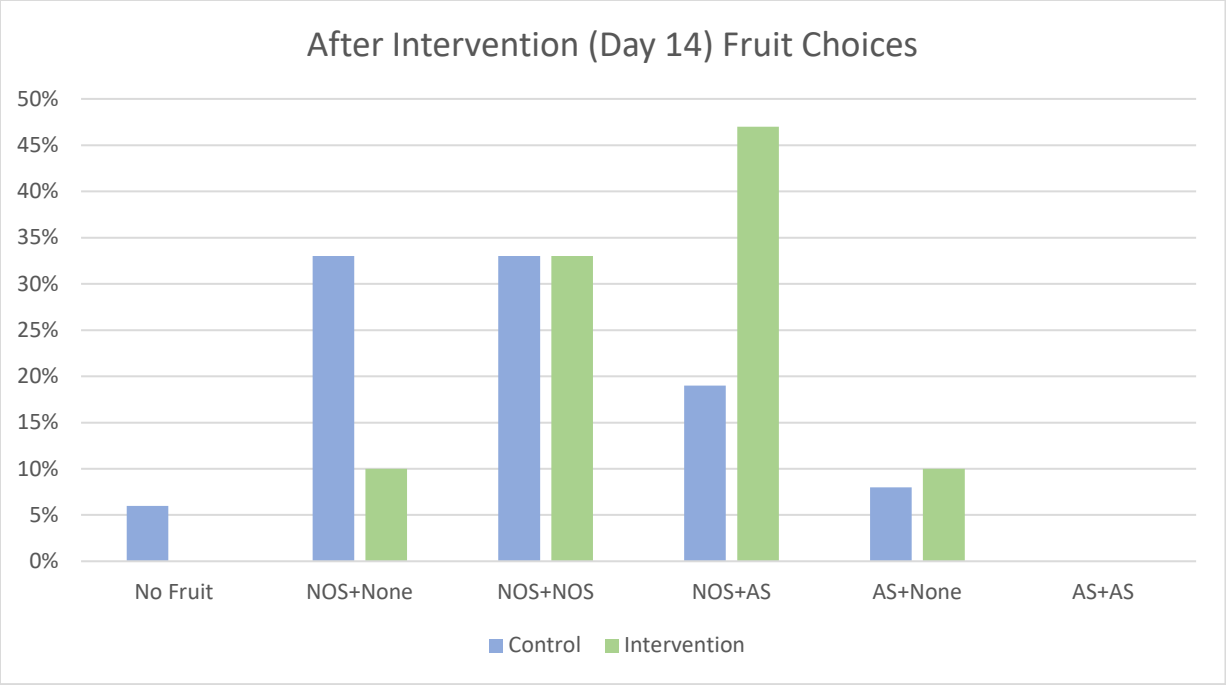

Figure 5: Percentages of Fruit Choices After Intervention (Day 14)

