School-Based Nutritional Education Interventions

Effects of Nutrition on Children Academic and Health Related Behaviors

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Introduction

Poor health has been linked to poor school performance for young children. Additionally, it results in the development of health problems in children, some of which carries on into adulthood. Apart from affecting their academic lives, poor health results in the development of health complications, which not only lower the quality of lives of young children, but puts a strain on the health care system as well. Children are known to learn from examples and instructions and carry what they have learned into adulthood. Proper nutrition is important for the mental and physical well-being of child and this, therefore, means that children need to be taught to develop healthy lifestyles at a young age so that they can carry on with this into adulthood.

The eating habits of young children are developed through observation and active learning/instruction, with key influencers in this case being parents, caregivers, teachers, and social leaders. This effectively means that the role adults play in the nutrition education of young children is critical. It is these same habits developed during childhood that end up influencing eating and nutritional preferences later in life. The role of teachers in imparting and reinforcing key nutritional concepts is particularly important. There is a need for follow-up action, and the fact that nutritional education and the values placed on making good food choices throughout the school day can easily be integrated into many other subjects. Teaching students about good nutrition has become an important way for students to make healthy choices. There is need to explore the relevance of school-based nutritional education interventions and identify the key benefits of them. There is also a need to identify challenges that could be

encountered in the implementation of said interventions, to recommend valid strategies and opportunities for teaching children good eating habits and proper nutritional choices to last their lifetime. This literature review will address the question of the relationship between the implementation of nutrition into school lessons and academic performance among primary grade students.

The Current Situation

Currently, the public health system is facing pressure from growing numbers of children developing childhood obesity, which is linked to other health problems such as diabetes and high blood pressure in children. According to the Centers for Disease Control and Prevention – CDC (2017), "the percentage of children with obesity in the United States has more than tripled since the 1970s." This is a clear indication of the poor eating and nutritional habits of school-aged children across the nation and the resulting effects on not only health related problems, but the overall relation to the cognitive ability in children who may not be eating a nutritionally well balanced diet. The implementation of successful nutritional education, particularly in primary grades 1-5 could be of great relevance in seeking to reduce the incidence of obesity.

Childhood obesity leads to other physical and mental problems in life. According to Stuber (2014), one-third of American adolescents and children are said to be overweight. Childhood obesity causes significant nutritional consequences which affect the health of children, their behavior and their thinking skills, which then leads to a poor academic performance. Proper nutrition leads to proper growth and healthy development in children, which can then be carried on to adulthood. Poor nutritional choices, however, lead to obesity, which then lead to poor growth and poor academic performance.

Both obesity and food insecurity have significant nutritional consequences which affect the health of children, their behavior and their thinking skills, which then leads to a poor academic performance. The result is failure in exams, which affects self-esteem of children and this can lead to depression. Katz, Katz, Treu, Reynolds, Njike, Walker, Smith, &Michael (2010), further note that obesity increases the risk of children developing heart disease, diabetes mellitus, metabolic syndrome, insulin resistance, and high blood pressure. Katz et al. implemented a nutrition education program with the purpose of educating elementary students to differentiate between more healthful and less healthful food choices in a variety of categories. A total of 1,180 second, third and fourth grade students from three separate schools participated and in a cross sectional-qualitative study. A control group of 552 students and an intervention group of 628 students were identified. Three schools were assigned a nutrition education program called *Nutrition Detectives*- that was designed to teach elementary students and their parents how to make good choices in eating healthy foods (Katz et al., 2010). Data collected using a pre/post-test method showed a statistically significant improvement of nutritional knowledge from baseline at 18.1% to completion at 26.9% respectively. The researchers concluded that the *Nutrition Detectives* program improved the ability of parents and children to take into consideration improved food choices. Healthy food choices can lead to a healthier lifestyle for all children, decreased BMI, and a conscious effort to increase physical activity in schools. The influence of school based nutrition programs can improve dietary patterns and the development of other health problems, which have an impact on the health of the child in adolescence and in adulthood (Katz et al. 2010 pp 21-28).

