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Undergraduate

Cognitive Abilities Affected by Students' Nutritional Consumption

By Emily Sim

Abstract

Students in a university setting usually experience individual living environments for the first time in their lives. Due to this, students are able to conduct their own decisions based on their personal desires. A major implication of this lifestyle change is that many students are unaware of how to feed themselves properly. Nutrition has an impact not only on their physical bodies, but on their mental, emotional and psychological abilities as well. The field of cognitive science has recently engaged the interest of dietary researchers and began searching for the correlation between certain nutrients and cognitive performance. Participants within the articles examined in the research papers were presented with nutrition information to see if learned knowledge has an impact on the decisions made. For example the study contained two groups of participants, a control group that received no treatment, and an intervention group that received nutritional education and was frequently reminded of the benefits of living healthy. Scientists then went in depth on the neurological perspective of hunger and made determinations based on their research, which is discussed later in this paper. Through the research I have come to determine that the relevant cognitive functions such as alertness, attention, memory and behavior are directly impacted by nutrition. These results are beneficial because students are endangering their academics with a lack of focus, attention, memory, recall and fluctuating behavioral patterns. With a strong nutritious diet the research suggests that students are prone to maintain cognitive functions and excel further in schoolwork based primarily on a nutritious aspect.

Nutrition is a key component of living a healthy lifestyle. When people think of being healthy, they refer to their physical health, but overlook mental and psychological. Nutrition not only has a large impact on the cognitive states of a person but also on the physical, emotional and mental capabilities. Due to the complexity of the breakdown of foods, scientists spend large amounts of time extracting certain nutrients to determine which ones specifically affect functions within the brain. The diverse make up of nutrients causes misconceptions of healthy options.

Students make health-related decisions based on time, availability and cost. Many students do not realize the impact their nutritional decisions have on their academics. Glucose inclined foods and beverages negatively impact concentration, focus and alertness in people, and these are all notions extremely relevant within a school context (Park, Sherry, Foti, Blanck 2012). This research is supported and explained in great detail in the paper “Self-Reported Academic Grades and Other Correlates of Sugar-Sweetened Soda Intake among US Adolescents” where Park, Sherry, Foti and Blanck discuss the correlation between declining cognitive and bodily functions following the consumption of high-glucose foods and beverages (Park, Sherry, Foti, Blanck 2012). Another concern of researchers is that glucose is decreasing the immune system, which negatively affects the student’s health. This paper will examine nutrients essential to a students overall wellness and discuss the body’s response to the ingesting of both healthy and non-healthy foods. This review will evaluate research on nutritional breakdown and determine what nutrients and foods are most influential to cognitive states within students of academia.

Health is not limited to nutrition, but is directly affected by it. Similarly cognition is affected by external factors, such as nutrition. In an article “Nutrition and Brain Development in Early Life” by Prado and Dewey, researchers determined that in childhood continuing until adulthood, children are at most risk for poor development most impacted by nutrition. Diseases such as heart disease, diabetes, and obesity among other diseases can be determined early in life and affect the development of a person at a young age. The intent of these findings is to bring awareness to the issues of disease development in children. Dewey and Prado produced a timeline of the short-term and long-term effects nutrition plays on humans by presenting data collected from children, and analyzing how negative trends derive from their nourishment selections. The data they shared offered credibility behind their assumptions that the short-term and long-term effects of a poor diet resulted in negative academic performance.

As stated in “Damaging Effects of a High-Fat Diet to the Brain and Cognition: A Review of Proposed Mechanisms” by Linnea R Freeman, Vivian Haley-Zitlin, Dorothea S. Rosenberger, and Ann-Charlotte Granholm “one of the greatest factors contributing to the prevalence of obesity is choice of diet”(Freeman et al 2014). Fat consumption is a key element in the obesity epidemic and conveniently costs less financially than healthy options due to its ingredient make-up. Typically fat is a cheaper ingredient because of its artificial make up. Discussed in the article “Identifying Sustainable Foods: The Relationship between Environmental Impact, Nutritional Quality, and Prices of Foods Representative of the French Diet” there was a study done in France that compares fat and starch levels to price per unit. The article proved that although per unit the prices were similar, the items overall price reveals a higher price level with more nutritional foods, typically due to their distinct processing and care versus fat, starchy processed foods which are chemically produced with cheaper substances. As I have discovered through my research, ingredient make-up is what misconceives the nutrition content in a product. White bread may say it is whole grain, but it is still enriched with added sugar contributing to its

unhealthy make-up. Research from Freeman's article concludes that there are long-term effects of high-fat diets, which can include dementia, such as Alzheimer's. Alzheimer's is a common dementia disorder that is significantly proven to be directly affected by diet and self care.

