

PERCEIVED EFFECTS OF NUTRITION ON COGNITION
AND LEARNING IN ADOLESCENTS

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By
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CERTIFICATION OF APPROVAL

PERCEIVED EFFECTS OF NUTRITION ON COGNITION
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DEDICATION

Perceived effects of nutrition on cognition and learning in adolescents is
dedicated to my son, Neal. As a young man you have sacrificed valuable time with me and have provided unconditional love and support during this journey. You had no say or choice in me pursuing this degree but served as a source of inspiration and motivation. May you always strive to do your best, work hard, and remember I love you. Life is a marathon: plan for it, pace yourself, and despite its challenges, the rewards and lessons can be found in every step; run it.

ACKNOWLEDGEMENTS

Special acknowledgements made to my family: my husband Scott and son Neal for their love, support, and putting up with me in pursuit of this degree; and my parents who have spent a great deal of time watching Neal so that I could attend classes. I would also like to thank my students who have provided me with inspiration and motivation to serve as a role model. I am especially grateful for their willing participation in the study, their openness to share their thoughts and ideas, and their desire to explore the world of psychology. Through this, I am reminded the value of hard work, dedication, and organization. I would also like to extend a special thanks to the professors at CSU Stanislaus who supported my desire and quest to do the thesis option for the degree requirements. While this is the road often not taken, there is value in the research and the experience. For that I am grateful for the help and advice.

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ABSTRACT

The aim of this study was to measure if perceived quality of eating behavior correlates to strong academic performance as measured by student grade point average. Students began by taking a survey designed to assess eating behavior, frequency of food types and choices, academic performance, as well as other lifestyle choices. Data compared included measuring frequency of eating specific meals such as breakfast and lunch, grade point average, and the perception regarding the degree to which quality of nutrition plays in cognition and learning. Thirty-eight students, between 16-18 years old participated in the in-class survey and follow-up Health Psychology unit. Results show there is a minimal positive correlation, .236, between the perceived role nutrition plays in learning and higher, with student average GPA of 3.13 and students reporting eating healthy “often”.

CHAPTER I

INTRODUCTION

While rates of individual classified as overweight or obese have remained relatively stable since 2002, there are concerns as approximately 17% of youths 2-19 and 35% of adults age 20 and over are overweight or obese (Ogden, Carroll, Kit, & Flangel, 2014). Because rates of obesity increase with age, prevention, is most effective when it can be addressed early and often in life. While there are myriad treatment options, prevention can be a more effective way of addressing the problem. Alongside the concerning rates of obesity among children are the age-old concerns regarding cognition, learning, and academic success. Children who do well in school are more likely to attend college. Those who attend college have higher chances of career placement and socio-economic stability. Educational attainment in families is related to lower rates of obesity, lower Body Mass Index (BMI), and higher rates of incorporating healthy food choices into one' diet (Wang & Beydoun, 2007). Academic success can serve as one prevention method; the two are bidirectional.

A great deal of literature regarding learning, has been on teaching methodology, class size, curriculum, classroom environment, and other elements that are subjective based on the learner and teacher. There has also been a great deal of research and results showing improved quality of behavior and learning related the quantity of food: students who have had breakfast and lunch do better than those who attend school hungry (Basch, 2011; Rampersaud, Pereira, Girard, Adams, & Metzl,

2005; Stephens, Resnicow, Latimer-Sport, & Walker, 2015). Research also makes connections between parent involvement, sense of efficacy, and family meals/dinner, to that of healthy weight, healthy eating behavior (as measured by intake of fruits and vegetables versus soda and sweets), and dietary preferences in both children and adolescents (Gillman et al., 2000; Ice, Neal, & Cottrell, 2012; Stephens et al., 2015).

Over the course of the past forty years, there have been numerous studies on nutrition and health. To begin to explore the relationship of the quantity and quality of food and nutrition on behavior and learning, it is important to look at various components of nutrition. This includes the effects eating breakfast has on learning and behavior, factors that play a role in dietary choices, role of parents in promoting dietary behaviors, and other influences on adolescent eating patterns.

Recent research has suggested the intake of quality foods (based on ratio of macronutrients, proteins, fats, and carbohydrates; and the intake of micronutrients, vitamin, minerals, and others) effects brain functions for all age groups (Gomez-Pinilla, 2008). Additionally, teens typically have a greater role in their food consumption than the younger population; it is important to educate teens on appropriate nutritional choices.

The aim of this study is to investigate the links between the perceived quality of diet and nutrition and the effects these may have on learning for both improved cognition and academic results. In doing so, it may explore the self-efficacy teens have in the food choices they make and the impacts it has on their learning and health. The study will focus on adolescents ages 16-18. With increased information in

the arena of quality nutrition, prevention can be utilized in the classroom to reduce obesity, improve academic success, thereby improving overall healthy lifestyle choices into adulthood. It is hypothesized the incorporation of healthy food choices will not have a negative impact on cognition and learning, rather, there will be a positive correlation between perceived healthy dietary choices and academic performance.