The National Association of State Boards of Education (NASBE) has been spearheading the development of policies to support school-based health education and

improve the nutrition of children, which will reduce obesity rates in young children. Apart from the physical problems linked to childhood obesity, children are at risk of developing mental problems as they can develop low self-esteem due to poor self-image, which can eventually lead to depression, and improper diets can result in poor academic achievement. If applied proper nutritional education could go on to influence the decision to live healthier lifestyles in adulthood, leading to a healthier population.

Impact of Implementing Nutrition in the Classroom

Emotional Skills and Self Confidence

Proper nutrition in childhood leads to better quality lives and lower health problems in children. The children have better abilities to participate in school and social activities, which leads to an improved quality of life. In cross sectional study by Dollahite, Hosig, Adeletti, Rodibaugh, and Holmes (1998), 548 school aged students in grades K-5 and their parents were provided nutrition information. The study was performed in an impoverished area of Arkansas with 85% of these students on a free or reduced lunch program. Process data analysis was qualitative with content analysis being the primary method employed. A school based intervention was used to assess the impact of nutritional education in food choices for elementary school children, the researchers found that nutritional education improved knowledge and the intent to lead healthier lives in elementary-level children. Moreover, the healthy nutritional plan was incorporated into the school's dietary plan (pg. 294-298). However, the study indicated that there is greater need for the school system to introduce a proper nutritional plan which involved classroom learning as well as practical application of the learnings in the school's feeding plan, so as to encourage children to practically apply the knowledge gained (Dollahite, Hosig, Adeletti, Rodibaugh, and Holmes, 1998, pp.289-301).

Academic Performance

Nutritional education has been shown to be useful in changing students' behaviors and improving their quality of school life, which promotes improved academic performance Florence, Asbridge, and Veugelers (2016) conducted a cross- sectional, qualitative study in which they investigated the link between children's diet quality and performance. As noted by the researchers, the need to explore the relationship between diet quality and academic performance arises due to the availability of limited research to substantiate their interrelation. The study covered 5200 grade 5 students and their parents from Nova Scotia, Canada. Florence et al. (2016) collected student-related data on diet intake, weight, height, and demographic factors, and linked it to a literacy test. Upon examination of the association between diet quality indicators and academic performance levels, multilevel regression methods were applied. The results of the study indicated that there was a direct link between children's diet quality and academic performance. Based on the literacy evaluation, the students who exhibited an overall low diet quality had a high probability of poor performance. Furthermore, the children from better socio-economically placed families performed better than others. These results not only indicate a link between quality diet and better academic performance but also outline the dietary factors leading to this association. Considering the findings, school nutrition programs should be sufficient enough to improve children's access to quality diet, thus bettering their academic performance (Florence, Asbridge, and Veugelers, 2016, pp.209-215).

In another study, Kleinman, Hall, Green, Ramirez, Patton, Pagano, and Murphy (2002) focused on the connection between diet and breakfast and academic performance in children. The primary purpose and objective of this qualitative study was to identify whether there would be improvements in nutrient intake, psychosocial

functioning, and academic performance of schoolboys and girls after the implementation of a free school breakfast program. The study involved the collection of information from 97 students from the inner city before the start of the program and 6 months after its end. Notably, the students with less than half of the recommended daily total energy intake allowance fell within the ‘at risk’ category (Kleinman et al., 2002). Before the beginning of the program, 33 percent of the children under study were considered as being at nutritional risk. They had poor turnout, poor punctuality, and poor grades at school. Upon completion of the program, those of them who had improved their dietary intake made progress in terms of school attendance, started participating in breakfast, and enhanced their math grade. Thus, the research confirms that better dietary intake is linked to better performance and psychosocial functioning in children. This fact also implies that schools and parents should seek to ensure that their children have better nutrient intakes to boost their class attendance and academic performance (Kleinman, Hall, Green, Ramirez, Patton, Pagano, and Murphy, 2002, pp.24-30)

Kleinman et al. (2002) and Florence et al. (2016) both show that there is a direct association between diet quality and academic performance in students, where nutritious foods are linked to better academic results. The research also highlights that children from the upper social classes usually perform better since their families have access to better nutrition. In essence, the studies by Florence et al. (2016) and Kleinman et al. (2002) confirm that diet quality is linked to academic performance, and this means that schools, as well as parents, should focus on improving dietary intakes of their children to enhance their academic performance, punctuality, and attendance among other important indicators. With nutritious foods improving children's eating habits, the emphasis should be put on diet quality as an important catalyst for increased

educational achievements and optimal physical and cognitive Proper nutrition is thought to lead to improved memory and thinking capabilities. Healthy children are more alert and active in class than those who are not. For children to realize their full potential for development, growth, and health, healthy nutrition is of paramount importance. development in children.

