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Fast Food Consumption and Academic Growth in Late Childhood

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Abstract

Objective.—The objective of this study is to examine the associations between fast food consumption and the academic growth of 8544 fifth-grade children in reading, math, and science.

Method.—This study uses direct assessments of academic achievement and child-reported fast food consumption from a nationally representative sample of kindergartners followed through eighth grade.

Results.—More than two thirds of the sample reported some fast food consumption; 20% reported consuming at least 4 fast food meals in the prior week. Fast food consumption during fifth grade predicted lower levels of academic achievement in all 3 subjects in eighth grade, even when fifth grade academic scores and numerous potential confounding variables, including socioeconomic indicators, physical activity, and TV watching, were controlled for in the models.

Conclusion.—These results provide initial evidence that high levels of fast food consumption are predictive of slower growth in academic skills in a nationally representative sample of children.

Keywords

child development; fast food; academic achievement; cognitive development

There is a growing recognition of the importance of children's eating patterns to their overall health and development.¹ Current research has primarily focused on how children's food consumption contributes to the child obesity epidemic.^{2,3} While links to obesity are undoubtedly critical to understand, there are other potential ways in which food can affect children's development. Because we know that food intake influences a number of systems within the body, it is important to look at relations between types of food consumption and a wide range of children's developmental outcomes, including their academic achievement. Of particular concern is children's consumption of fast food. Children eat more fast food now than they did decades ago, and nearly a third of all children and adolescents in the United

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States report consuming fast food on any given day.^{4,5} While the implications for physical development are well studied, we do not yet know what implications this major change in eating patterns may have for other domains of children's development.

Fast food is a broad category of prepared food purchased outside the home and includes common restaurants such as McDonald's, Burger King, and Taco Bell. Although it has long been considered unhealthy, recent research has documented a number of specific potentially harmful characteristics of fast food. Kirkpatrick et al⁶ compared the food offerings at the top 5 fast food chains in the United States with the 2005 Dietary Guidelines for Americans and found that while there is a variety of food offered at these restaurants, it is consistently of poor dietary quality. Other recent research has examined the nutrient quality of "kids' meals" at fast food restaurants using criteria from the National School Lunch Program (NSLP) and found that only 3% of "kids' meals" met all NSLP criteria.⁷ Instead, children who eat more fast food ingest more calories, total fat, saturated fat, carbohydrates, and added sugars than children who do not eat fast food, even after controlling for socioeconomic characteristics.⁴

Fast Food Consumption and Children's Development

To date, most research has focused on relations between fast food consumption and children's obesity.^{2,3} However, recent research has also pointed to other developmental domains, including academic achievement and cognitive development, that may be influenced by fast food consumption. One possible mechanism for a link between fast food and academic growth is the consumption of fewer specific nutrients. Because fast food meals are often deficient in a range of nutrients,⁷ children who eat fast food several times per week may be at risk of not receiving enough of these nutrients to develop optimally. Supporting evidence comes from an intervention that increased late elementary school students' nutrient intake and found positive impacts on math scores.⁸ Another school-based intervention that increased nutritional content of school meals and provided nutrition education to families and teachers found that children who were in the intervention schools had greater increases in academic scores than children in comparison schools.⁹

While overall nutrient levels in food have been found to affect children's cognitive development, iron levels in particular have been found to be important. Less than a third of fast food meals provide the recommended amount of iron.⁷ This is of concern because children who are iron deficient are more likely to score below average on standardized math exams.¹⁰ Thus, it may be that children who consume higher levels of fast food have lower levels of iron, and that this deficiency connects children's fast food consumption to their academic outcomes. There is also substantial research suggesting that diets high in fat and added sugar—similar to fast food meals—influence learning processes such as attention. One experiment found that adults had longer reaction times on the days in which they had a meal high in either fat or carbohydrates.¹¹ Another study randomly assigned men to either a high fat (70%) diet or an average fat (24%) diet and found that, after 5 days, men on the high fat diet showed poorer attention and processing speed than men on the average fat diet.¹² Because the bulk of the prior research focuses on adults, it is less clear how diets high in fat and sugar relate to children's learning processes, although there is some evidence that

there are deleterious relations between sugar and other simple carbohydrate consumption and children's memory and attention processes.¹³