With the increased availability of knowledge regarding nutrition, cognition, and behaviors, it is imperative to explore the interrelated connections if, as a society, we are to reduce and even prevent obesity among children and teens while being able to increase academic performance. Combined, these realities promote a more holistic approach to health: physical, emotion, and socio-culturally. A review of the previous research is necessary to explore what is understood thus far and provide ideas for future research.

CHAPTER II

REVIEW OF THE LITERATURE

Literature on nutrition and cognition can be as narrowed as a small age range group or focused on a sociocultural element to a broader range of general parent efficacy. Reviewing this literature helps bring into focus the research that has already been done, thus providing context for new research and helps to formulate new questions.

Due to the implementation of universal breakfast programs in schools, research abounds regarding the role breakfast plays in helping young students focus in school and in reducing behavioral problems. In 2005, Rampersaud et al., presented an updated view of the association between eating breakfast to that of children's health through nutritional adequacy and body weight as well as cognitive and academic performance. In doing so, their meta-analysis included an examination of the types of food children consumed as well as the time of day food was consumed. It was found the types of food consumed for breakfast was similar across different population groups, with milk being one of the most commonly consumed foods. The breakfast consumers did not eat more calories later in the day, rather their energy intake was more consistent throughout the day. Breakfast consumers also had higher intake of fiber and calcium rates. Intake of sugar was mixed between breakfast and non-breakfast eaters, partially related to the types of cereals breakfast eaters consumed. Rampersaud et al, in their conclusion regarding the role of breakfast was

that breakfast was associated with “more healthful food choices or diet habits in children and adolescents. Breakfast skippers are more likely to have overall diets defined as poor or inadequate” (p.748).

In their review of the role of breakfast consumption to that of cognition, Rampersaud et al.(2005), looked at studies linking the relationship to eating breakfast to a variety of cognitive skills including: attention/concentration, memory, reasoning, creativity, problem solving, learning, vocabulary, reading and listening comprehension; behavior including: impulsivity, physical endurance, discrimination, attendance, tardiness, and psychosocial function; as well as academic test scores and grades. In many of the areas, the results of the studies are mixed, particularly for attention, impulsivity, problem solving, and learning. However, areas that showed greater consistency in a significant effect between breakfast and cognition were found in creativity, physical endurance, test scores, grades, tardiness, attendance, and psychosocial functioning. The interpretation and the results themselves are complicated by the myriad variables that cannot be fully controlled such as socioeconomic status and educational variables. None the less, their overall conclusions connect the role of breakfast to that of increases in some academic areas while not reducing or causing a negative effect in others.

Rampersaud et al. (2005), did acknowledge there was a difference between eating breakfast and eating a healthy breakfast. In their study, Rampersaud et al., showed the prevalence of cereal among children for breakfast; thus, studies need to be done evaluating the composition of breakfast and to differentiate “between the

benefits of those high in whole grains and fiber from those high in refined grain and sugar” (p.755). They also recommended controlled studies using similar and age-appropriate cognitive tests to assess long-term benefits of breakfast consumption and academic performance. The concern in this was that breakfast, rather than overall nutrition and healthy eating behaviors, served as a determinant of academic success. While breakfast may be a good start, there also needed to be a focus on day time snacks and meals to encourage strong brain function consistently.

Since sociocultural and socioeconomic factors served as factors in learning and cognition, as well as access to food and nutrition, it was assumed that those in disadvantaged groups may be best served by universal breakfast programs as a means to increase school attendance and performance. Basch, in 2011, explored the disparities of breakfast consumption among urban, minority youth to that of academic achievement. Basch (2011) concluded “skipping breakfast is highly and disproportionately prevalent among school-age urban minority youth” (p. 635) and there is a negative impact on cognition and school attendance. Like the Rampersaud et al. study (2005), the focus was on the consumption of breakfast, not the nutritional quality, and thus only explores general academic performance, not cognitive improvement.

Basch’s (2011) study does remind the reader the negative effects of inadequate nutrition in regard to brain development, cognition, and health as well as studies that linked specific nutrient deficits to physical and mental health problems, difficulties in learning, and emotional and behavioral problems. Basch argued the

importance of studying breakfast was related to brain function in that it was influenced by both the timing and quality of consumption. Basch's review included recent neuroscientific studies with preliminary findings linking the intake of specific nutrients on the molecular system and cellular processes of cognition specifically on neuronal function and synaptic plasticity, both elements in acquisition and processing of information. Because the urban minority generally were lower in socioeconomic status, it was suggested that their lack of availability to breakfast led them to be at an increased risk in falling behind in school. By incorporating universal breakfast programs, these disadvantaged groups gained access to one part of the equation: breakfast consumption, thereby reducing the number of behavioral and academic deficiencies (Basch, 2011).

