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EFFECTS OF SCHOOL MEAL CONSUMPTION ON SCHOOL RELATED FACTORS IN
ELEMENTARY SCHOOL-AGED CHILDREN

by

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A thesis submitted in partial fulfillment of the requirements
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ABSTRACT

The purpose of this study was to examine teacher perception of student school meal preferences in an elementary school setting. This was a cross-sectional mixed-methods study that is part of a larger study to develop a nutrition education program for elementary school children. Focus groups and surveys were administered to faculty at a charter school in downtown Orlando to gain insight into the types of food offered at school and student response to these food items. All members of the faculty were invited to participate in the study, and seven teachers volunteered to take part in this study. Focus groups were recorded using tape recorders; they were then transcribed verbatim and coded independently by two research assistants.

Results of this study showed that according to members of faculty, overall, the food served in school during breakfast and lunch is of poor quality. Portion sizes were acceptable according to participants, however, there is still too much food is being wasted. The students do not respond well to breakfast or lunch, which has adversely affected the academic performance of students as well as their classroom behavior due to hunger and low energy levels. It was also noted that older children expressed interest in learning about topics pertaining to nutrition.

This study is the first stage of a larger initiative to develop nutrition education programs and to encourage conversation regarding school meal reform, especially as it pertains to those individuals of low socioeconomic status. The implications for this study could be beneficial for a wide-range of children who attend school on a daily basis.

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INTRODUCTION

Background

Childhood obesity is a national epidemic with as many as 25% of U.S. children currently classified as overweight or obese (CDC, 2011). Although it is clear that obesity leads to serious health consequences later in life, the immediate effects of obesity on cognition and psychosocial factors are often overlooked (Fonvig et al., 2017). Evidence indicates that youth who are obese are less likely to perform well in school, and are more likely to be diagnosed with major depression compared to their normal weight peers. Such factors can significantly impair quality of life for these individuals, and hinder future academic performance and career opportunities (Rankin et al., 2016). Thus, it is necessary to adopt measures that help prevent obesity, rather than treat this condition, during childhood and adolescence.

To tackle the obesity epidemic, it is important to first determine the factors that contribute to this increase in bodyweight. Evidence indicates that while both physical activity and nutrition play a role in weight status, nutritional habits tend to be the primary contributing factor to this epidemic (McGill, 2014). Consumption of high quality food items that contain essential nutrients is vital for healthy physical and mental development. For example, prior studies have found links between fruit and vegetable consumption with positive mood and academic performance (Ogunsile, 2012). Thus, an emphasis should be placed on ensuring that children have access to high quality food that will promote physical and mental health.

The reduction of healthy opportunities in changing behaviors during the school day may have the greatest impact on children and adolescents of low socio-economic status (SES) (Carlson et

al., 2014). This population is at increased risk of developing obesity and obesity-related diseases as a result of poor lifestyle behaviors (Chen et al., 2006). Evidence indicates that, compared to youth of middle to upper SES, these individuals have greater rates of screen time, lower amounts of physical activity, and less servings of fruits and vegetables (Carson et al., 2010). Furthermore, low SES youth are also more likely to drop out of high school or attend college due to poor academic performance. Many individuals are caught in a vicious cycle where they become trapped in a low-income job due to limited educational opportunities, while continuing to make poor nutrition choices, which are then passed down to their children. As there has been little to no research on the independent influence of health behaviors on obesity and academic achievement for youth of low SES families, further exploration of these relationships is warranted to determine which factors are significant.

School-based interventions have been popular in the literature due to the fact that almost all children attend school on a daily basis. Nutrition interventions focus on nutrition in schools because children are most likely to consume one to two meals at school, thus accounting for a substantial amount of daily caloric intake (CDC, 2012). Meals served in school could impact children's overall nutrition profile, especially for children who consume the majority of their caloric intake at school.