Short-term effects are what directly influence a student's abilities to perform well within academics, but little do they know that food has long-term effects on a person's body. In a trial study mentioned within the article "Diet, Cognition and Alzheimer's Disease: Food for Thought" by Ane Otaegui et al, participants were supplemented with DHA (docosahexaenoic acid) once per day for twelve months to track its effect on cognitive performance. DHA is a polyunsaturated omega-3 fatty acid found throughout the body that is a major fat participating in improving cognitive and physical functions through the body. Within this study, it was proven that DHA has a positive impact on a person, and it can be found in healthy options such as oils, fish, vegetables, nuts, seeds and other whole grains. Despite natural aging deterioration, participants improved cognitive functions throughout the twelve-month period. Diet and nutrition is a newfound risk factor for the onset of Alzheimer's. Although it is previously thought that unchangeable conditions such as age and prior health have an impact on the development of Alzheimer's, new research has found that cardiovascular factors suggest it may be preventable through positive dietary and health-related patterns.

Malnutrition takes an emotional toll on students as well as it does on mental, physical and psychological abilities. In the article "Diet-Induced Obesity Progressively Alters Cognition, Anxiety-like Behavior and Lipopolysaccharide-Induced Depressive-like Behavior: Focus on Brain Indoleamine 2,3-dioxygenase Activation" by Caroline Andre et al the study involves two groups of rats, one where they were on a standard diet of nutritious ingredients and foods and one based on the "western diet" containing foods of high fat and sugary content. Over a nine-week period rats were showing anxiety and depressive like behavior, causing emotional discrepancies. It was possible to dissociate emotional impairment from motor impairment, which revealed prevalent as well. Within the article it is noted that although this experiment was performed on mice, it can be directly related to humans, because we have the same digestive and hormonal pathways. An emotional fluctuation can be impairing to a student, especially while still in the hormonal puberty years, because it can influence activity, determination and distractions. An enhanced emotional response can distract students from their academics and all together proving malnutrition's depreciations on the body.

It is a common belief that students make uninformed decisions when it comes to their personal health. Students have large quantities of stress over a period of fifteen weeks consistently, resulting in less interest in cooking and meal prepping, and they become more prone to cheap and convenient food sources, which is typically fast food or high sodium, sugar or fat foods. We determine this, since added ingredients are cheaper to make, since they obtain less nutritional value. In an article "Outcomes on Psychosocial Factors and Nutrition-Related Quality of Life: Intervention in University Students" a study was done by Wan Putri Elena Wan Dali, Mohd Razif Shahril, Pei Lin Lua (also the authors) where 417 students were placed randomly within an intervention group (IG=205) or a control group (CG=212). Over a period of ten weeks, students within the intervention group received nutrition education through lectures, brochures and SMS text messages while the control group did not receive any intervention. The results to this experiment demonstrated a positive influence on food-related decisions, social/interpersonal relationships, physical functioning and overall health categories although

psychological health did not show a significant difference in either group. This article showed how significant knowledge of nutrition has influence on students' personal decisions, and how they may change up their habits knowing this information.

Students are a population at risk of fluctuating dietary habits. Even with proper education, students tend to make decisions based on time and availability. I chose to select the student population during my research in order to expose where poor nutritional decisions stem as well as many common health concerns, and hopefully yield a relationship between the two. After reviewing numerous research articles, I determined that unhealthy diets induce cognitive disabilities with short-term and long-term effects on the brain. High-fatty diets have sequential effects starting with loss of energy, concentration and focus and leading to memory loss, cognitive decline and dementia. Not only does an unhealthy diet promote cognitive deficiencies but it also recognizes physical shortcomings. These physical effects can include obesity, loss of muscle, cardiovascular disease, diabetes and illness. Although some students may consciously chose unhealthy foods while understanding the impacts on health conditions, they may not realize all consequences that follow. Overall, students consciously choose unhealthy foods not understanding their lasting effects while it is determined that unhealthy high-fatty and glucose diets conclude to physical, psychological and cognitive deteriorations.

