The Effects of Breakfast on Cognition in Children and Preadolescents

CFS 453 Nutrition in the Life Cycle
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March 17, 2014

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Abstract

Adequate nutrition plays a vital role in school-aged children for their development well into adulthood. Many children are not getting their recommended dietary allowance (RDA) of nutrients as established by The Institute of Medicine, (Otten, Hellwig, Meyers 2006) and overall school performance has been suffering because of it. We analyzed and reviewed scholarly journals and articles from around the world to come up with a comprehensive look on how breakfast programs affect a child’s academic performance and growth. In our research we established the importance of macronutrients such as carbohydrates, proteins and fats in a school-aged child’s psychological and physiological development. Studies from The United Kindom (UK), Jamaica, and United States (US) were reviewed in order to get a more in-depth look at the nutritional status of children worldwide, as well as the effectiveness of providing school breakfast programs. It can be said that providing breakfast to school-aged children significantly impacts cognitive function, overall health status, and academic achievement, but there is still room for improvement within the school’s breakfast programs.

Background and Introduction

Children continue their growth and development during their middle childhood and preadolescent years. The cognitive, physical, and physiological changes they experience during this time are essential to prepare them for the transition into puberty. Nutrition plays a vital role in this phase of life because it ensures that children reach their maximum potential of growth, health, and development. Healthy lifestyle patterns adopted by a child during this time will help reduce the risk of developing any immediate disease, as well as reduce the risk for developing chronic diseases later in life. The child develops more complex cognition, situational analysis, and a sense of self. Middle childhood and adolescence is also a phase in the life cycle that an
individual is most influenced in their lifestyle patterns by their family and environment (Brown 2011).

Nutrition is essential in the growth and development of children and preadolescents. According to Kleinman, et al., 30% of children in Boston’s school districts alone are considered to be at risk for nutrient deficiencies (2002). A child’s success in an academic and social setting is dependent on their ability to function at an optimal level. Consuming a healthy breakfast in the morning is especially important because it ensures that the brain receives the energy it requires to function to the best of its ability (Donohoe 1999). Studies showed eating breakfast improved intellectual test scores, improved psychosocial functioning and improved attention and response (Wesnes 2012, Kleinman, et. al. 2012). Regardless of the numerous other components that may be factored into the overall outcome of cognition in children and preadolescents, studies showed that eating breakfast still provided benefits in children who exhibited various other components (Powel 1998). Breakfast is also one of the more controllable factors in improving cognitive function in children and preadolescents. This is a key period in the child’s life cycle to incorporate healthy lifestyle choices, starting with good eating, because this is when the child is most influenced in their habits and behavior (Brown 2011). Breakfast provides fuel for the brain; driving the children and preadolescents’ cognitive function and skills throughout the day, and laying the groundwork for future wellness and intelligence.

**Review of Research and Data**

It is imperative that the body receives the fuel it requires to be able to operate throughout the day. Donohoe and Benton (1999) reviewed the influence of blood glucose levels and their direct correlation with cognitive function. Glucose is the preferred fuel for the brain. They determined that glucose, which is more readily available in the blood, fuels the brain more
efficiently in tests of cognition than when it is broken down from stores of glycogen as would be noticed after a fasting period. Bellisle (2004) summarizes and focuses the results of this study to its effects on children and preadolescents specifically, without an adequate supply of glucose cognitive function is severely impaired. Without the proper energy they are unable to perform to the best of their mental abilities. Respectively, when a child misses breakfast, he or she is not able to overcome the effects of an overnight fasting state as aptly as an adult because of their greater brain metabolic demands. Donohoe and Benton concluded that improved cognitive function and attention is associated with higher availability of glucose in the blood where it is more readily available for use by the cells in the brain.

Kleinman, et al. (2002) looked at the effects of a universal-free breakfast program (USBP) on academic and psychosocial functioning of 97 inner city children in fourth to sixth grade in three different Boston schools over a six month period. The subjects had similar ethnic diversity and socioeconomic standings. The study used a 24 hour food recall to gather initial data before the implementation of USBP and compared the results with the recommended daily allowance (RDA) for the age and gender of a child to see if they were nutritionally at risk. A nutritionally at risk child was defined as a child who consumed two or more nutrients at ≤50% of the RDA. Of the sample, 30% of the children were found to be nutritionally at risk. Kleinman, et al. also used the Pediatric Symptom Checklist (PSC) to assess the child’s psychosocial problems. They then implemented the USBP and used the same measures after six months. Several correlations were found in the study, the first being children who participated in the USBP improved their caloric and nutritional intake, and had a significant improvement in psychosocial functioning. Secondly, with increased nutrient consumption there was a correlation with math grades. There was a significant difference in letter grades between at risk children and those who
were not at risk, as much as a whole letter grade. Lastly, children who had partaken in USBP had an average of 4.4 fewer days absent from school.