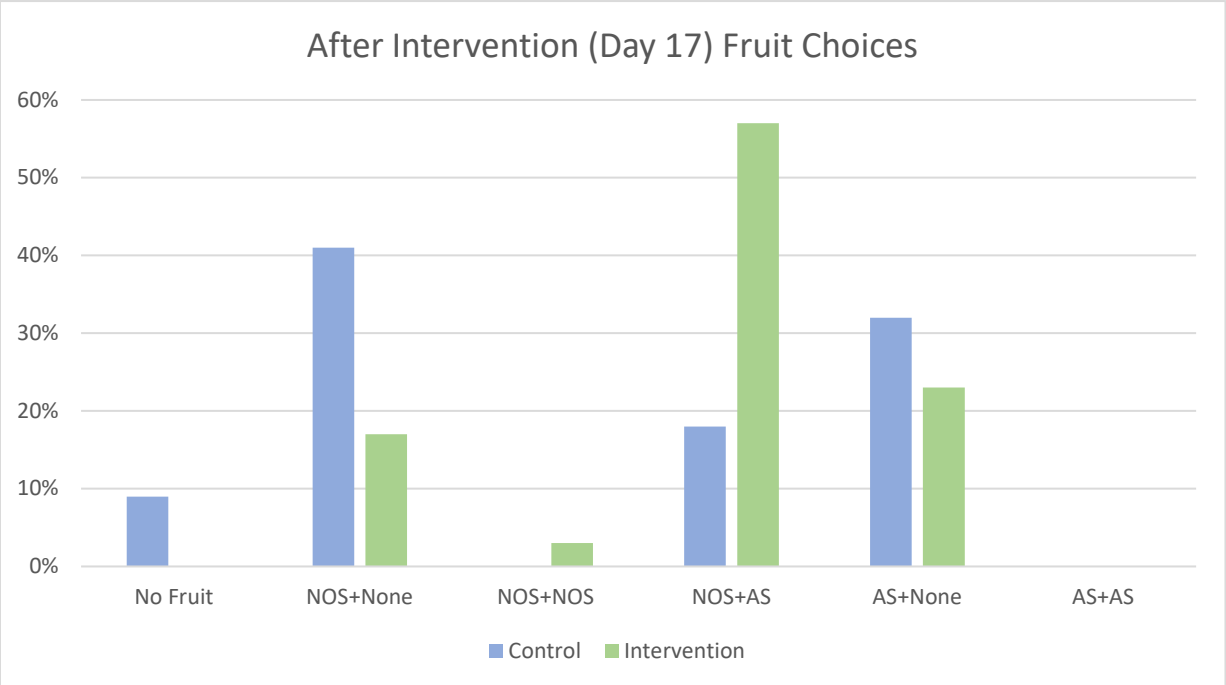

Figure 6: Percentages of Fruit Choices After Intervention (Day 17)

Milk

Based on differences in the control and intervention groups, the Healthy Habits for Life health literacy intervention lead to statistically significant changes in milk choices made by Kindergarten students in the Title I school that took part in this study. Table 2 reports the results of the Pearson Chi Square test for the difference in milk choices made by the control and intervention groups. All ten days of data collection before the intervention consistently showed no difference in milk choices between the control and intervention groups, and the ten days of data collection following the intervention consistently showed statistically significant differences between the groups for milk choices. Due to this consistency, one day was randomly selected to show the groups before the intervention in Figure 7, and three days were randomly selected to depict the results of the data collection following the intervention (See Figures 8-10).

Day 7 represents the control and intervention groups prior to the health literacy intervention lessons. As depicted in Figure 7, on Day 7, both the control and intervention groups had 19% of students selecting low-fat milk (NOS), and 78% and 77% of the students in the control and intervention groups selecting either chocolate or strawberry milk (AS), respectively. In each group, only one student chose not to have milk at all. The p-value of .987 for Day 7 suggests that the two groups began with almost no difference in milk choices prior to the health literacy intervention.

Days 14, 17, and 19 represent data collected following the health literacy intervention. On Day 14, seen in Figure 8, 19% of the students in the control group selected the NOS milk option, while 50% of the students in the intervention group chose low-fat milk for lunch. Eighty-five percent of the students in the control group chose milk with added sugar on Day 14, and 37% of students in the intervention group selected AS milk. On Day 14, there were no students

who chose to forego milk at lunch. The p-value of .009 for Day 14 indicates a significant difference between the milk choices of the two groups on this day.

On Day 17, shown in Figure 9, 15% of the students in the control group selected low-fat milk versus 53% in the intervention group. Eighty-five percent of the students in the control group chose either chocolate or strawberry milk (AS) while only 37% in the intervention group chose AS milk. There were no children in the control group who chose not to have milk on Day 17, and there were three children (10%) who did not select milk in the intervention group. The p-value of .000 for Day 17 indicates the statistically significant difference between the milk choices.

Day 19, in Figure 10, shows 15% of the control group choosing NOS milk, and 68% of the intervention group choosing NOS milk. Eighty-four percent of the control group chose AS milk on Day 19, and 26% of the intervention group selected AS milk. Zero students in the control group chose not to have milk, and two students (<1%) opted not to have milk on Day 19. The p-value .000 indicates a statistically significant difference in milk choices on Day 19.