The Current Study

The goal of this study was to isolate the potential influence of children's fast food consumption on their later academic achievement. Using longitudinal data from a large, nationally representative study of school children, we examined whether frequent consumption of fast food at fifth grade would be associated with smaller academic growth between fifth and eighth grades. Because the prior research linking diets high in fat and sugar to learning-related outcomes has primarily shown relations when the proportion of one's diet is extremely high in fat and sugar, we anticipated that any associations between fast food and academic growth would be strongest at the highest levels of consumption. We improved on prior research that established cross-sectional associations between fast food consumption and children's academic test scores¹⁴ by looking at the relations longitudinally.

Because food intake was not randomly assigned in this study, it is possible that any relations found between children's fast food consumption and their academic growth are due to third variables that correlate both with fast food consumption and academic scores. In order to minimize this risk, we controlled for earlier test scores, which allowed us to look at how fast food consumption in fifth grade influences children's academic growth from fifth to eighth grades and thereby takes into account any unmeasured selection variables that affect both children's initial academic scores and their fast food intake. Second, we included an extensive set of sociodemographic control variables, such as parent education, family income, and food insecurity, that may affect both achievement and fast food intake. Third, we gave careful consideration to alternate explanations and included such potential confounders in our analyses. We included indicators of children's other food consumption to remove the possibility that fast food consumption is serving as a proxy for other eating habits. To rule out the possibility that children who consume fast food more often are also engaged in less exercise, we included multiple parent-reported variables about children's exercise and activities. We included other measures of behavior, such as watching TV, that may covary with both fast food intake and achievement.

It is also possible that larger contextual conditions may provide alternate explanations of relations between fast food and children's development. For example, children in urban areas or areas with high poverty rates may have more access to fast food, and less access to healthy food, and may attend underresourced schools that hamper their achievement. We thus controlled for whether children lived in a rural, urban, or suburban area and for school-level poverty rates.

Method

Data and Sample

We used data from the Early Childhood Longitudinal Study–Kindergarten Cohort (ECLS-K), a nationally representative study of students who were in kindergarten during the 1998–1999 school year that was collected by the National Center for Educational Statistics

(NCES).¹⁵ Children were followed from kindergarten through eighth grade. Our sample consisted of approximately 11 740 children (51% male; 43% White, 11% Black, 19% Hispanic, 7% Asian, 6% other race or ethnicity) who had a valid longitudinal child assessment sampling weight for the fifth (collected in the spring of 2004) and eighth grade waves (collected in the spring of 2007).

Measures

Children's Academic Achievement.—Children were assessed in reading/literacy, mathematics, and science in both the fifth and eighth grades. We used the vertically scaled item response theory (IRT) assessment scores.¹⁶ Children's eighth-grade IRT scores were the dependent variables but each model controlled for the fifth-grade IRT scores for that same subject, so that our estimates represented growth in achievement between the fifth and eighth grades.

Children's Fast Food Consumption.—Children reported their fast food consumption in the week before the survey as part of a food consumption questionnaire, which was adapted from the Youth Risk Behavior Surveillance System, which is a survey given to US middle and high school students by the centers for Disease Control and Prevention on a biennial basis.¹⁷ Children were asked, "During the past 7 days, about how many times did you eat a meal or snack from a fast food restaurant such as McDonald's, Pizza Hut, Burger King, KFC (Kentucky Fried Chicken), Taco Bell, Wendy's, and so on?" They could respond using 1 of 7 frequency categories: *did not eat food from a fast food restaurant during the past 7 days; 1 to 3 times during the past 7 days; 4 to 6 times during the past 7 days; 1 time per day; 2 times per day; 3 times per day; and 4 times per day.* Because few children reported the most frequent usage (see Results section), we collapsed these 7 categories into 4: *none in past week, 1 to 3 times in past week, 4 to 6 times in past week, and daily.*