Nutrition Education in Schools and Opportunities for Intervention

Nutrition Education in the Classroom

Perera, Frei, Frei, Wong, and Bobe (2015) conducted a cross-sectional mail survey study with the aim of identifying opportunities and challenges for improving nutrition education within U.S. elementary schools. The researchers issued a structured questionnaire covering three study elements – facilitators, barriers, and preferences – to 106 respondents distributed within 17 Oregon elementary schools. Results of the survey showed that in addition to supporting school-based nutrition programs, 87% of educators believe that they need to work with families more directly to improve student food choices 97% of the participants considered nutrition education in elementary schools to be important and that it could enhance food choices of the students (both in the short-term and long-term). The respondents also identified competing academic expectations, time constraints, lack of favorable curricula, and unsupportive home and school food environments, as the main barriers to implementing nutrition education. Majority of the study participants preferred having a nutrition education that effectively integrates other curricula like math and science, and features a cafeteria component. This study highlighted the challenges that make it difficult to have a stand-alone curriculum on nutrition education, and the need to employ an integrated curriculum that

is backed by a supportive food environment both inside and outside the classroom. (Perera, et al., 2015, pp. 45-47).

In a 2 X 2 mixed analysis of variance carried out by Powers, Struempler, Guarino, and Parmer (2005) the researchers studied the effects that nutrition education had on the nutrition knowledge and dietary behavior of school-children, with a specific emphasis on second and third grade learners. More specifically, they utilized a "Social Cognitive Theory-based nutrition education program" to study its effects on the students' dietary behavior and level of nutritional knowledge (Powers, et al. 2005, p.129). The researchers utilized a dynamic assessment method known as Pizza Please that contained both an interactive game and questionnaire components. Additionally, a control group was used for pre-assessment and post-assessment purposes composed of 1100 second and third-grade students from 64 schools within Alabama (i.e. 550 boys and 550 girls). The results show that students within the treatment group had significantly more improved dietary behaviors compared to students in the control group. Regarding nutritional knowledge, the students in the treatment group showed better retention of nutrient knowledge than those in the control group. The students in the treatment group had a higher grasp of the Food Guide Pyramid including a better association of food and job to the nutrients acquired (pg. 129-33). This study is important since it shows that nutrition education programs can effectively improve both the dietary behavior and nutritional knowledge of students, especially if used to deliver positive dietary messages to learners (Powers, Struempler, Guarino, and Parmer, 2005, pp.129-133).

Lastly, Sahota et al. (2001) evaluated the implementation and outcomes of a school-based food program whose purpose was to lower the risk factors associated with obesity. In a cross sectional study the research team utilized an intervention program

known as APPLES that sought to promote lifestyle education in the schools including administration of questionnaires to assess the level of support given by parents and teachers for this program. A total of 634 children aged between 7 and 11 years 350 boys & 284 girls) from 10 primary schools in Leeds participated in this study. The study results indicated that the program implementation was successful, with 89% of the schools effectively accomplishing their set action plans. Moreover, teachers and parents displayed strong support for the physical activity and nutrition education in the schools. Intervention produced desirable outcomes in the learners. Key benefits noted included better knowledge scores, improved attitudes, as well as healthy eating and increased physical activity (based on self-reported behavior). This study contributes to the prevention of diabetes by showing how a school-based intervention program can be used to produce school level changes that are effective in reducing the risk factors for the disease (Sahota, et al., 2001, p. 4).

