Breakfast for champions

Brenda Ragonesi

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BREAKFAST FOR CHAMPIONS:
A study of the impact of participation in the School Breakfast Program on Achievement in Mathematics

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By

Brenda Reber Ragonesi

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for the Degree of
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Approved: V. K. Costiuleadak
(committee chair)

Nicholas DiFonzo
(committee member)

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BREAKFAST FOR CHAMPIONS:

A study of the impact of participation in the

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by

Brenda Reber Ragonesi

Rochester Institute of Technology

Running Head: The Breakfast Program and Performance in Mathematics
ABSTRACT

The purpose of this study was to examine the impact of participating in the school breakfast program on performance in mathematics by children of low socioeconomic status. Stanford Achievement Test (Harcourt Brace Jovanovich, 1989) scores in mathematics were collected for children who qualified for and joined the school based, publicly funded, breakfast program, in a small rural Western New York district, both before and after this program became available. There were a total of 24 children who met this requirement and joined the program during second, third, or fourth grade. A control group was comprised of children in the same school district who attended grades 1, 2, 3, and 4 prior to the implementation of the school breakfast program. These children joined the program as soon as it became available when they were in middle school. These children also qualified for the publicly funded breakfast. There were 11 children from this district who met this criteria. Their Stanford Achievement Test scores were gathered for first, second, third and fourth grades. While the results of this study were not significant, the trend in the data was for participation in the breakfast program to improve performance in mathematics.
INTRODUCTION

Statement of the Problem

"The preponderance of theoretical literature expressing the opinions of educators, nutritionists, and doctors, from the 1930's to the present strongly suggest that there is a high correlation between the eating of breakfast and optimal mental performance" (Purnell, 1989, p. 4). In 1971, the Food Research and Action Center reviewed the National School Breakfast program which provides breakfast to public school children across the country. The subjective evaluations of teachers, administrators, and students on the effectiveness of the school breakfast program were striking. Teachers stated that students' attention spans, academic achievements and behavior improved drastically as a result of their eating breakfast. (Congressional Record, 90th Congress 1968). Students reported that they felt better, and that their concentration was enhanced when they ate breakfast in the morning (The Food Research and Action Center, 1972).

The National Academy of Science, however, upon considering the National School Breakfast Program, concluded that the influence of breakfast programs on improving school performance has not been documented. This group stated that careful studies on the physiological effect of hunger were needed (National Academy of Science-National Research Council, 1973). Tseng (1980) concluded that the literature suggests that breakfast plays an important role in the mental health of children but that more extensive research needs to be done. Pollitt (1978) criticized the evaluations of the National School Breakfast Program as not being serious scientific investigations. Upon considering the studies of school nutrition programs, Nelson (1981) concluded that the short term studies yielded conflicting results,
while the long term studies failed to conclusively demonstrate significant relationship.

Evaluations in developing countries of the nutritional and educational benefits of school feeding programs have been generally unsuccessful (Pollitt, 1978).

**Importance of the Study**

Currently, the standards for acceptable student performance are being raised at the same time that budget constraints are pressuring school districts to cut costs. An example of increasing standards in New York State is the recent initiative spearheaded by the Commissioner of Education requiring all students to attend Regents level courses and pass Regents exams in order to graduate. Soon, 90% of all students in New York State, including those in Special Education, will be expected to pass the Regents exams. Goals 2000 is an example of a national effort to raise standards for student's in this country. It is likely that closer scrutiny will be made of the effectiveness of various school programs in improving academic achievement. Should any currently publicly funded program fail to demonstrate that it is producing the desired results, it may be eliminated in favor of other options. Conversely, when it can be documented that a program provides the desired results, school districts are more likely to incorporate it. As of 1988 the School Breakfast Program was offered to only 39% of children nationwide (Meyers, et al. 1988). Should more conclusive data demonstrate the link between participation in the School Breakfast Program and increased academic success, it is likely that more school districts will incorporate this federally funded program.
Order of Presentation

This study of the efficacy of the school breakfast program and performance in mathematics for children of low socioeconomic status will begin with a review of literature providing evidence for the pervasiveness of hunger and under nutrition for American children. Following will be a brief history of the Breakfast Program including the impetus for its establishment. A review of the research that has been done in the area of breakfast consumption and performance in problem-solving and mathematics will then be highlighted. A methods section will follow which will delineate the essence of the investigation including the subjects included and procedures followed. Results will then be shared describing the nature of the data and the statistical treatment used. Summary and interpretation of the results will follow including limitations of this study. Finally, references cited in the text will be listed.