Powel, Walker, Chang, and Grantham-McGregor (1998) studied the effects of poor nutrition on children’s ability to learn in a classroom setting. They also observed the children’s socioeconomic status, quality of housing, and the schools’ level of organization. Eight hundred fourteen children in grades two through five were chosen from 16 different schools in Jamaica to take part, 407 were categorized as undernourished according to their weight for their age. All students were randomly assigned to a breakfast or control group. The control group received a quarter of an orange (18 kcal), and the breakfast group received either a cheese sandwich or spiced bun and cheese, accompanied by a flavored milk (576 - 703 kcal). Powel et al. (1998) observed trends in attendance, money brought to school by the children, as well as achievements in reading, spelling and arithmetic. They concluded that providing breakfast improved the child’s achievements in school, attendance, and overall nutritional status.

Wesnes, Pincock, and Scholey conducted a study (2012) on the hypothesis that breakfast affects cognitive function in school aged children. The study was based on whether or not the child had eaten breakfast and how they performed on several tests presented on a computer. The tests consisted of: power of attention, response speed variability, digit vigilance targets detected and false alarms, choice reaction time accuracy, picture recognition sensitivity and speed. The tests were conducted during school hours at 32 participating campuses across Europe. In total there were 1,386 student participants ages 6-16; 721 being girls and 655 being boys. Each student, under teacher supervision, was given the opportunity to go online everyday sometime after the hours of breakfast and before lunch, to answer questions concerning their food and drink consumption that day as well as to take part in the cognitive tests.
Of the seven tests that were conducted, six of the seven tests showed a significant effect when the student had eaten breakfast. According to the results, children who had breakfast were superior on the power of attention factor, lower response speed variability, detection of more targets in the digit vigilance task, made fewer false alarms in the digit vigilance task, were better able to correctly distinguish previously presented pictures from novel ones and were faster at making correct responses in picture recognition. Accuracy of response was the only test that the results showed little to no difference between the two groups. All other tests showed that there was a significant effect on school aged children and cognitive function. Children who ate breakfast were shown to have an advantage, while those children who skipped breakfast showed a decline in cognitive function.

Discussion

As discussed throughout the paper, adequate nutrition is essential for school aged children. According to Wesnes, Pincock, and Scholey (2012), children who ate breakfast before school showed a significant advantage in attention, speed, and recognition tests. The one tested area that showed little to no difference was accuracy. The later the tests were taken after the consumption of breakfast, the larger the gap between the two groups grew in each category. Powel, Walker, Chang, and Grantham-McGregor's (1998) study showed that children who ate breakfast had an improved nutritional status, attendance, and in 2nd and 3rd grade improvement in arithmetic comprehension. Children that received breakfast also gained more weight and increased in height more than the placebo group. Powel et al. (1998) concluded that providing breakfast improved attendance, achievement, and nutritional status in children overall. Those children who were undernourished came from underprivileged homes and showed poor achievements.
In Kleinman, et al. (2002) study, 30% of the children were found to be nutritionally at risk, meaning a child consumed less than 50% of two more nutrients. Those children who were nutritionally at risk, tended to be absent more, produced poor grades and were less likely to have eaten breakfast. Absence had an important effect on the child’s psychosocial functioning as well as learning capability. In the study, breakfast was implemented in participating schools and the results showed that those who ate breakfast improved attendance, math grades, and behavior.

As proven in this paper, nutrition is an important factor in child development and breakfast has an effect on cognition in school aged children. Children need fuel to function, according to Donohoe and Benton (1999) glucose is the preferred energy source for the brain. Their study concluded that children who ate a breakfast that produced higher blood glucose levels showed improved cognitive function because the glucose was readily available in contrast to other fuels. Like the rest of the studies reviewed in the paper, Donohoe and Benton (1999) showed that skipping breakfast decreases attention and cognitive function in children and preadolescents.

**Recommendations and Conclusion**

Based on the studies reviewed above, the recommendations were to implement breakfast programs in schools for children and preadolescents. By providing breakfast, students had a positive correlation in increased attention span, attendance and cognitive functioning with regards to math. In addition, School Breakfast programs should be supplemented with nutrition education in order to achieve a maximum benefit for the student.

Children are at a critical growth development stage at the age of 5 to 12. Supplying enough nutrients in the morning such as glucose for the brain, makes it so that a child can perform better in school by improved attendance and increased attention span in the classroom.
Children cannot withstand overnight fasting as well as adults can. Therefore, the studies reviewed in this paper support the fact it is highly beneficial for a child to consume breakfast not just for the caloric and nutrient intake, but also for cognitive functioning and physiological growth. Other factors such as socioeconomic status and familial relationships can impact how and what a child eats. Eating habits are influenced by family, peers and the media (Brown 2014). Supporting healthy eating habits at home, or at school through a school breakfast program, will have a beneficial outcome for a child’s growth and development as well as lower their risk of chronic health issues. Therefore, providing nutrition education and school breakfast programs will aid in a healthier long term outcome for our future generation of children.
References (APA)