These three studies reinforce the need for nutrition education in schools. For example, Perera et al. (2015) showed that 97% of the elementary school teachers questioned indicated that they perceived nutrition education to be important since it helps to enhance the food choices made by learners (both in the short-term and in the long-term). In the same vein, Power et al. (2005) found out that nutritional education programs could be effective in improving the dietary behavior and level of nutritional knowledge possessed by the students. Through successfully implementing an intervention program in 10 schools, Sahota et al. (2001) demonstrated that similar programs could be successfully adopted in various schools leading to better health outcomes for the students, especially through reducing risk factors for diabetes. Besides, there are numerous opportunities associated with implementing nutrition education in schools. Perera et al. (2015) found out that the teachers were eager to

implement an integrated nutrition education curriculum in their schools if provided. Also, as the third study shows, the parents and teachers are very enthusiastic to have a school-based intervention program. They are also ready to provide the needed support to make such programs successful (Sahota, et al., 2001).

In conclusion, nutrition education provides numerous opportunities if implemented properly in schools. As noted in Perera et al. (2015), there are several challenges that face nutrition education including time constraints, lack of supportive curricula, and unsupportive home and school food environment. Therefore, there is a need to come up with an integrated nutrition education curriculum that can be implemented alongside other subjects, such as math and science. To ensure successful implementation of nutrition education in schools, both the home and school food environment should reflect what is being taught to learners.

Peer Engagement and Group Effort

Schools are a popular setting in which students learn from one another both in positive and negative behavior traits. Peer learning has been identified as one of the ways in which students learn to conform good decision making. When it comes to healthy behaviors, peer learning can involve imitation of behavior and this can have a positive influence on the food choices made by students. More specifically, the role of teachers and parents in learning proper nutrition has been well documented. In a quasi-experimental study by Blitstein, et al., (2015), it was found that the use of parent-focused marketing messages for healthy foods and social marketing campaigns, led to better and more impactful school-based nutritional programs. The aim was to investigate the role of parent-targeted communication. In BASICS, the researchers had a 30-minute nutrition education program which included physical education lessons and a social marketing campaign carried out in “supermarkets and out- door signage in

areas around participating schools to increase exposure among low-income households with children participating in BASICS" (Blitstein et al, 2015). The first message targeted students and parents while the second one targeted parents from the low-income bracket, aged between 18 and 34 years and was placed in point-of-sales, billboards, media advertisements, and event-themed family functions. In this study, it emerged that children who participated in the BASICS program increased their fruit-intake as compared to the group under comparison, while the group that was included in the BASICS Plus program had an even higher intake of fruits and better nutrition than the control group. The study indicated that including parents in nutritional programs had great results, as they had an effect in the nutritional choices of their children, as opposed to only involving children (Blitstein, et al., 2016, pp.1285-94).

Proper nutrition is thought to lead to improved memory and thinking In a two-phased mixed method study performed by Mooney, Kelly-Blakeney, Cloat, & Black, (2011), the researchers reviewed a survey of 200 teachers using the nutrition education curriculum in their schools, emphasizing health promotion initiatives translated to healthy eating among the learners, which in turn affected teaching outcomes. These teachers agreed that nutritional education helped to promote positive behavior in class because the students' concentration was improved, making them more focused, alert, and active in class when compared to students who had little or no nutritional knowledge. (Mooney et al., 2011). The same survey revealed that children experienced increased enjoyment when handling the practical sessions of the nutrition education curriculum, which contributed to them learning more and retaining more of the instruction from class (Mooney et al., 2011). "Social, Personal and Health Education" provides specific opportunities to enable the child to understand himself or herself, to develop healthy relationships, and to establish and maintain healthy patterns of

behavior" (Mooney et al., pg.4). For children to realize their full potential for development, growth, and health, healthy nutrition is of paramount importance (Mooney, Kelly-Blakeney, Cloat, & Black, 2011)