Covariates.—We included five categories of covariates (see Table 1 for descriptives) measured at fifth grade to remove potential confounding influences. *Children's characteristics* included child gender, race/ethnicity, and overall health (reported by the child's parent). *Children's other food consumption* was indicated by children's reported consumption of fruits and vegetables, milk, 100% juice beverages, and soda and other sugary beverages on the same scale as reported fast food consumption. *Family socioeconomic characteristics* were parent reports of household income-to-needs ratio, combined parent highest education, household food insecurity,¹⁸ and maternal employment.

We also controlled for a number of indicators of *children's activities and time use*. Parents rated their child's actual activity level compared to other children (more, less, or similar) and their child's preference for active activities (prefers active, sedentary, or both). Parents also reported on how many days per week their child exercised for at least 20 minutes, the hours of TV their child watches on an average weekday, and whether the child has a regular bedtime.

Finally, we included 2 *neighborhood and school characteristics*, namely whether the family resides in an urban or rural area (as compared with suburban areas), and the school poverty level as defined by the percentage of students eligible for free or reduced price lunch.

Results

Fast food consumption was quite high in this nationally representative sample. As shown in Figure 1, less than a third (29%) of fifth graders reported not having consumed fast food in the past week. Consuming fast food between 1 and 3 times in the past week was the most common response (52%). However, 10% of children reported consuming fast food 4 to 6 times in the prior week, while another 10% reported consuming fast food daily.

As hypothesized, children who reported daily fast food consumption experienced the slowest growth in their academic achievement across all 3 subjects (see Table 2). Children who reported consuming fast food daily gained significantly fewer points in reading over the years from fifth to eighth grade than did children who reported consuming no fast food in the past week. For math achievement, any fast food consumption was related to lower gains: Children who reported consuming fast food 1 to 3 times in the past week, 4 to 6 times in the past week, or every day in the past week all experienced significantly smaller gains than children who reported no fast food consumption. In science, children who reported consumption of fast food 4 to 6 times per week or daily both had significantly lower test scores than children who reported no fast food consumption.

As shown in Figure 2, the associations between fast food consumption and achievement gains over time followed a stepwise pattern, with each more frequent category of consumption in fifth grade associated with lower achievement gains by eighth grade across all 3 subjects, above and beyond the effect of fifth grade achievement and other covariates. It is also important to note that while the standardized coefficients indicate small effect sizes, these are indicative of the role of fast food on children's total academic score because they are created on the metric of the eighth grade score, not the growth between fifth and eighth grade. The average test scores gains from fifth to eighth grades were between 16 and 19 points, depending on subject. Thus, a 1-point unstandardized difference across consumption groups is equivalent to approximately 5% of the total variation in students' test score growth.

Discussion

Our results show clear and consistent associations between children's fast food consumption in 5th grade and academic growth between 5th and 8th grade. While these results are observational as opposed to experimental, our confidence in the findings is bolstered by the facts that we examined change in academic scores, which removes potential selection factors that occurred prior to 5th grade, and that we included an extensive set of potential confounders at the child, family, and neighborhood/school levels in order to isolate the contribution of fast food specifically. These findings indicate that fast food consumption is linked with deleterious developmental outcomes in children beyond obesity.

Importantly, we find that whether children report high levels of fast food consumption (i.e., daily) is a more consistent and stronger predictor of lowered achievement growth than less frequent fast food consumption. In contrast, children who report eating fast food one to three times per week only experience lower academic growth in one subject (math). Taken together, these results suggest that, at least for child achievement, reducing frequent fast

food consumption is a more critical issue for clinical and public health intervention than eliminating fast food consumption altogether.