These results confidently suggest that for milk choices, the health literacy intervention made a significant difference for this study.

Table 2:

Pearson Chi Square Results for Milk Choices

Day	Before or After Intervention	Pearson Chi Square	df	*p*
1	Before	1.271	2	0.530
2	Before	2.858	2	0.240
3	Before	2.145	2	0.342
4	Before	1.317	2	0.518
5	Before	2.576	2	0.276
6	Before	0.234	2	0.889
7	Before	0.026	2	0.987
8	Before	1.621	2	0.445
9	Before	.277	2	0.871
10	Before	2.834	2	0.242
11	After	1.247	2	0.536
12	After	8.478	2	0.014
13	After	8.814	2	0.012
14	After	6.875	1	0.009
15	After	17.564	2	0.000
16	After	8.195	1	0.004
17	After	16.677	2	0.000
18	After	8.019	2	0.018
19	After	21.376	2	0.000
20	After	5.751	2	0.056

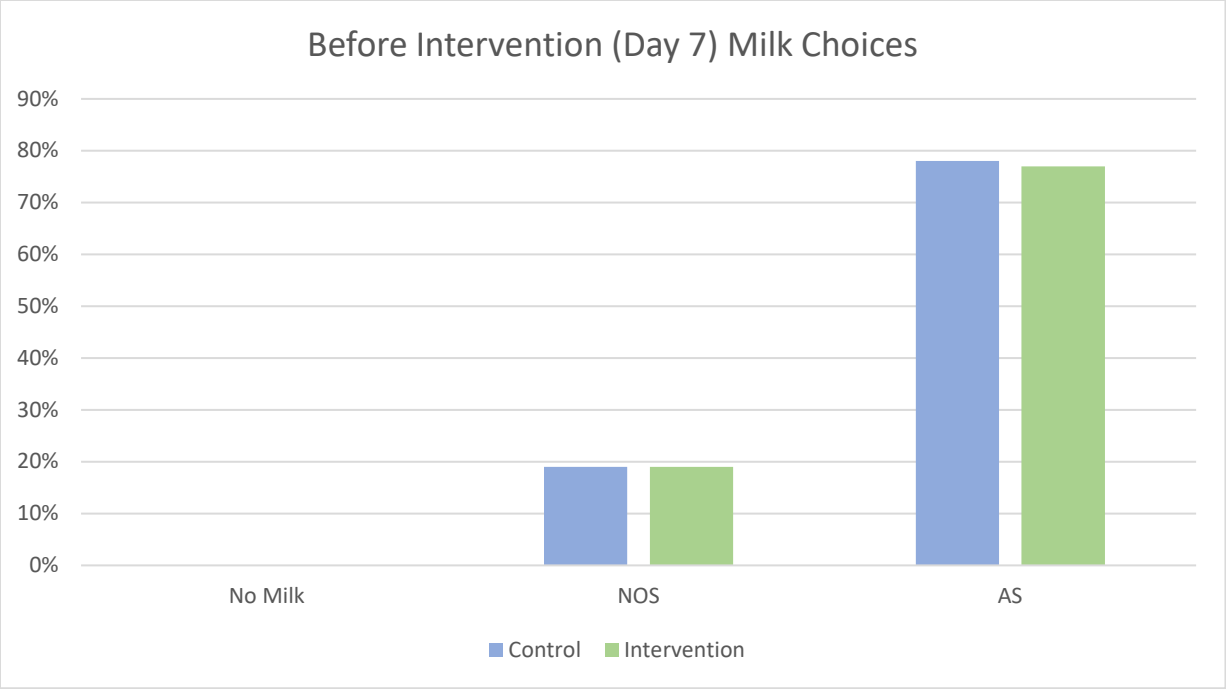

Figure 7: Percentages of Milk Choices Before Intervention (Day 7)