African Americans disproportionately make up the urban minority youth, thereby putting them at a disadvantage in terms of access to good nutritional options and cognitive development. In working to address this, Stephens et al. (2015) researched the role of social cognitive behaviors and dietary behavior among the African American population. While their research was based in Georgia, its focus dealt with the barriers and likelihood of fruit and vegetable intake – foods high in nutritional content and quality. A measure of social cognition is the role of parental self-efficacy, an area also explored by Ice et al. (2012). Stephens et al. (2015) utilized churches to conduct their study (recruit participants and disseminate surveys) as well provide the treatment of health fairs. Aside from parental self-efficacy as playing a strong role in determining consumption of fruits and vegetables, Stephens et al.,

found faith-based interventions had the capacity to reach a large group of participants, and serve as great locations for health education. This addition of churches serving as role models to promote nutrition and health could be valuable for future research (Stephens et al., 2015).

As noted previously, Ice et al. (2012) also explored the relationship of parental efficacy and role responsibility in terms of their abilities to promote healthy eating behaviors of their children. Their research looked at a broader population than Stephens et al. (2015), a value since it could be generalized among a greater population. Their research was based from previous information on the increasing rates of childhood obesity, the negative impact on health due to obesity, and the positive correlation of high fitness levels and academic test scores. The study mostly focused on younger children as they measured physical activity (PA), BMI, and healthy eating behaviors based on consumption of fruits and vegetables for kindergartners, second, fifth, and eighth graders. Their results found that parents and guardians played a key role in promoting both healthy eating and physical activity. Ice et al., found that parental efficacy and parental role for assisting in their “child’s healthful behaviors is significantly related to child BMI percentile, child daily fruit and vegetable intake, and the child vigorous and moderate PA [physical activity]” (p.46). Thus, if parental efficacy is indeed a factor in the healthy behavior of children, it is worthy to explore if it carries through into adolescents.

An area studied in relationship to adolescent eating behavior as well as diet quality is the role of the family dinner. Gillman et al. (2000) were specifically

concerned with the nutritional effect of eating family dinner while Videon and Manning (2003) worked to provide estimates of the frequency and influences of adolescent's consumption of fruits, vegetables, and dairy. Gillman's et al., research established the declining relationship between age and attendance at family meals with more than half of 9-year olds eating with the family daily to less than 33% of 14-year olds. They also found an increased frequency of family dinner to be associated with a "substantially" higher intake of several nutrients, including fiber, iron, and vitamins B-6, B-12, C, and E; lower glycemic load, and lower intake of saturated fats. They concluded eating family dinner to be associated with the inclusion of more fruits and vegetables, as well as lower levels of soda and fried food. They did not see differences in terms of red meat consumption or snack foods. Their research was later supported by Videon and Manning (2003) when they concluded the most significant parental influence in dietary behavior was the family meal; conversely, the adolescents who had greater freedom in their food choices had poorer consumption eating patterns. They also found, that even as children age, the role parents play in eating behaviors can remain consistent even later in life due to the dietary choices established at younger ages through the family meal. A key element provided by the Videon and Manning (2003) study was their purpose – if there was to be a focus on improving nutritional intake through higher amounts of fruits and vegetables among adolescents, it was important to understand the factors that played a role in their eating behaviors. This led to the development of more effective programs to address poor eating behaviors and call attention to nutrient dense foods in health and nutrition

courses. It was also important to involve parents through education, meal planning, and family dinners.

The plethora of research details connections between children's breakfast eating intake and academic performance, the value of parent efficacy in the quality and quantity of nutrient-dense foods, and factors which play a role in reducing obesity rates. Research also shows the carry-forward effects of establishing some of these habits in childhood into adolescence. It can then be postulated that as teens become aware of connections between nutrition, lower rates of obesity, and increased academic performance, they may begin to have the tools necessary to make healthy nutritional choices. It suggests the necessity to have parents play a strong role early on to provide a foundation for teens to continue to practice healthy nutritional choices as they take on greater responsibility in their dietary choices. It is with this information, that exploration into teens' perception of what constitutes healthy nutritional choices and the impact they may have on academic performance can begin.

CHAPTER III

METHODS

The focus for this study was on adolescent perceived eating behavior as it related to cognition and academic performance. This helped to bridge a gap between in research on parent self-efficacy and child eating patterns, as teens were allowed greater choices in eating. Teens at the high school in review were allowed to leave school campus for lunch, if they chose. If teens were provided with greater freedom in food options, it was necessary to explore what they were eating and what they perceived as healthy.