Literature Review

"I’m hungry!" This often repeated childhood lament can be heard daily in homes across America. For the majority of children in the United States, this cry is quickly satisfied with a snack or the news that the next meal will be coming shortly. Sadly, not all children are so fortunate. The following study and survey results from around the country indicate a significant number of children are suffering from hunger and or under nutrition.

- In 1987, the U.S. Conference of Mayors documented an 18 percent increase in the number of families with children who were seeking emergency food in major cities across the nation (United States Conference of Mayors, 1987).
A 1986 study of hunger among low-income children in New Haven, Connecticut found that 18 percent of families with children between the ages of one and 11 had a chronic hunger problem and another 7 percent of these children were at risk of developing a serious hunger problem. In addition, the study found that 65.3 percent of the households had experienced at least one indicator of a hunger problem. (Connecticut Association for Human Services, 1987).

A 1983 study carried out by the Public Health Department in Massachusetts showed that chronic malnutrition is a significant public health problem among the low-income, preschool children in Massachusetts, with 9.8 percent of the children identified as having low height-for-age and weight-for-age. In addition, anemia was present in 12.2 percent of the children. (Massachusetts Department of Health, Division of Family Health Services, 1983).

Now that the presence of hunger and under nutrition in American children has been demonstrated, attention will turn to one program that has sought to address this issue. The School Breakfast Program was created by Congress in 1966 to provide a breakfast, on school days, to low-income Children who would otherwise have none. (New York State Education Department, A Guide for School Breakfast Programs, “n.d.”). The impetus for the creation of the school breakfast program was a widespread concern in Congress that many children, who had to travel long distances to school or who were from low-income families came to school hungry, making it very difficult for them to learn in the morning (Meyers, et. al. 1988). The Congress expanded the breakfast program in 1971 to include those schools where there was a need to improve the nutrition and dietary practices of children with working mothers and children from low-income families. In 1975 the program was expanded so that any school
wishing to participate could join. (New York State Education Department, A Guide For Breakfast Programs, “n.d.”) Under the program, School Breakfast is offered at no cost to children with family incomes below 130% of the federal poverty level, at reduced price to those with family incomes between 130% and 185% of poverty, and at full price to all others. (Meyers, et. al., 1988).

Having looked at the evidence of hunger and under nutrition among children of low-socioeconomic status and the development of the School Breakfast Program, attention will now turn to research that has evaluated the impact of breakfast on performance in problem-solving and mathematics.

Pollitt (1981) conducted research on the effect of not eating breakfast on children’s learning ability. His study, which was carried out in a carefully controlled laboratory setting, investigated the effect of skipping breakfast on the speed and accuracy of response in a number of problem-solving tasks. The tasks were carried out in the late morning by 9-to-11 year old, well-nourished middle class children. Skipping breakfast had an adverse influence on these children’s performance in problem-solving situations similar to ones they might face in a classroom setting (Parker, L., et al, 1989).

Connors (1980) conducted a similar study with 9-to-11 year old children. In this study, Connors tested the same children four times, at intervals of one week, twice after the children had eaten a standard breakfast, and twice after they had fasted for 12-hours. Each test day, their performance on school-type tasks was assessed three time - at 9:50 a.m., 11:00 a.m., and 12:10 p.m. Eating breakfast decreased errors on the tasks. In addition, as the morning progressed, performance on arithmetic tests between these three testing sessions was better if breakfast had been eaten (Parker, L. et.al., 1989).
James Purnell (1989) in his extensive review of the literature looking at the effects of breakfast on mental performance and achievement cites a number of studies that demonstrated the merit of breakfast consumption and improved mathematics performance. Furman and Noli (1983) found a slight, but not statistically significant growth in mathematics achievement for 200 second through fifth graders who had a mid morning snack of nuts and raisins. Simeon and Grantham-McGregor (1989) compared severely undernourished children with a control group of properly nourished children and found that the sub-nourished group was adversely affected in their arithmetic performance. However, the properly nourished control group did not show the same negative affect. A study showing the benefits of adding breakfast was conducted by Powell, Grantham-McGregors, and Elston (1983). Undernourished Jamaican children who ate a breakfast of milk, banana cake, and minced meat and vegetable patty showed significantly improved math scores over children who simply had tea with syrup.