An important strength of the current study is the inclusion of such an extensive number of potential confounders. The relations between fast food consumption and children's academic growth held, even when children's socioeconomic environment, physical activity, and other characteristics were included in the model. While this type of analysis documents the clear relation between fast food and academic growth, more research is needed to understand the process that links the two. Continued research on how specific dietary elements of fast food, such as high sugar foods and additives, influence attention and learning behavior can shed more light on these processes.^{11,12}

There are important limitations to note. Despite the use of extensive covariates, including earlier test scores, these results are not causal and still could be influenced by other unmeasured factors. Additionally, fast food consumption was collected in this study in 2004. Although fast food availability has not changed dramatically in the past 10 years, many fast food restaurants, including McDonald's, have removed trans fats from their foods. Thus, efforts should be made to replicate these results in a more recent cohort of children. Last, while children reported their food consumption using a measure validated in other large-scale studies,¹⁷ reporting error is still a possibility. More research on the accuracy of children's reports of their eating behaviors is clearly warranted.

Despite these limitations, our results suggest that reducing children's fast food consumption may benefit their academic growth at the same time that it reduces risk for physical health problems such as obesity. Intervention efforts will need to address the multiple reasons that families continue to include fast food in their diets on such a frequent basis. Recent research has shown that providing food for children is often a stressful experience for parents and thus the ease of fast food may be a way to reduce this stress.¹⁹ Efforts to reduce parent stress around food preparation may be a promising way to reduce fast food consumption and thereby improve child achievement. Low cost is of course an appealing feature of fast food to both children and their parents, and a 10% increase in the price of fast food has been associated with a 5.7% reduction in fast food consumption among fifth graders.²⁰ Thus, pricing and taxes are potential mechanisms for reducing fast food consumption. Easy access is also a likely contributor to fast food consumption. Recent spatial analysis research in Chicago found that there were 3 to 4 times as many fast food restaurants located within 1.5 km of schools than elsewhere in the city, with fast food restaurants clustered around schools in both urban and suburban areas.²¹ Fast food is present within many schools themselves, including 10% of elementary schools, 18% of middle schools, and 30% of high schools.²² Reducing the availability of fast food and the school-based advertising is one potential route to reducing actual fast food consumption among children.

These findings also provide further support for prior policy statements from the American Academy of Pediatrics^{23,24} that recommend reducing children's consumption of unhealthy out-of-home meals such as fast food and encouraging restrictions on fast food advertising during child-directed television programming and other child-directed media. While the American Academy of Pediatrics has issued these policy statements out of concern over

high rates of childhood obesity and its accompanying health problems, these statements may serve to benefit children's academic and cognitive development as well. As research on this topic grows, pediatricians may choose to use information about cognitive development when discussing the harms of fast food to parents.

Conclusion

These results provide initial evidence that fast food consumption is associated with deleterious academic outcomes among children. Further research is needed to understand the processes involved. For example, future research should consider relations between the nutrient profiles of specific fast foods and children's learning processes. In addition, current theories suggesting that the hippocampal and prefrontal cortex are likely the brain areas that may link nutritional intake to cognitive processes warrant further investigation.²⁵

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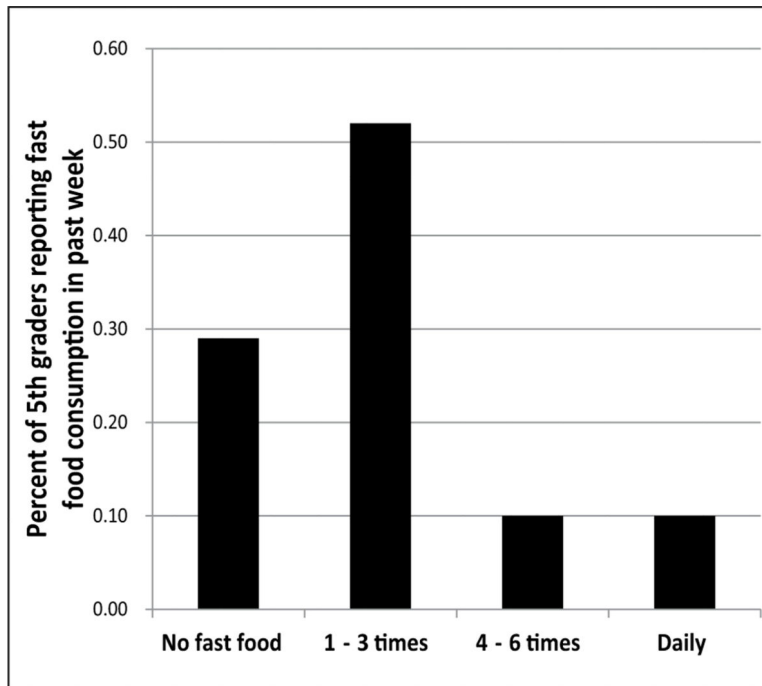