Purpose

This study will examine teacher's perspectives of school meal consumption and classroom behavior among children from disadvantaged backgrounds. Concern for this topic arose from the awareness that childhood obesity and the diseases that accompany it such as diabetes and hypertension are continuing to rise, which have negative implications for this population as

adults. Meals served in school could potentially intervene and help to reverse these statistics, especially for underprivileged children where many rely on this food to satisfy their daily nutritional needs. This project seeks to discover relationships between these factors in order to optimize the success of young students from different backgrounds.

REVIEW OF LITERATURE

Nutritional Guidelines for Children and Adolescents

Evidence indicates that proper nutrition and physical activity are critical in healthy child development (Alderman & Fernald, 2017; Perez-Escamilla & Moran, 2016; Zalewski et al., 2015) and maintaining a healthy bodyweight (Rose et al., 2016). According to the 2015-2020 dietary guidelines, it is recommended that children consume a variety of vegetables from all of the subgroups- dark green, red and orange, legumes, and starchy. It is also encouraged to consume whole fruits, whole grains, fat-free or low-fat dairy, and a variety of protein foods. These guidelines also emphasize low intakes of saturated and trans fat, cholesterol, as well as added sugar and salt (Gidding et al, 2006). Unfortunately, a substantial percentage of U.S. children do not consume the recommended servings of fruits and vegetables.

Nutrition and Health Factors in Children from Families of low SES

The overconsumption of foods such as sugary beverages and fast food have been linked to the rise in childhood obesity over the past decade (Datar & Nicosia, 2012; Cochrane & Davey, 2016; World Health Organization, 2016). Such behaviors put children at risk for becoming overweight or obese, and children of low socioeconomic status are at a disadvantage in that they may not have access to healthy foods or have the opportunity to engage in physical activity (Rogers et al, 2015). Thus, underserved children have higher rates of obesity than children of higher socioeconomic status. While obesity is a public health problem due to the adverse physical and psychological conditions that may result from this condition, it can also be even more damaging to youth of low SE, who may already be experiencing health related effects due to greater levels of stress and conflict resulting from financial burdens. Early childhood is a

critical time for adults to influence children's preference for healthy foods rather than energy-dense, high-fat, salty or sweet foods (Mennella et al, 2006). Adults establish the food environment for young children by determining the amount and variety of food options available. If a variety of healthy foods are easily accessible and served frequently, children develop preferences for those foods (Birch & Davison 2001). In a 2017 study done by Piana et al., after a one-year nutrition education intervention, data showed a significant increase of fresh vegetable consumption, a reduction in food consumption in fast-food restaurants, and a reduction in sweets and candy consumed. This type of lifestyle change can be beneficial to children's educational performance (Ralston et al, 2008). Underprivileged students are already at a disadvantage because of the existing relationship between children of disadvantaged backgrounds and declining academic performance (Hochbein & Duke, 2010), and a nutrition intervention could arguably be significantly more beneficial to those belonging to this population.

Health Behaviors During School Hours

Studies have reported that the availability of snacks and drinks sold in schools to students' high intake of total calories, soft drinks, total fat and unsaturated fat, and lower intake of fruits and vegetables (Story et al, 2009). Millions of youth consume school lunch daily offered through the National Schools Lunch Program (NSLP), which is a federally assisted meal program operating in public and nonprofit private schools providing nutritionally balanced, low-cost or free lunches to children each school day (USDA, 2018). In communities of low socio-economic status breakfast is often offered as well. While the NSLP is required to meet the most up to date nutritional guidelines outlined by the CDC, there are no assurances that students are actually consuming these school meals. Two-thirds of teachers across the U.S. say they have children in

their classrooms who regularly come to school hungry to learn because they are not getting enough to eat at home. This can have negative implications for classroom behavior as teachers are nearly unanimously in agreement that there is a strong connection between eating a healthy breakfast and a student's ability to concentrate, behave well, and perform academically (Telecommunications Business, 2011).