Participants

For this study, 38 students attending a high school located in the Central Valley of California were utilized. All participants ranged from 16-18 years of age and of various academic levels. Participating students were members of an Introduction to Psychology course and all participants attend the course after lunch. This school had close to 2200 students that came from a somewhat diverse population. The breakdown according the School Accountability Report Card (SARC) 2015-2016, the most recent currently available, consisted of 34.3% white, 42% Hispanic/Latino, 5.6% Black or African American, 4% Filipino, 9.9% Asian, .4% Native Hawaiian or Pacific Islander, and .2% American Indian or Alaska Native. It was estimated that 34.70% of the population was classified as socioeconomically disadvantaged, 10.6% were English learners, and 10% were students with disabilities

(SARC 2015-2016, published 2016-2017). The results from the CAASP testing for the 2015-2016 school year included 97.7% of the students tested with 56.20% of the total population meeting or exceeding the state standards in English Language Arts, while only 35.9% did so in Mathematics (SARC). While socio-economic and cultural factors were not included in the survey or gathered during class time, they were important to consider when looking at the general demographic of the school as it revealed the pool in which participants were drawn. The study cannot be generalized to all students at this school or beyond, as the information to allow for cross reference of demographics was not collected. Furthermore, lower-classman were not included as they are not permitted in the psychology course. Thus, the class may not be represented of the total school population.

This high school was home to several academic subgroups consisting of the Agriculture-Science (Ag/Sci) program, International Baccalaureate (IB) program, the Performing Arts Magnet (PAM), Advancement Via Individual Determination (AVID), provided college prep courses, and had goal of helping students feel connected with one or more groups. Students participating in parts of these programs were included as the Introduction to Psychology course was open to all students. From this, it drew from a cross section of the programs available.

Of the participants, 26 were female, 11 males, and 1 identified as transgender. In identification of type of diet, 31 of the students reported their own eating behavior as 'omnivore', while three stated they were 'vegetarian', and four noted 'other' or 'declined to state'.

Sampling Procedures

Students were chosen through opportunity sampling, as this was the most convenient means to gather participants and conduct the study. They were a closed group available to the researcher. Ethical considerations were followed with both parent and student consent forms distributed and collected; students were given permission to withdraw themselves and their data from the study at any time; they were informed of the nature, purpose, and aim of the study in advance; and debriefing procedures were conducted. The survey was taken anonymously, only recording their student identification number, and their responses kept private. The survey and the study were reviewed and approved by the University Institutional Review Board, protocol #1718-017 on 27, September 2017. Furthermore, students were exposed to material regarding nutrition as provided from the United States Department of Health and Human Resources, the Academy of Nutrition and Dietetics, and other reputable resources. It was also clearly communicated that the course instructor was not a licensed dietician and could not formally assign eating plans; rather, simply communicating information as provided by the US government and licensed dieticians. This was all completed as part of the regular assigned teaching duties and students were not required to make any dietary or lifestyle changes.

Research Design

This study incorporated a mixed methods approach with the incorporation of quantitative and qualitative data gathered from student-self-reported surveys. The quantitative data included figures from Likert Scale and student's grade point average

(GPA—the formal calculation based from final letter grades assigned). Qualitative information came from some open-ended questions regarding eating behavior and perception nutrition played in learning. Because this was not a true experimental study, there were no control or experimental groups. All students were exposed to the treatment through independent measures. The survey was created by the author and designed to gather information regarding student demographic; academic information; a review of physiological needs, such as sleep and nutritional behaviors; cognitive needs; aesthetic needs; and self-fulfillment needs, much of which was not included in the final statistical analysis. Additionally, an extensive amount of data was gathered from the survey including frequency of eating specific food types such as candy, chocolate, ice cream, drinking soda, caffeine consumption, and other similar foods, which were not included in the final analysis, as these did not seem necessary to include or effect the results. The unit concluded with a whole class, open-forum discussion where students could verbally share their thoughts, concerns, and considerations regarding the Health Psychology unit; however, few students focused on information relevant to the study, thus there was limited data to compare, analyze, and present.

Materials

- Informed consent for both parent and student; student provided is online at start of survey (See Appendix A)
- Survey/Questionnaire (see Appendix B)
- Computers for students to access online survey

- Nutrition and diet information to presented during the Health Psychology unit

Procedures

Students are members of a psychology course and thus recipients of a health psychology unit. This survey and coinciding information were part of the unit curriculum. While not all students participated in the study (due to absences on the day of the survey), all students were exposed to as part of the curriculum. Once the parent consent forms were returned, participants were given an access code to complete a survey designed to serve as a baseline measure. The heart of the survey revolved around gathering nutritional data, however, other measures were incorporated to review importance of nutrition as compared to other measures as well as to provide correlative evidence. The survey was given during class time using an on-campus computer lab; however, several students opted to complete the survey using their cell phones.