Active Engagement and Practice

A recent research study notes that incorporating gardens in schools helps to reinforce the lessons being offered (Morris, Briggs, & Zidenberg-Cherr, 2000). Social cognitive theory (SCT) indicates that young children are greatly influenced by their surroundings, and a garden complements these lessons. The schools selected to participate in this project resided within a 75-mile radius of the University of California, Davis; and had garden sites readily available for use by teachers. 4th-grade classrooms were chosen as the study population. These schools took part in the "Nutrition to Grow On" curriculum that provides opportunities to improve students' knowledge and skills related to healthy eating while simultaneously enhancing their awareness of the environment. Lessons were taught for 17 weeks and a Nutrition Knowledge questionnaire was distributed following each lesson (Morris et al., 2000). The curriculum was formally evaluated at three schools: a control site receiving no formal nutrition or gardening lessons; one intervention site receiving only the in-class nutrition lessons; and a second intervention site receiving all the nutrition lessons and gardening activities. All 215 students completed a nutrition knowledge questionnaire (Morris et al., 2000). The researchers found that active engagement of the learners using school-based gardens is a helpful way of teaching them these crucial lessons. The second intervention site that received both in class and gardening experience had a greater willingness to try the garden foods as a snack (Morris et al., 2000). The level of intensity demonstrated by teachers when delivering content is directly correlated to the

active engagement of the learners. This is manifested in students in terms of increased knowledge gain and enhanced behavior (Morris, Briggs, & Zidenberg-Cherr, 2000).

In a separate cross-sectional observational study by Bevans, Sanchez,Teneralli, and Foresst (2011), it emerged that including healthy food choices in the diets of students increased their chances of eating healthy food as it complemented the lessons taught in class. The study included 2039 students drawn from 10 middle schools and 12 elementary schools, involving self-reports by students who ate food from an a la carte menu. Student questionnaires were administered in which on average, students purchased a la carte menu items 1.9 days a week. The availability of nutritious foods during school lunch periods was associated with healthier eating behavior among students. However, this effect was observed only among children who infrequently purchased a la carte food items, and not among those who were frequent purchasers. The results showed that including nutritious foods in the schools' menu, improved chances of the students choosing healthier meals. Increased availability of fruits, vegetables, whole grains, and low-fat dairy products as components of school meals may be an effective strategy to promote healthy eating behaviors among children. These studies showed improving the nutrition standards for school foods positively impacts children's eating behavior and including proper food content in school menus had the effect of enhancing the ability of students choosing healthy meals.

Conclusion

A review of literature reveals a strong connection between child nutrition and academic performance. The National Food Service Management Institute (2001) points out poor nutrition can have a direct, physiological impact on a number of physical health effects including obesity, academic performance, and an indirect effect linked to factors like emotionality and self-confidence. In the words of Perera et al. (2015), "a

balanced diet provides the essential nutrients for healthy development and growth" (p. 41. Children who do not receive proper nourishment often exhibit behavioral problems, problems concentrating, and are significantly more likely to get sick ("Healthy Body Healthy mind: The Impact of School Lunch on Student Performance," 2015). As a result, these children are significantly more likely to miss school, and tend to attain low standardized achievement test scores. It is clear, therefore, that a direct link between good nutritional habits and the performance of children in a class setting does exist.

Implementing a nutrition program in schools can help mitigate the effects of poor nutrition behaviors learned at home or in a society that condones or even encourages unhealthy lifestyles. Good eating habits are also linked to enhanced academic performance. Briggs et al. (2017) points out that in a school setting it is no stretch to link academic performance to nutrition. In the author's own words, "if kids aren't in a position to learn because they're hungry, or they don't get enough nutritious food at home, then schools that don't make the nutrition-performance end up undermining what they are trying to do in the classroom" which is learn (p. 36). Good nutrition education empowers students to become informed and enhances the students' performance.

A review of literature studies shows that school-based interventions can be tremendously helpful in promoting student physical health, which in turn enhances student cognitive and academic performance. Implementing strategies that help students stay healthy through eating healthy foods and being physically active can result in decreased rates of obesity, student absenteeism, fewer behavioral problems, and higher school-wide test scores and grades. As demonstrated in this text, schools investing in the health of students contributes to healthy communities in the future.

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Literature Review Points		
Accurate summary of essential information for at least 10 empirical studies	10	8
Clear introduction, discussion & overall structure	10	9
Virtually no errors in grammar, spelling, quotes, citations, or references	10	5
Total	30	22