Conversely, Purnell (1989) found studies that showed breakfast consumption was not necessarily related to improved performance in mathematics. Dickie and Bender (1982) gave a food survey to students and determined that eating breakfast did not impact math test scores. Duke (1986) also gave children a morning snack of raisins and nuts and failed to find a significant difference in mathematics test performance between students who regularly ate protein for breakfast and those who ate “junk” food without protein.

One study was found (Meyer, et.al., 1988) that investigated the impact of the implementation of the school breakfast program in Lawrence, Massachusetts on students in grades 3 though 6 in the area of achievement in mathematics. While the school breakfast program participation was shown to be responsible for slight, yet statistically significant improvements in attendance and standardized achievement test scores, it could be argued that
the improvement was due to the Hawthorne effect. The Hawthorne effect refers to changes in persons' behavior brought about by the interest the "significant others" show in them. The effect was named after the events occurring at the Hawthorne plant of the Western Electric Company in Cicero, Illinois, near Chicago (Shaughnessy & Zechmeister, 1994). The children in this breakfast study knew that their eating habits and test performance were being monitored because consent was given for participation. A Hawthorne effect generally refers to behavior change resulting from a subjects' awareness that someone is interested in them which could account for the improved attendance and test performance.

In light of the fact that the methodology implemented in the Meyers, Sampson, Weitzman, and Kayne (1988) study may have led to spurious results, the purpose of this study was to look at comparative standardized test results in the area of mathematics that avoids the possibility of a Hawthorne effect. The question posed was, "Does participation in the school breakfast program improve academic achievement in mathematics for children of low socioeconomic status?" It was anticipated that children from low socioeconomic status who participate in the breakfast program would demonstrate improved performance on standardized achievement tests in mathematics.

METHODS

Instrumentation

Stanford Achievement Test (Harcourt Brace Jovanovich, 1989) scores were gathered for this study from school records. This instrument is given to all students in the school district in the spring of each academic year. Percentile scores are given for three sub tests, "Concept of
Numbers”, “Computation” and “Application” with a “Total Test” score offered for overall performance. These “Total Test” scores were then converted to standard scores.

Treatment

A total of 35 students in this study received the free or reduced breakfast. A sample breakfast menu was evaluated for the school district under investigation. (See appendix for sample menu.) Milk and cereal are offered daily. Some form of fruit (either juice or a fruit cup) is offered on most days. Protein, other than milk, is offered in the form of cottage cheese which is available one day per week as well as a “Breakfast Pizza” which also appears weekly. This “Pizza” is made of a yeast based crust covered in eggs, sausage and cheese. Other breakfast menu items include English Muffins, bagels, donuts, toast, and cinnamon buns.

Subjects

The subjects for the test group were all children who were enrolled in a rural school district in Western New York who qualified for a free breakfast and joined the program during second, third or fourth grade. There were 24 children who met these requirements from this district. Stanford Achievement Test scores in mathematics were gathered both for the year prior to their joining the school breakfast program and the year subsequent to their joining the program. These scores came from tests given in the spring for grades 1, 2, 3 and 4. Because this was a record review without the collection of identifying data, no consent was necessary and therefore no possibility of a Hawthorne effect was introduced.
Characteristics of the study sample are delineated in Table 1. There were 15 males and 9 females in this group of students. Of these 24 students, seven had test scores gathered for first grade (with no breakfast program) and second grade (after participating in the breakfast program for that academic year). Second grade (without the breakfast program) and third grade (with the breakfast program) test scores were collected for another seven of these 24 students. The remaining 10 students had test scores gleaned for third grade (no breakfast program) and fourth grade (with the breakfast program).

A control group was comprised of children in the same school district who attended grades 1, 2, 3, and 4 prior to the implementation of the school breakfast program. These children joined the breakfast program as soon as it became available when they were in middle school. These children also qualify for the free breakfast. There were 11 children from this school district who met the criteria. It is believed that these children would have qualified for and participated in the breakfast program had it been available to them during their elementary school years and therefore had characteristics similar to the children in the treatment group due to low socioeconomic status. Of the eleven children, seven were females and four were males. From these 11 student's records, 8 students had test scores gathered for first and second grade on the Stanford Achievement Test, 10 of these 11 students had test scores collected for second and third grade and finally, 9 of these students had test scores gleaned for third and fourth grade for a total of 27 comparisons of performance between elementary school grades for 11 students.