The methods and procedures utilized in this study include quantitative and qualitative data, relying on an opportunity sampling of 16-18 year olds. Ethical considerations were accounted for as students were informed and allowed to withdraw at any time. Efforts were made to provide the greatest amount of information, while requiring the least amount of effort or impact on the participants. It is understood that the naturally occurring limitations and weaknesses of these procedures did influence the results. Nonetheless, the results as presented are authentic based on the students' self-reported survey data.

CHAPTER IV

RESULTS

Reported Eating Behavior of Healthy Food and Frequency

Figure 1.1 shows the frequency students believe they consume healthy food, with the majority reporting often and frequent consumption of healthy foods; only 1 student reported always/only. There was consistency in the reporting as it was supported by the high number of home cooked meals students reported consuming, 20 students, 52% reported they always or only ate home cooked meals.

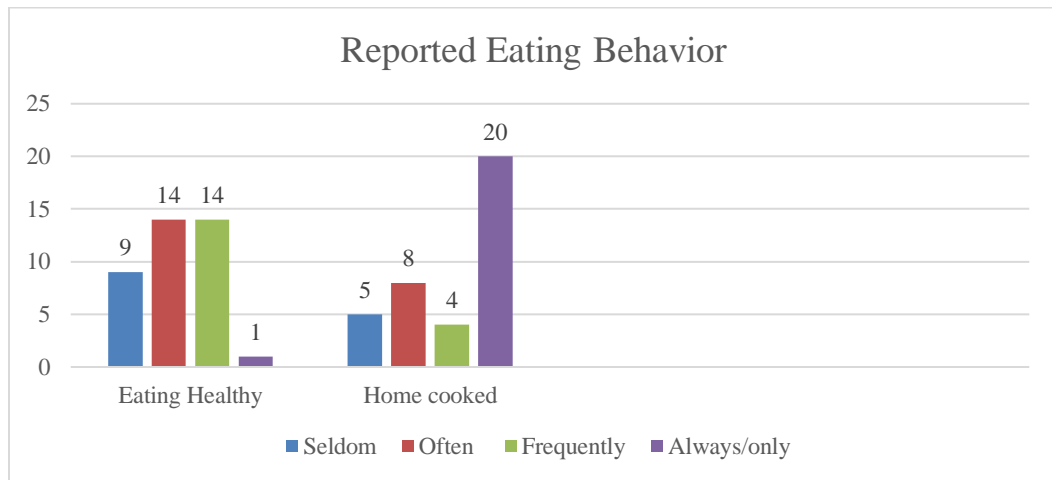


Figure 1. Reported eating behavior. A review of perceived eating behavior and amount of home cooked meals.

Frequency of Meal Consumption

Students reported the frequency of breakfast, lunch, and dinner consumption. While the breakfast consumption is bi-modal between 1-2 times per week and every day, more students report eating both lunch and dinner on a more regular basis. Similarly, lunch consumption was bi-modal with students eating lunch 5-6 days or everyday. It appears most students do try to eat lunch on a daily basis. Twenty-three

students, or 60% of students reported eating dinner each day and when the 5-6 days a week group was included, the number reached 84%. There was no information gathered as to why students would miss any meal.

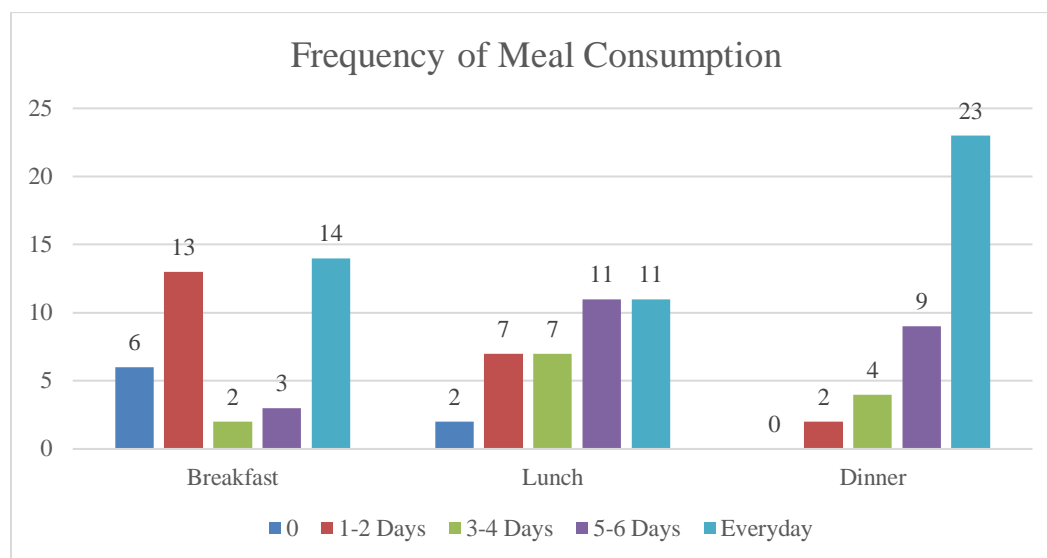


Figure 2. Frequency of meal consumption. A review of the number of students reporting meal consumed on average.