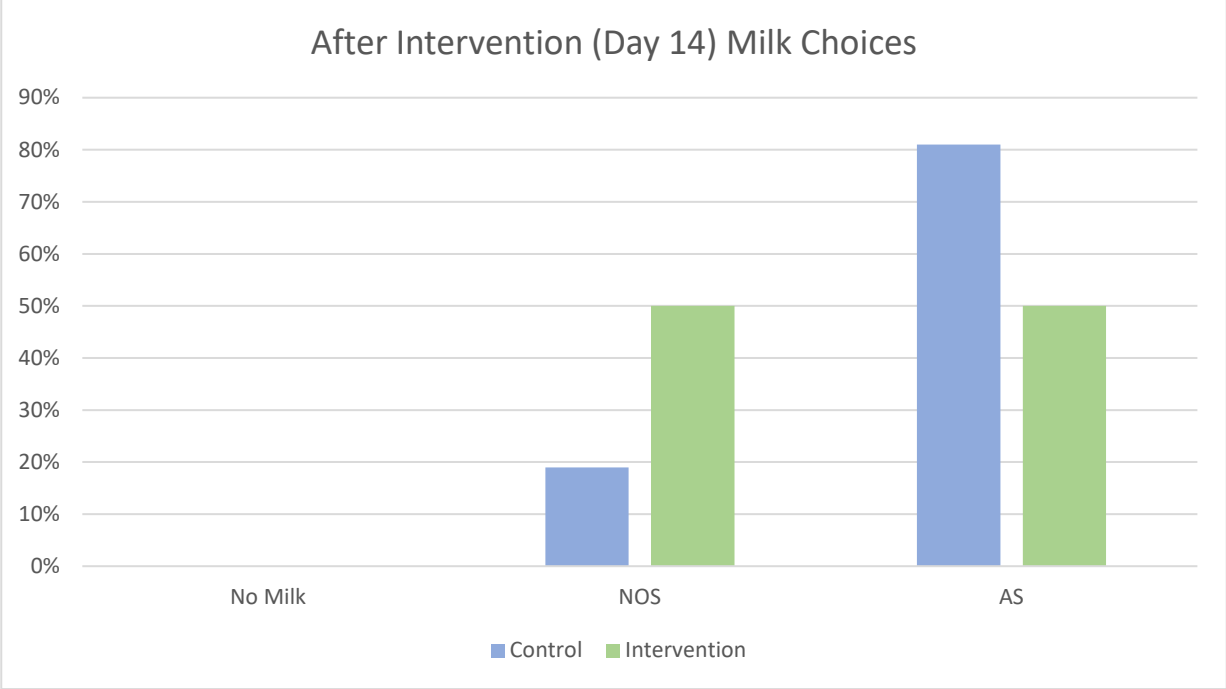

Figure 8: Percentages of Milk Choices After Intervention (Day 14)