Link Between School Nutrition and Classroom Performance

While the purpose of reforming the nutrition guidelines for school meals has been primarily to reduce the rate of childhood obesity, it is also of interest to determine the extent to which school nutrition affects classroom behavior and academic achievement (Imberman and Kubler, 2014; Frisvold 2015). Previous research demonstrates that there is a link between fruit and vegetable consumption and lower grades among elementary school students (Kleinman et al. 2002; Taras, 2005). Additionally, meals typically consumed at home, such as breakfast, are associated with factors related to academic achievement (e.g. alertness, attention). Specifically, skipping breakfast has been linked to decreased cognitive performance during the school day (Murphy 2007; Mahoney et al., 2005). Such effects may be more prominent in children from low SES neighborhoods who may not have the opportunity to consume breakfast regularly (Alaimo, 2001). In fact, studies have shown that insufficient food intake in underserved children was associated with lower grades, higher rates of absenteeism, and lack of concentration in class (Alaimo 2001; Kleinmen 2002). Schools that offer breakfast to underserved students have observed increases in standardized tests and grades (Bradley et al., 2013). While it is helpful to provide meals to underserved children, it is also imperative to determine whether children both find school meals appealing and if they consume all of the food items offered.

Food Waste Link between School Nutrition and Classroom Behavior

While there have been many reports of excess food waste in schools, and it has also been reported that food waste increases after the release of updated dietary guidelines from the Department of Agriculture (Cohen et al, 2014), there is still limited information in the literature regarding how waste from school meals affects classroom behavior. It is pertinent to uncover how to make these meals more appealing to students, because when students don't eat these meals at school, they may be hungry and lethargic during the day. This is especially important for underserved children, who may be relying on these school-provided meals for all of their daily nutritional needs.

METHODS

Participants and Setting

This study utilized a cross-sectional, mixed-methods study design to examine teacher reports of children's school meal preferences and food quality.

There were 7 teacher participants with students from grades pre-k to 5 that were selected based on interest. Teachers were asked to participate in focus groups and fill out short multiple-choice questionnaires.

Teacher Measures

- a. *Teacher Focus Groups*. Elementary school teachers were asked to take part in focus groups that assessed teachers' observations of student nutritional practices and beliefs in the link between school meal consumption and classroom behavior. Additionally, teachers were asked to describe the overall school practices of healthy eating and activity for students. These discussions lasted approximately 10-15 minutes.
- b. *Fruit/vegetable availability in schools survey*. The food availability survey consisted of fifteen questions that listed a multitude of fruits and vegetables and asked participants to check boxes if that particular food item was available for school breakfast, school lunch, or both (Cullen KW, Baranowski T, et al).

Statistical Analysis

- a. *Statistical Analysis*

Descriptive statistics were conducted for all quantitative data from questionnaires. Focus group data was transcribed verbatim and independently coded by two research assistants. Themes were extrapolated from codes and summarized into tables.

RESULTS

Teacher Survey Results

Food item	School breakfast	School lunch	Both	None
Apple	1 (14%)		6 (86%)	
Apple juice		1 (14%)	5 (72%)	1 (14%)
Bananas	1 (14%)	3 (43%)	3 (43%)	
Strawberries		1 (14%)		6 (86%)
Fruit juice	1 (14%)	1 (14%)	5 (72%)	
Applesauce	1 (14%)		6 (86%)	
Peaches	1 (14%)	1 (14%)	5 (72%)	
Carrots		6 (86%)	1 (14%)	
Corn		7 (100%)		
Potatoes		6 (86%)		1 (14%)
Green salad		4 (57%)		3 (43%)
Green beans		7 (100%)		
Broccoli		7 (100%)		
Peas		7 (100%)		
Tomatoes		2 (28%)		5 (72%)

Table 1

Teachers were given a list of foods and asked whether these items were served during school breakfast, school lunch, both, or not at all. Data is shown in Table 1.

In addition to which food items are offered to students at school, the faculty was also asked what foods students either like “a lot” or “a little,” what foods students do not like at all, and if students wouldn’t know the item or they haven’t yet tried that food. This information is found listed in Table 2.