Eating Behavior and Academic Performance

In reviewing a correlation between reported current GPA (grade point average) and reported frequency of healthy eating, the correlation between self-reported GPA and frequency of healthy eating was nominal at .236. The average self-reported GPA was 3.13, while the average consumption of healthy eating was noted as *often*.

Correlation between GPA and Belief Diet and Learning are Related

There is a very slight correlation between GPA and the reported belief that diet affects learning, $r = .0453$. This number is quite weak and does not reveal and

strong perception of nutrition being linked to cognition, learning, or academic performance. However, it also does not negate or disprove the possibility. Many 23 students or 60% reported *maybe* and 31.5% reported *yes* for this question, suggesting students are open to the possibility, but do not have enough information or have not thought about it. Only 3 students, 7% felt that nutrition did not affect academic performance.

Table 1

Student Response Totals Regarding Belief that Diet May Affect Learning

Perception	Responses
Yes	12
No	3
Maybe	23

Correlation between GPA and Eating Lunch

As noted previously, all participants in the study take the course after lunch. Thus, it was worth considering a correlation between eating lunch, a mid-day fuel opportunity, and GPA. Again, the results show a minimal, yet positive correlation between GPA and increased lunch consumption at $r = .1574$. While the majority of students did report eating lunch. This was the weakest correlation from the study.

Correlation between GPA and Eating Breakfast

Previous studies have noted the correlation between breakfast consumption and academic performance. The results here confirm these previous results with a positive correlation of .3013. Again, while this was a nominal correlation, it validated

previous studies. Furthermore, this was a stronger correlation than that regarding lunch consumption and academics. Clearly, the importance of breakfast cannot be ignored.

Factors Influencing Food Choices

In reviewing factors that influence food choices, *taste* garnered highest importance; 11 students noted this as their number 1 factor. *Health* and *cost* tied with seven students stating it was the most important factor and *availability* and *family* appears to have equal status with six students each reporting it has their main factor. These results represent the declining role family plays in adolescent dietary choices, with nearly a third, 32% of students ranking it as the fifth factor of influence, only ahead of *peers*. Perhaps the strongest piece of data from this question was the low rate peers play in influencing food choices as 73% of students rated it as the lowest factor. As noted above, fruits and vegetables were a common indicator of nutritional quality of diet.

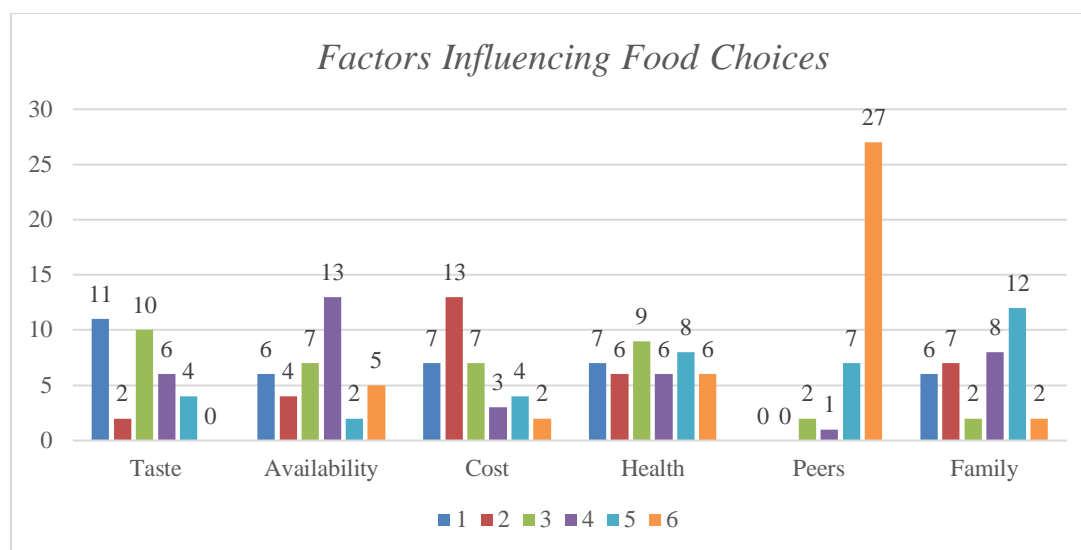


Figure 3. Factors influencing food choices. Reported factors influencing dietary choices among participants.