Figure 1. Children’s fifth grade reported fast food consumption.

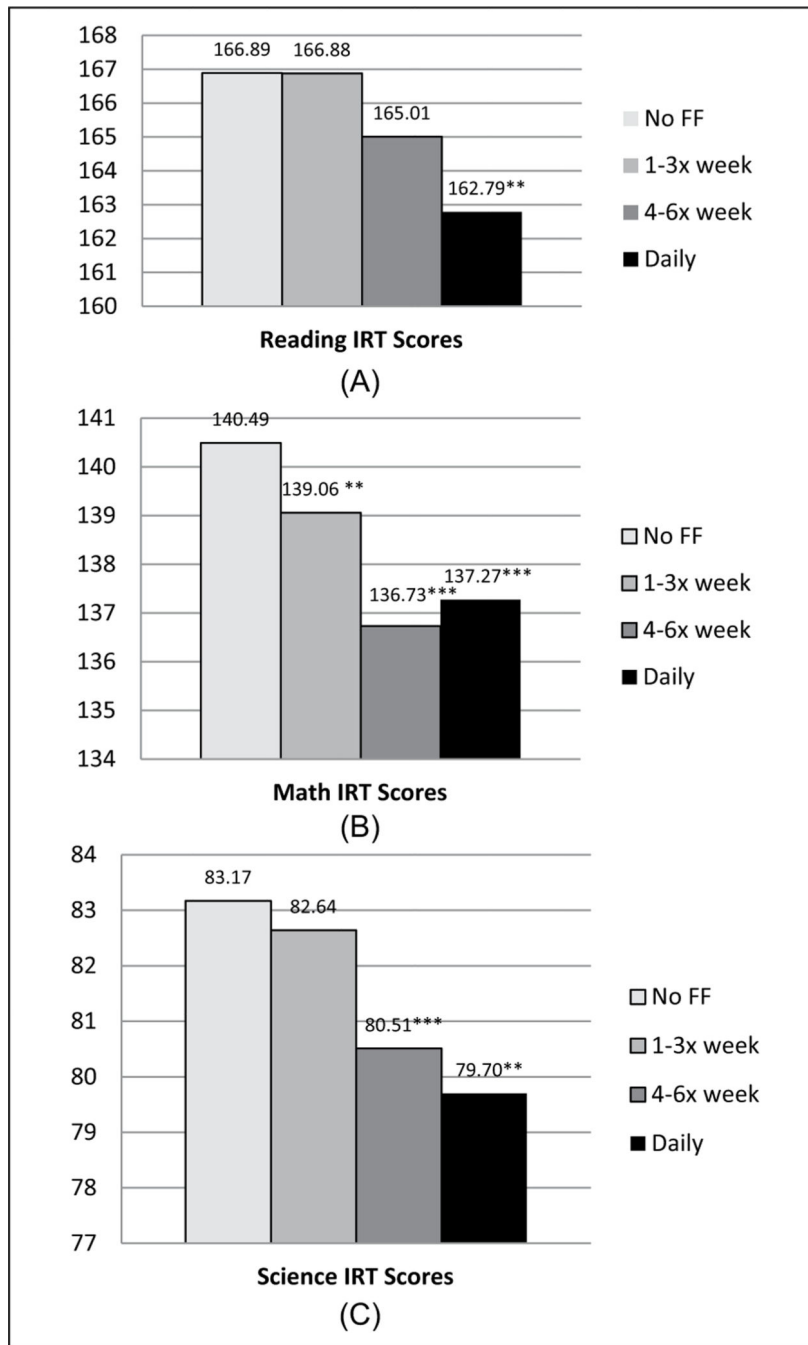


Figure 2. Growth in achievement from fifth to eighth grades predicted by fifth-grade fast food consumption: (A) reading, (B) math, and (C) science. Abbreviations: FF, fast food; IRT, item response theory.