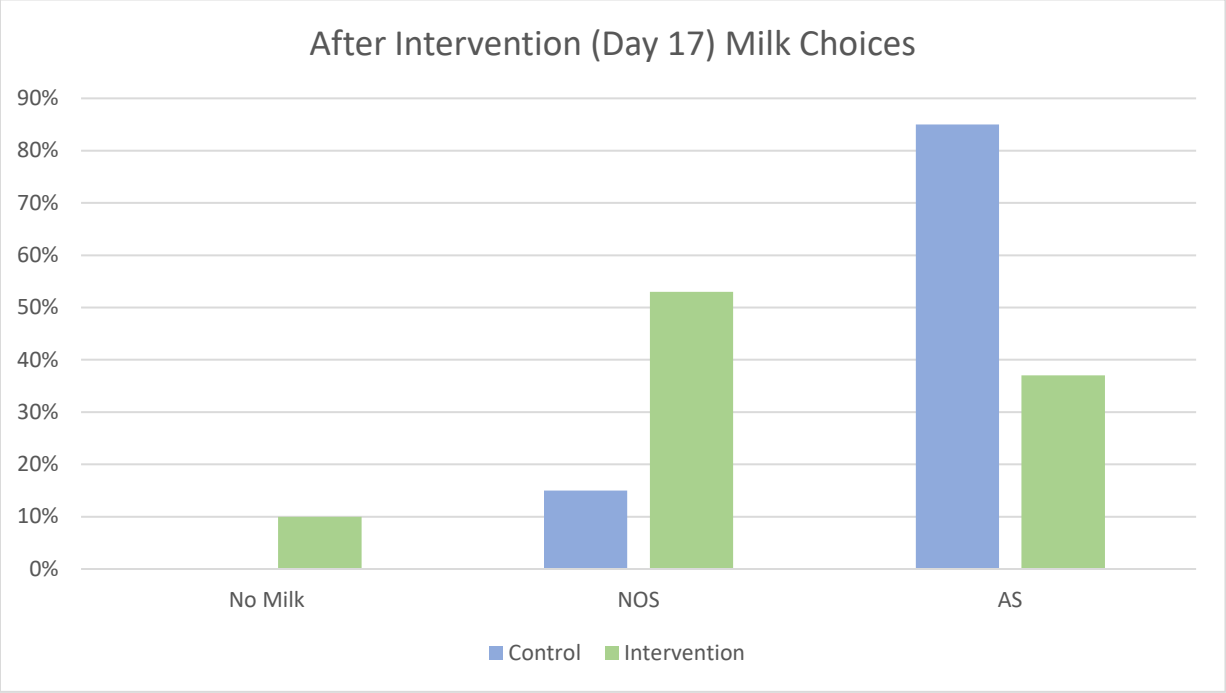

Figure 9: Percentages of Milk Choices After Intervention (Day 17)

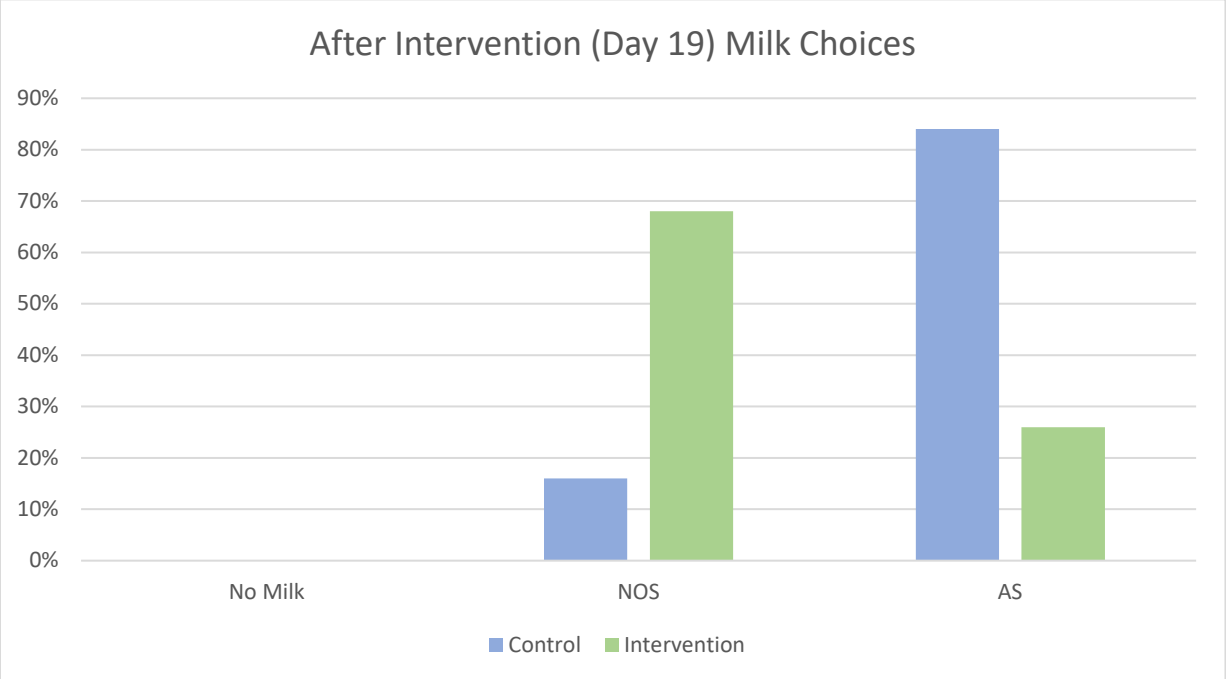

Figure 10: Percentages of Milk Choices After Intervention (Day 19)

Gender

RQ2: Is there a difference between Kindergarten males and females regarding their response to intervention for fruit and milk choices at lunch in a Title I school?