Food item	Students like a lot	Students like a little	Students do not like at all	Students wouldn't know item/haven't tried it
Asparagus		1 (14%)	3 (43%)	3 (43%)
Avocados		2 (28%)	2 (28%)	3 (43%)
Beets			4 (57%)	3 (43%)
Broccoli		7 (100%)		
Cabbage		2 (28%)	3 (43%)	2 (28%)
Cooked Greens		2 (28%)	4 (57%)	1 (14%)
Corn	3 (43%)	4 (57%)		
Dried plum		1 (14%)	1 (14%)	5 (72%)
Grapefruit		1 (14%)	2 (28%)	4 (57%)
Green Beans	4 (57%)	3 (43%)		
Mandarins	3 (43%)	4 (57%)		
Melons	2 (28%)	3 (43%)		2 (28%)
Mushrooms			2 (28%)	5 (72%)
Nectarines	1 (14%)	2 (28%)	2 (28%)	2 (28%)
Onions			3 (43%)	4 (57%)

Table 2

Focus Group Summation

Teachers' thoughts on food served at school was broken down into seven general categories including: overall thoughts on breakfast offerings, overall thoughts on lunch offerings, if children get enough to eat, nutrition education, areas to be improved, school wellness programs offered, and effect on academic performance. This data is tabulated in Table 3. While the consensus among the group was that portion sizes are adequate, according to faculty there is still a large amount of excess food that gets wasted.

Categories	Main Themes
Overall Thoughts on Breakfast offerings	Descriptions sound appetizing, but actual food is not; nothing is fresh and juices are particularly unappealing; biggest complaint was lack of variety
Overall Thoughts on Lunch Offerings	Students won't touch vegetables – teachers wanted “fresh” vegetables to be offered; Decrease in quality of food this past year; served a lot of chips & nachos
Do children get enough to eat?	Portion sizes are adequate, but too much food is wasted; students will eat sugary cereals or waste much of the food & still hungry with low energy levels
Nutrition Education	Appears to be teacher dependent, however, older students are very interested in nutrition
Areas for Improvement	Need for variety in the menu
School Health & Wellness Policies & Programs Offered	No actual policies No after school or summer meal opportunities
Effect on Academic Performance	Students appear lethargic and lack focus in afternoon classes after lunch when they haven't eaten much & are still hungry

Table 3

DISCUSSION

Analyzing the survey and focus group data shown, it is possible to conclude that the overall quality of the food served at UCP Beta is poor. Based on the tabulated survey data, there is a slight variety of fruit and vegetable options available for students as part of the school meal program. However, many of these options are in the form of processed items such as fruit juices and applesauce. Furthermore, looking at focus group results shows that most if not all of these options arrive to school prepackaged, frozen, and are mostly thrown away or left untouched by the kids. It is also important to note that participants determined that portion sizes are adequate, however there is still plenty of food being wasted on a daily basis. This has negative implications for the students' behavior in the classroom, their ability to focus and pay attention, as well as their energy levels – especially after lunch.

Teacher Nutrition Knowledge

Teachers work closely with their students every week, and due to the nature of this relationship, it is safe to determine that students are watching and learning from them each day. It has been shown that in general, underprivileged children learn poor nutrition habits from their families. In order to counteract this, nutrition interventions need to occur to increase the chances of making better health choices in adulthood. This particular school does not have nutrition education standards in place, and as a result, this places teachers in a position to be the sole example of healthy eating habits. According to the survey results, the majority of the faculty members that took part in the survey possess basic knowledge of general nutrition. However, 17% of respondents answered that they did not know when asked if what you eat can make a difference in your chances of developing obesity-related diseases, and if people who are

over/underweight were more likely to have health problems than people who were not. The implications of this lack of understanding between diet and chronic health – if translated to the students - could adversely affect the wellness of the youth population.