Due to personal situations, students within academia are the most affected population by poor nutrition. As mentioned earlier, nutrition is taken for granted by students dealing with financial and time management dilemmas. These two predicaments are common among students and unfortunately they are unaware of the toll they are taking on their bodies. In the article "Nutrition and Brain Development in Early Life" Elizabeth Prado and Kathryn Dewey present an overview of the route from early nutrient deficiency to long-term effects on physical and cognitive abilities. Appropriate nutrient supplementation is necessary for ample development. Just three weeks following child conception, neural tubes and pathways are being formed within the offspring. These neurodevelopmental processes begin at three weeks and carry on through infancy. If the offspring does not receive adequate nutrient consumption, a child's brain development will decline. A developing child's internal environment sends the nutrients through the mother into the child. If the mother is consuming a poorly nutritious diet, the child will not be receiving the appropriate nutrients needed to promote healthy development. The pattern of early declination of nutrients leads to unhealthy patterns later in life due to additive effects. As stated in the article, "nutrient deficiency and experiential input from the environment may have independent additive effects on brain development" (Prado, Dewey 2014). Brain development is crucial to the proper functioning of cognitive abilities. It is dangerous to have children addicted to malnutrition habits at a young age, because these patterns become more prominent later in life and will detriment a person's health significantly. Students are still at a relatively young age and at risk of becoming addicted to certain foods, especially additives such as caffeine, fat or sugar.

Based on current research, high glucose and saturated fats cause inattention and loss of concentration following consumption. Energy levels are affected as well, rising immediately following consumption but sufficiently dropping a short period after. Students are adjusting to a fast-pace lifestyle and consume cheaper and quicker alternatives. Poorly nutritious diets can lead to a variety of conditions but are not limited to: diabetes, heart disease, cancers, weight gain, Alzheimer's, hypertension, and arthritis. Although mortality rates overall seem to decrease due to technological and medicinal advances, obesity and malnourished behaviors are linked to increasing mortality. Obesity is damaging to our population as a whole, but biologically it has

not been explored enough to determine its damaging effects. The most common relationship between insulin resistance and cognitive decline is the development of certain types of dementia. In human tasks, it has been noticed that a high-fat diet that includes mostly omega-6 and SFA (saturated fatty acid) are associated with cognitive deterioration. This cognitive deterioration increases the risks for long-term effects such as Alzheimer's. In the end, my research brought me to discover that nutrition plays a key role in the development and ability of students. Poor habits could start at an early age due to the mother's poor nutrition or develop over the course of years between childhood to adulthood.

References

- [1] Andre, Caroline, Dinel, Anne-Laure, Ferrerira, Guillaume, Laye, Sophie, Castanon, Nathalie. "Diet-induced Obesity Progressively Alters Cognition, Anxiety-like behavior and Lipopolysaccharide-induced Depressive-like Behavior: Focus on Brain Indoleamine 2,3-dioxgenase Activation." (2014). *Brain, Behavior and Immunity*, 41, 10-21.
- [2] Freeman, Linnea R., Haley-Zitlin, Vivian, Rosenberger, Dorothea S., Granholm, Ann-Charlotte. Damaging effects of a high-fat diet to the brain and cognition: A review of proposed mechanisms. (2014). *Nutritional Neuroscience*, 17(6), 241-251.
- [3] Masset, G., Soler, L., Vieux, F., Darmon, N. (2014). Identifying Sustainable Foods: The Relationship between Environmental Impact, Nutritional Quality, and Prices of Foods Representative of the French Diet. *Journal of the Academy of Nutrition and Dietetics*, 114(6), 862-869.
- [4] Otaegui-Arazola, A., Amiano, P., Elbusto, A., Urdaneta, E., & Martínez-Lage, P. (2014). Diet, cognition, and Alzheimer's disease: food for thought. *European Journal Of Nutrition*, 53(1), 1-23.
- [5] Park, S., Sherry, B., Foti, K., Blanck, H.M. (2012). Self-Reported Academic Grades and Other Correlates of Sugar-Sweetened Soda Intake among US Adolescents. *Journal of the Academy of Nutrition and Dietetics*. 112(1), 125-131.
- [6] Prado, E. L., & Dewey, K. G. (2014). Nutrition and brain development in early life. *Nutrition Reviews*, 72(4), 267-284.
- [7] Wan Putri Elena Wan, D., Mohd Razif, S., & Pei Lin, L. (2014). Outcomes on Psychosocial Factors and Nutrition-Related Quality of Life: Evaluation of a 10-Week Nutrition Education Intervention in University Students. *ASEAN Journal Of Psychiatry*, 15(1), 39-53.



As a fourth year Cognitive Science student with a writing minor, Emily Sim has been prompted to fashion numerous research papers. Her passions all started as a simple research paper for class but ended up leading her toward a career goal. Although an exact career has not found its way into her path, she noticed that she took pleasure in research because it unfolded new truths about cognitive abilities within the human brain. Had you not read my paper, I discuss the impacts of nutritional decisions on cognitive abilities and how that is strongly correlated to academics. Upon completing my research, I found many of the circumstances relevant to both myself and the majority of other students; that of which includes over-commitment because I hold two jobs, participate on the Club softball team and maintain a 16-unit semester. My hope for this paper is to have the information reside in readers and promote self-care.