Reported Daily Intake of Fruits, Vegetables, Sweet Treats, & Snacks

Seventy percent of students reported eating 1-2 servings of fruit per day, while slightly fewer, 4 reported consuming 1-2 sweet treats per day, more than vegetable consumption. Only 2 students reported eating five or more servings of vegetables per day, and no students reported eating more than four servings of fruit per day. These numbers suggest students may barely be getting the recommend number of fruits and vegetables per day: 2 and 3 respectively. Snacking can be a measure of good nutrition and students reported a range of snacking, while most eating 1-2 snacks per day. No information was gathered on what foods were chosen for snacks. At the same time, this did point to some discrepancy in student reported data, as most stated they eat healthy *often* and are eating home cooked meals, yet their fruit and vegetable consumption were on the low end of the recommended scale and these are consumed similar quantities as *sweet treats*.

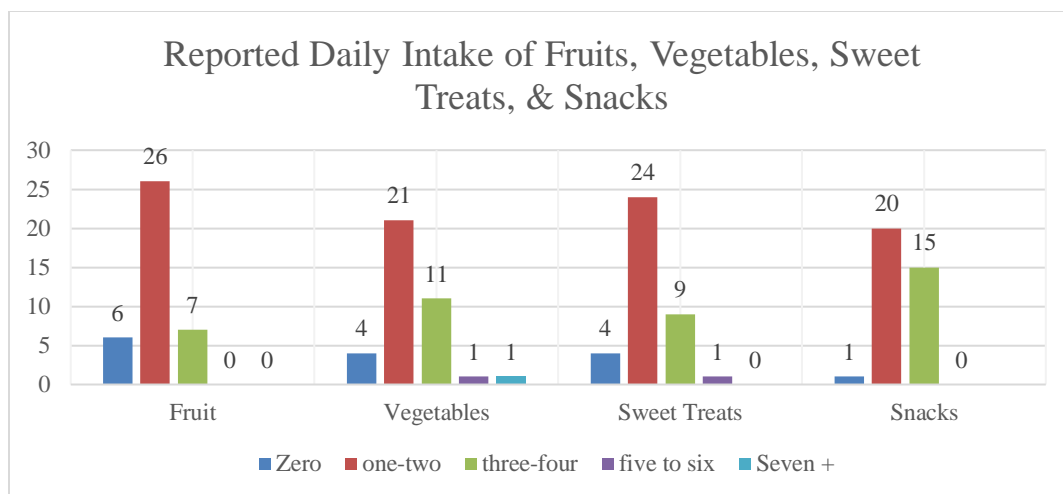


Figure 4. Reported daily intake of fruits, vegetables, sweet treats, & snacks. Participant report of fruit and vegetable consumption compared to sweets and snacks.

Overall, while these results are nominal in correlation, there is consistency between the participant's perception of healthy nutritional choices, the dietary choices they actually made, their eating frequency, and their belief that diet may affect cognition and learning. These results also suggest the participants have some ideas of the elements that make up a healthy diet compared to foods that may not be deemed healthy.

CHAPTER V

DISCUSSION

While most of the results suggested only a minimal correlation between perceived eating behaviors and academic performance as measured by GPA, the results did not discredit the value of a healthy diet. Teens have greater choices in dietary behaviors than their younger counterparts, yet they were still limited by food provided to them through their parents, the schools, and other gatekeepers. Furthermore, clarification and understanding of foods that constitute a healthy diet may be in order.

The results of the study reaffirm the results of previous studies including Basch (2011); Rampersaud et al. (2005); and Stephens et al. (2015) as reviewed in the literature. These studies indicated the positive correlation for students who ate breakfast and lunch on a regular basis, perform better in school than students who do not. The study here took the results regarding children and extended the data to teens. Since this study looked at the perception of eating behavior and academic performance, there was consistency in the measures of self-efficacy of eating behavior as also reported by Gillman et al. (2000); Ice, et al. (2012); and Stephens et al. (2015). Teens who felt nutrition and diet may play a role in academics, may be self-reinforcing. The self-fulfilling prophecy promotes self-efficacy in making healthier nutritional choices as well as performing well in academics.

The health psychology unit did provide information on reading nutrition labels, activities on understanding serving sizes, macro and micro-nutrients, and the

meaning of easily confused terms such as *less sodium* as opposed to *low sodium* and claims such as ‘made with whole wheat’ versus ‘100% whole grain.’ Information such as this was helpful for students in gaining awareness of healthy eating behaviors; however, this information was presented after the survey and the content of the curriculum was not being assessed in this study. Perhaps, a follow-up study on the efficacy of a nutrition and health unit would yield more enlightening results on the role nutrition plays in academics.

Another area for future research includes the role active involvement in sports and athletic programs influence dietary choices, thereby influencing academic performance. This study was guided by the premise that many adolescents make poor dietary choices, and by learning healthier options, they could improve not only their health, but their academic performance. However, there are teens who engage in disordered eating behaviors such as anorexia nervosa, bulimia nervosa, and binge-eating. Future research would need to be conducted to explore the role athletic involvement may have in influencing eating patterns and their short-term effects in education. Likewise, correlations between eating behavior and other social or co-curricular activities could be assessed.