Somewhat alarmingly, teachers surveyed were not in agreement as far as methods to adopt more nutritious meals for students. While 86% of teachers agreed that diet can make a difference in the chances of developing chronic diseases, only 72% of those surveyed agreed that the best way to add fruits and vegetables to students' meals were to serve more natural, non-processed fruits and vegetables, and the same percentage of participants agreed that ordering a side salad would be the best way to add fruits or vegetables to a students' meal at a fast food restaurant. While the hope is for children to adopt healthier eating habits, accomplishing that may be difficult if the variance among responses recorded in this data set is representative of adults in schools across many different communities.

Foods Offered at School

According to the data collected from teachers, the elementary school studied offered a decent variety of fruit and vegetable options to students. Looking at school breakfast, 14% of respondents marked that the school served apples, bananas, fruit juice, applesauce, and peaches to students. During lunch, 14% reported that the school serves apple juice, strawberries, fruit juice, and peaches, 28% said that tomatoes are offered. Bananas are served during lunch according to 43% of respondents, 57% said that the school serves green salad, 86% agree that carrots are available, while 100% of teachers said that corn, green beans, broccoli, and peas are served to students at lunch. Combining both breakfast and lunch options, 14% of teachers reported that carrots are served during both meals, 43% said bananas are available during both

times, 72% claimed that apple juice, fruit juice, and peaches are served at both meals, and 86% of faculty believes that apples and applesauce are available during both meals. There were also a few items that were marked as not being available at all throughout the school day. Of these, 14% of teachers said that apple juice and potatoes are not offered, 43% say that green salad is not available, according to 72% of teachers, tomatoes are never offered, and 86% of those surveyed say that strawberries are not available to students during breakfast or lunch.

To ensure an adequate intake of nutrients, it is essential that young students are consuming well-balanced meals daily. While there are a variety of healthy-type foods available for students at school, many of the foods reported are unnatural or processed (e.g. applesauce, fruit juice, apple juice). In addition, young children tend to respond better to food that is visually appealing (Chung & Fong, 2018). Frozen and pre-packaged produce tend to lose that appeal, thus discouraging students from trying new food items.

Student Food Preferences

Teachers were also surveyed on the types of foods that students respond well to and those that aren't as favorable. Regarding the foods students like "a lot," 14% of teachers chose nectarines, 28% chose melons, 43% chose corn and mandarins, and 57% chose green beans. There were more responses regarding the foods students like "a little." In this category, 14% of faculty decided on asparagus, dried plum, spinach, tomatoes, and grapefruit, 28% of respondents chose avocados, cabbage, cooked greens, salad greens, and nectarines, 43% chose green beans and melons, 57% chose corn, sweet potatoes, and mandarins, while 100% of respondents chose broccoli. Moving to foods students do not like at all, 14% of faculty picked dried plum and salad greens, 28% chose avocados, grapefruit, mushrooms, persimmons, plums, radishes, sweet

potatoes, tomatoes, and nectarines, 43% chose asparagus, cabbage, spinach, and onions, while 57% of respondents selected beets. The last category asked teachers to choose which food items students wouldn't know or haven't yet tried. In this section, 14% of faculty selected cooked greens and sweet potatoes, 28% chose cabbage, melons, and nectarines, 43% chose asparagus, avocados, spinach, and beets, 57% selected grapefruit, salad greens, and onions, while 72% of teachers chose mushrooms, persimmons, plums, radishes, tomatoes, and dried plum.

It is interesting to note that most of the food items that the participants assumed children didn't like were the same items that participants believed the students hadn't tried yet. This could be due to a variety of factors including limited options or sensory appeal. Exposure to new foods could benefit students that may never have other opportunities to discover. This significantly impacts families of low socioeconomic status, who may see less variety in their diets when compared with more affluent families and their children who are within the same age group.