Insert Table 1 about here

________________________________________
RESULTS

Difference scores (looking at results before and after joining the breakfast program) were computed for the “Total Test” in mathematics for the Stanford Achievement Test for the children who joined the breakfast program during elementary school. Difference scores were also computed for the control group who did not have the breakfast program available until middle school by comparing their own test scores between first and second, second and third, and third and fourth grades for a total of 27 difference scores for these 11 children. While inspection showed an improvement in mathematics performance on the Stanford Achievement test with participation in the school breakfast program, the results were not statistically significant ($t(33) = .92, p = .35, r = .158$). The mean improvement in standard scores for children after they joined the breakfast program was 6.08 points ($s_d = 10.32, n = 24$) while the control group gained a mean of 3.93 points ($s_d = 11.23, n = 11$) in their standard scores.

DISCUSSION

In light of the conflicting research results that have been offered concerning the efficacy of breakfast consumption and improved performance in mathematics for school age children and the lack of statistically significant data that was generated in this study, it is the recommendation of this author that further investigation be conducted in this area. Providing breakfast in school addresses only one element of the needs that children from low
socioeconomic status present when they come to school each day. It may be that lack of adequate health care, poor living conditions, and lack of adequate nutrition may continue to undermine school performance and dilute the benefit that the breakfast program offers.

The issue of whether or not adequate nutrition is gained from a school based breakfast is also worth noting. While the preponderance of carbohydrates (such as the bagels, muffins, and buns) would probably be appealing to children and therefore more likely to be eaten (addressing the issue of hunger), it is questioned by this investigator whether the student’s nutritional needs are adequately met. Because the children can select what they will and will not eat, it is not known how much fruit and protein is actually consumed by the children. While the school may offer breakfast to children of low socioeconomic status, there is no guarantee that the children will take the greatest advantage of this opportunity. The original concern of the Congress regarding children coming to school hungry has only been magnified as the problem of hunger and under nutrition for school age children has grown. It is questioned whether offering a carbohydrate loaded breakfast is a sufficient solution.

Limitations

There are a number of limitations to this study which may have contributed to the lack of significant results. To begin with, there was a very small number of students who qualified for inclusion in this study, extreme cases (such as the student whose standard score dropped by 21 points between first and second grade) would therefore have greater impact on the mean difference scores. Another limitation is the lack of information on other possibly confounding variables such as frequency of breakfast consumption and quality and quantity of meals actually eaten by the students in the test group. Other factors that may have accounted for
poor test performance on a given day such as illness, lack of sufficient sleep the night before, and the distraction of life stressors (e.g. conflict at home or with other students) were not accounted for and may have had a more significant impact on this small sample for both the treatment and the control groups. Finally, the use of multiple comparisons within the control group limited the effectiveness.
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Table 1

Characteristics of Study Sample

<table>
<thead>
<tr>
<th></th>
<th>Breakfast Participants</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>Gender: Male</td>
<td>62.5%</td>
<td>36.36%</td>
</tr>
<tr>
<td>Gender: Females</td>
<td>37.5%</td>
<td>63.64%</td>
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</tbody>
</table>

Test Score Comparisons:

<table>
<thead>
<tr>
<th>Grades</th>
<th>Breakfast Participants</th>
<th>Control Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 to 2</td>
<td>29.17%</td>
<td>29.63%*</td>
</tr>
<tr>
<td>2 to 3</td>
<td>29.17%</td>
<td>37.04%*</td>
</tr>
<tr>
<td>3 to 4</td>
<td>41.67%</td>
<td>33.34%*</td>
</tr>
</tbody>
</table>

* N=27 for total number of test score comparisons when number of subjects equals 11.
<table>
<thead>
<tr>
<th>Monday</th>
<th>Tuesday</th>
<th>Wednesday</th>
<th>Thursday</th>
<th>Friday</th>
</tr>
</thead>
<tbody>
<tr>
<td>FroYo</td>
<td>Fruit cup</td>
<td>Cereal or donut</td>
<td>Juice</td>
<td>Cereal or English muffin</td>
</tr>
<tr>
<td>27</td>
<td>28</td>
<td>29</td>
<td>30</td>
<td>31</td>
</tr>
<tr>
<td>NO SCHOOL</td>
<td></td>
<td></td>
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Breakfast Menu:
- Milk and Cereal offered daily.