Using a hierarchical log-linear analysis, it can be concluded that gender did not moderate the treatment effect. Meaning, both genders responded similarly to the intervention as indicated by the p-values of more than p =.050. See Table 3 for the three-way interaction between gender, treatment group (control or intervention), and milk choices. See Table 4 for the three-way interaction between gender, treatment group, and fruit choices. Only the randomly selected days are reported since all 20 cases indicated gender did not influence the response to the intervention.

Table 3:

Three-Way Log-linear Analysis (Gender*Group*Milk)

Day	Before or After Intervention	Pearson Chi Square	df	*p*
7	Before	1.916	2	0.384
14	After	0.59	2	0.745
17	After	0.487	2	0.784
19	After	0.02	2	0.990

Table 4:

Three-Way Log-linear Analysis (Gender*Group*Fruit)

Day	Before or After Intervention	Pearson Chi Square	df	*p*
7	Before	0.391	5	0.996
14	After	4.372	5	0.497
17	After	3.558	5	0.615
19	After	4.342	5	0.501

CHAPTER FIVE: CONCLUSION

Discussion

The purpose of this study was to determine if intentional teaching of a health literacy intervention would influence choices made by Kindergarten students in a Title I school who receive free school lunch. A secondary purpose of the study was to determine if male and female students would have a difference in response to a health literacy intervention. Gender did not have a significant effect on the response to the intervention based on a three-way log-linear analysis, so the remaining remarks about the findings can be applied to both male and female participants. It was clear from the data that the intervention was successful for the milk choices. This success was paramount in light of the research done by Welsh et al (2018) that reports that most added sugar consumption comes from liquids, and six percent of a child's daily added sugar intake comes from flavored milks alone. Even though the data was not as clear for fruit options, observations suggest that students were truly considering which choices to make based on health, even if they ultimately chose the 'sometimes' choice.

As the researcher watched and listened to the children making their selections in the lunch line, the words 'anytime' and 'sometimes' filled the lunch line. Children were identifying the healthy choices aloud, even if they did not select them to eat or drink for lunch. As the research team collected data, students from the intervention group would giggle as they admitted they chose 'sometimes milk,' and would proudly proclaim when they had all anytime choices on their tray. One day, at school dismissal time, the researcher (a teacher at the school site), asked a student what she had learned that day, and of all the subjects she could have mentioned, she said she learned about healthy food.

Similar to the other studies that used elements from the Healthy Habits for Life curriculum such as the 5-2-1-0 method, this study yielded a positive experience for teachers and student-participants (Rogers & Motyka, 2009; Tucker & Lanningham-Foster, 2015; Tucker et al., 2010). The teachers whose classes were in the intervention expressed that they would eagerly teach the same lessons in the future, while the teachers with classes in the control group were looking forward to the study ending so they could teach their students the lessons as well.

With further enforcement of these health literacy lessons, Bronfenbrenner's Ecological Systems Theory could be very effective in this community (Paquette & Ryan, 2001). The idea that an individual is influenced by his environment, but also can influence his environment is an inspiring concept within the context of giving children the tools to live a healthy life. Children who are learning about health literacy can then influence the people around them at school, at home, and in their community to make healthier choices as well.

Limitations

The main limitation of this study is what is offered in the school cafeteria. This study was designed to be sustainable for students throughout their school years, so only options that the school district provides for lunch were utilized. Currently, there is not an option for students to easily choose to drink water during breakfast or lunch, so the low-fat milk option was the healthiest choice. In the intervention lessons, children learn the Healthy Habit of 'drink water when you're thirsty,' so it would be best if the cafeteria served water as it has no sugar. The fruit options in the cafeteria were also limiting; the researcher had to work with the kitchen manager of the school to alter which fruit would be served on which day to ensure there was always a choice for NOS fruit as well as AS fruit. If a fresh fruit option was not possible even with menu

alterations on a given day, the researcher provided orange slices, a commonly served fresh fruit option from the school district.