Focus Group

The overall attitude of teachers regarding food served during breakfast and lunch at school is that the quality of the food is poor, the children don't touch a lot of it, and that it looks unappealing. The general consensus of the group on school breakfast was that the descriptions make the meals sound appetizing, but the actual food is not. Fresh options are not available – most of the food is prepared from frozen. The juices in particular are especially unappealing, and everyone in the group agreed that a lack of variety was a large issue. Many schools use fruit juice as a way to meet dietary fruit and vegetable recommendations, and it is unfortunate that even the processed juices are unattractive to students. Fresh fruits and vegetables would be much more enticing to young students.

The discussion of school lunch offerings again followed a trend of advocating for fresh produce. Teachers agreed that students don't touch the vegetables as they are not in the best condition. There was also consensus amongst participants that the quality of the food offered at school had decreased in the past year. Chips and nachos were served very often, and the children would only touch the chips and not the more nutritious toppings (e.g. meat, cheese).

It was reported amongst focus group members that portion sizes are adequate, but nevertheless there is still too much food wasted. Students will eat portions of the meals provided (sugary snacks or cereals) and leave the rest untouched. This results in pervading hunger and low energy levels throughout the school day. After not eating much at lunch, students appear lethargic and lack focus during afternoon class time. This has negative implications for standardized test scores, especially for students in classrooms that teach math and science in the afternoon. Low energy levels and an inability to focus may result in a weaker grasp on material that is weighted heavily on nation-wide examinations.

Nutrition education offered in classrooms appear to be dependent on the teacher, however it was reported by teachers who have classrooms full of older elementary school kids that there is high interest in learning about topics pertaining to nutrition. It was noted that learning about what they are eating encouraged the students to try new and unfamiliar foods. These results express a need for involving young students more closely with their nutritional education. Hands-on learning may be more appropriate and beneficial to this population (Ex: Farm to Table Programs).

Areas for improvement overwhelmingly favored adding variety to the menus, as well as advocating for "fresher" fruit and vegetable options. There are currently no policies regarding

health and wellness in place at the school, and no nutritional intervention programs offered. It is clear UCP Beta could benefit from some reform to its school meal program, as the food currently being served is negatively impacting the classroom behavior amongst its students. The results also warrant a stronger push for nutrition education in elementary schools – particularly amongst the older students.

Strengths

This study has several strengths that should be noted. This study is one of the first to examine teachers' perspective on school nutrition quality and the link between nutrition and classroom performance. The study examined a school that caters to an underserved population, where the majority of students are on the free/reduced lunch program. Also, the research is being done in a charter school where the nutritional value of school food is not federally regulated. It is important to recognize and explore the food environment in this type of institution as the effect on its students could have far-reaching consequences throughout the community. There is very little pre-existing literature on how school nutrition independently affects children from low socio-economic backgrounds. In addition, although evaluations of school meals have been reported, there has been limited research regarding children's behavior during periods following meal consumption. It is important to examine teacher perspectives on the relationship between school meal patterns and children's behavior, as well as their perspective regarding food item preferences and consumption in children, given their close proximity to students during the school day. Finally, there has been limited information regarding research on teacher recommendations to improve school lunches for youth.

Limitations

Several limitations of this study should be noted. A major limitation of this study was the small sample size. Only seven faculty members participated in the study, and all were female. Overall, this was not an entirely representative sample of the entire school. Each response weighed heavily on the results of this study, which may have reduced the accuracy of the results and conclusions. In addition, the study did not assess actual school meal consumption, and all teacher measures gathered were subjective. Lastly, student assessment measures were not taken, which may have helped researchers gain different perspectives and points of view on food quality.

Implications for Future Research

This research explored the relationships among elementary school children's school meal consumption, classroom behavior, and academic performance and, therefore, could potentially find stronger evidence to intervene in school meal programs by increasing the availability of nutritionally dense food items. The results showed that teacher observations are beneficial and should be considered when designing school menus. Also, it was reported by teachers of older students that their students were interested in nutrition education – this warrants a stronger push to implement nutrition education courses in schools. The data collected could be used to intervene in schools that may not have strict regulations or to change federal/state guidelines in order to boost students' health and academic performance. The association between proper nutrition and learning ability also suggests future research would be beneficial.

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