Table 1.

Weighted Descriptive Statistics for All Study Variables.

	Mean (SD) or Percentage
Item response theory achievement scores	
Eighth grade: Reading	143.33 (21.65)
Fifth grade: Reading	126.26 (23.23)
Eighth grade: Math	172.45 (27.06)
Fifth grade: Math	153.09 (25.96)
Eighth grade: Science	85.63 (15.68)
Fifth grade: Science	66.62 (15.32)
Covariates included in regression models	
Demographic characteristics	
Child gender (male = 1)	0.49
Child is White (referent)	0.64
Child is African American	0.09
Child is Hispanic	0.17
Child is Asian	0.05
Child is other ethnicity	0.05
Child Health (1 = excellent; 5 = poor)	1.70 (0.84)
Child's other food consumption (1 = none; 4 = everyday)	
Fruits and vegetables	2.18 (0.63)
Milk	3.20 (1.05)
100% juice	2.43 (1.23)
Soda/sugar-sweetened beverages	2.60 (1.06)
Family socioeconomic characteristics	
Household income-to-needs	3.70 (2.56)
Highest parent education (1 = eighth grade; 9 = professional degree)	5.19 (1.98)
Household is food insecure	0.14
Mother is employed full-time (referent)	0.50
Mother is employed part-time	0.24
Mother is looking for employment	0.03
Mother is not employed	0.23
Children's activities and time use	
Child is more active than typical child	0.26 (0.36)
Child is less active than typical child	0.12 (0.26)
Child prefers sedentary activities	0.16
Child prefers active activities	0.23
Child prefers both types of activities (referent)	0.61
Number of days per week child exercises	3.72 (1.87)
Average hours per weekday child watches TV	2.09 (1.23)
Child has regular bedtime	0.93
Neighborhood and school characteristics	

	Mean (SD) or Percentage
Neighborhood is in rural area	0.26
Neighborhood is in urban area	0.35
Neighborhood is in suburban area (referent)	0.39
Percentage of students at school who receive free/reduced price lunch	36.40 (27.90)

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Table 2. Regression Results Predicting Children’s Eighth-Grade Test Scores From Fifth-Grade Food Consumption.^a

Frequency of Fast Food Consumption at Fifth Grade	Eighth Grade Achievement Scores							
	Reading		Math		Science			
	<i>b</i> (SE)	95% Confidence Interval	<i>B</i>	<i>b</i> (SE)	95% Confidence Interval	<i>B</i>	<i>b</i> (SE)	95% Confidence Interval
1–3 times per week	–0.01 (0.72)	[–1.418, 1.399]	.00	–1.43** (0.44)	[–2.29, –0.57]	–0.03	–0.53 (0.42)	[–1.34, 0.30]
4–6 times per week	–1.88 (1.31)	[–4.439, 0.686]	–0.02	–3.76*** (0.74)	[–5.21, –2.30]	–0.05	–2.65*** (0.54)	[–3.71, –1.60]
Daily	–4.10** (1.33)	[–6.708, –1.500]	–0.05	–3.22*** (0.77)	[–4.72, –1.72]	–0.05	–3.46*** (0.64)	[–4.71, –2.21]

^aReference category is no fast food consumption in past week. Models control for all covariates listed in Table 1, including children’s fifth-grade test scores. Regression models were conducting using full information maximum likelihood estimation with longitudinal sampling and jackknife weights.

* $p < .05$.

** $p < .01$.

*** $p < .001$.