The length of the intervention was also a limitation for this study. Ultimately each class in the intervention group only received four lessons on health literacy, which is not long enough to truly change behaviors. With the astounding differences in the milk choices, perhaps the students would have better results with the fruit choices if they had more time to master the many differences between 'sometimes' and 'anytime' fruit options.

Other limitations include absence of funding for this study, and lack of availability of research team members. In order to influence all choices made during the school day, it would have been beneficial to also track breakfast choices, but the research team members were not available often enough to record for breakfast and lunch. Compensation for their time could have incentivized more people to join the research team in order to have the option to record breakfast choices as well.

Recommendations for Future Research

This study was a step in the right direction for changing the habits of choices made by students in Title I schools who receive free lunches. Further research should include longer interventions for children to have more time to process and foster their new health literacy skills. The current study had sufficient time for children to make drastic improvements in their milk choices, but a longer intervention could help children make consistently healthy fruit choices as well. Further research could also be completed at multiple school sites to increase the sample of children, as well as include breakfast choices as a part of the data collection. Lastly, future research should be done to explore the parental role in child health. Health literacy interventions can be used with parents to measure changes in health habits in the household.

Implications

Several groups of stakeholders should be interested in the results of the current study. Parents, teachers, administrators, and policy makers should be aware of the impact of health literacy interventions on children in order to improve health opportunities for children both in school and at home.

Parents are obvious stakeholders when it comes to the health of their children, but parents do not always know the best ways to promote healthy habits at home. Parents are also the most immediate influence in a child's microsystem based on Bronfenbrenner's Ecological Systems Theory (Paquette & Ryan, 2001), so parents can possibly make the most impact on a child's health habits. A health information night hosted at school for parents could be helpful in making the home-school connection for children that healthy food choices can be made at home as well, not just in the school cafeteria. Future research should be conducted to further include parents in the health literacy intervention process.

A teacher's input has the potential to leave a lasting impression for the rest of a person's life. If teachers knew that even a four-lesson health intervention made such an impact on students, they would likely be willing to integrate health literacy into their classroom routine. Nemours Children's Hospital has free resources for teachers to teach students about 'sometimes' and 'anytime' choices, and it would only require minimal training for teachers to familiarize themselves with the material. Based on the studies by Dallacker et al (2018), Farris et al (2014), and Hur et al (2011) that indicate parents do not necessarily know how to best promote healthy habits, it is likely that efforts to ensure healthy children will have to start with teachers. Teachers can deliver quick, effective health literacy lessons in class that could ultimately reduce the daily added sugar intake of their students.

Beyond intentional teaching of health literacy, teachers can also model and promote healthy habits. Teachers can encourage students to drink water by allowing unrestricted access to classroom water fountains and communicating with parents that students are permitted to bring water bottles to class. Teachers can drink water and narrate the process of feeling thirsty to model the mantra from Healthy Habits for Life: 'drink water when you're thirsty.' Similar practices can be done with healthy food as well—modeling during lunch and snack time, talking about where food comes from, and encouraging parents to send healthy snacks to school.

School administrators can also make informed changes based on the findings of this study. The administration can allow teachers the freedom to teach health literacy in the classroom, plan school events for health information similar to the common 'Literacy Night' or 'STEM Night,' as well as set school-wide policies that promote healthy habits.

One common policy set by administrators in schools today is that children cannot leave their tables at lunch. This is mainly a policy to ensure safety at a time where there are few adults and many children in one area, however, this standard policy is restricting the students' access to water during lunch. In the lunch line, at least at schools in the same district as the study site, there is no option to drink water at breakfast or lunch, only milk or juice; further, children do not have access to the water fountain in the cafeteria due to the no movement policies. This contradicts what they would be learning in their health literacy lessons to 'drink water when you're thirsty.' Administrators can employ a policy similar to that which was used in the *Grab a Cup, Fill It Up!* study by Kenney et al (2015). Children can be responsible for filling up a cup of water at the beginning of the lunch period, then sitting down for the remainder of the time. This would allow for the safety and order in the cafeteria that schools desire, while allowing children to choose the healthiest drinking choice at school meal times.

Lastly, the findings of this study hold implications for policy makers. Results from this study should urge policy makers to rethink the food and drink choices being served in schools today. Chocolate and strawberry milk should not even be an option at school. Our children need an easy way to access water at school meal times. There are dessert-like choices currently being served as a 'fruit' in the school lunch line. Children should only be having up to four to six ounces a day of fruit juice (American Academy of Pediatrics, 2019), yet some Title I schools serve juice up to three times per day (breakfast, lunch, snack) (OCPS, 2018). All these oversights in school nutrition policies are hurting children when it comes to BMI, childhood overweight and obesity, and chances for type II diabetes.

Whether child health changes begin at the microsystem level and work their way to the policy makers through the Ecological Systems Theory, or if policy changes to keep children at the forefront of decisions, changes in school lunch need to be made in order to reduce the amount of added sugar consumed by children who rely on free school meals.

APENDIX A: IRB APPROVAL LETTER

UNIVERSITY OF CENTRAL FLORIDA

Institutional Review Board
FWA00000351
IRB00001138Office of Research
12201 Research Parkway
Orlando, FL 32826-3246

APPROVAL

February 13, 2019

Dear Melissa Kent:

On 2/13/2019, the IRB reviewed the following submission:

Type of Review:	Initial Study
Title:	HEALTH LITERACY INTERVENTION TO INFLUENCE CHOICES BY STUDENTS IN A TITLE I SCHOOL WHO RECEIVE FREE LUNCH
Investigator:	Melissa Kent
IRB ID:	STUDY00000009
Funding:	None
Grant ID:	None
IND, IDE, or HDE:	None
Documents Reviewed:	• Data Checklist.pdf, Category: IRB Protocol; • HRP-502b, Category: Consent Form; • Intervention Lesson Plans, Category: Recruitment Materials; • Updated HRP-503, Category: Other;

The IRB approved the protocol on 2/13/2019.

In conducting this protocol, you are required to follow the requirements listed in the Investigator Manual (HRP-103), which can be found by navigating to the IRB Library within the IRB system.

If you have any questions, please contact the UCF IRB at 407-823-2901 or irb@ucf.edu. Please include your project title and IRB number in all correspondence with this office.

Sincerely,

APPENDIX B: DATA COLLECTION TOOL

Name of Team Member: _____ Date: _____

Circle Teacher Name: Jackson Kent Muise Quates Rehmet Richards

Circle: M T W TH F

F=Female NOS= Naturally Occurring Sugar

M=Male AS= Added Sugar

Child #	F	M	Milk Choice		Fruit 1		Fruit 2	
1			NOS	AS	NOS	AS	NOS	AS
2			NOS	AS	NOS	AS	NOS	AS
3			NOS	AS	NOS	AS	NOS	AS
4			NOS	AS	NOS	AS	NOS	AS
5			NOS	AS	NOS	AS	NOS	AS
6			NOS	AS	NOS	AS	NOS	AS
7			NOS	AS	NOS	AS	NOS	AS
8			NOS	AS	NOS	AS	NOS	AS
9			NOS	AS	NOS	AS	NOS	AS
10			NOS	AS	NOS	AS	NOS	AS
11			NOS	AS	NOS	AS	NOS	AS
12			NOS	AS	NOS	AS	NOS	AS
13			NOS	AS	NOS	AS	NOS	AS
14			NOS	AS	NOS	AS	NOS	AS
15			NOS	AS	NOS	AS	NOS	AS
16			NOS	AS	NOS	AS	NOS	AS
17			NOS	AS	NOS	AS	NOS	AS
18			NOS	AS	NOS	AS	NOS	AS
19			NOS	AS	NOS	AS	NOS	AS
20			NOS	AS	NOS	AS	NOS	AS

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