Furthermore, research regarding off-campus meals for teens needs to be conducted. Many high schools have an open-campus policy, which means they may return home for lunch or eat at a local fast food eatery. If they chose to remain on campus, their choices are linked to eating food brought from home, food sold at the cafeteria, or not eat at all. Students at the school in this study, had a 35-minute lunch

break, which does not afford much time for sit-down meals or extensive lunch options. Furthermore, as teens, they are often involved in extra-curricular activities, keeping them on campus beyond the scheduled school day. They remain on campus for sporting events, performing arts practices, and club meetings. Their long and busy schedules make meal planning and making nutritional choices challenging. Within a short walking distance from the school there are two taquerias, a Little Cesar Pizza™, and McDonalds™. It is worth exploring the effects of open-campus schools, their proximity to various eateries, and correlations to eating behaviors.

Evaluation of Study

Strengths of this study include the ease of survey administration; the survey was tested in a prior round to check for adolescent user-friendly, and teens participated in the survey. The survey was developed a year prior to the study with the goal of measuring student health behavior. It included an extensive list of eating behaviors as well as sleep, personal growth, and academic lifestyle questions. From this, a more complete or well-rounded view of the teens in question could be viewed. At the same time, since the survey was tested in advance, it was clear that the questions were understood by students and they were able to easily answer them. The fact the study revolved directly around teens is different than many previous studies, as previously discussed in the review of the literature. At the same time, the information came from the teens themselves rather than parents or other gatekeepers. The teens involved were 16-18 years of age, and thus somewhat representative of typical teenagers. The survey and follow-up curriculum was created by the students'

teacher, someone they were familiar and comfortable with. This lends itself to involved participation and interest in the study. While, there is not a great deal of qualitative data for the results from the post-unit discussion forum, students did express they enjoyed the unit, the material, and expressed they learned new information on reading nutrition labels.

As with all studies, there are limitations, and these need to be reviewed. Adolescents, while well-meaning and helpful, may not always be truthful or accurate in their reporting. They may report based on what they think they should record, a problem found in all surveys. Likewise, the results of the survey were based from memory and estimations. Teens often forget or are unaware of the little food choices they make throughout a day, and thus do not think of reporting. For example, they may be offered a cookie during a passing period, share some soda with a friend, or take part in a class event. While these may not seem like everyday occurrences, they likely occur more frequently than teens recall or report. Similarly, students in this study had high estimations of eating home-cooked meals; however, many go off-campus or out to lunch frequently, few bring a lunch from home. Furthermore, many of the questions instituted a Likert scale or other standard of measure that is not clearly define. What ‘occasionally’ means to one student may be marked as ‘seldom’ by another. The best way to overcome these limitations would be to have students log or track their dietary habits for a few weeks prior to the study, then have them respond to the survey. While such activity may not yield completely accurate results, they may be closer to reality.

Another limitation included the length of the survey and what it measured. The survey was well planned, and the question wording was tested; however, it did not yield the results or measures as targeted. The aim was to look at perceived diet and nutrition and the role it may play in academics. The survey can serve as a review of eating behavior, but did not necessarily help to track academic performance, perhaps due to the brevity in time of the study. A more longitudinal approach would be more fitting. An approach where students' dietary habits are established early on, along with an assessment of their contemporary academic performance, followed by instruction on healthy eating and nutrition could be implemented. This would be followed by quarterly measures of eating behavior and academic performance, perhaps following students for 2 to 4 years. This approach would allow for more consistent measures of correlation between nutrition and academic. This would also more closely match previous studies longitudinally conducted regarding eating behaviors and academic performance in young children.

As noted in the results, students are snacking, typically 1-2 times per day. Snacks maybe healthy, including fruits such as an apple, vegetables such as celery with peanut butter, or other protein-based snacks such as cheese and meat slices. However, snacks may also take place in the form of candy, sweet treats, pudding, cakes, or other sugar-based foods. There were no questions regarding snack choices, thus it is hard to measure whether the reported snacks being consumed in this study are of high quality. Further exploration from this could be helpful, particularly, if it is

associated with timing of the snack and how they may relate to the academic school day.

In conclusion, there is a great deal to consider when conducting research with teens and the academic payoffs for nutritional eating behaviors. The information gained thus far is valuable and is a step in the right direction if the goal is to reduce childhood and adolescent obesity while increasing academic performance. It confirms the hypothesis that a perception in healthy eating behaviors will not result in reduced academic performance. Furthermore, it has helped to outline weaknesses in teens' understanding of nutritional choices and has provided clues for future research. The benefits outweigh the cost and it is the hope that this is a step in furthering research and not the end.

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APPENDICES

APPENDIX A

PARENT CONSENT

California State University, Stanislaus

Rachel Hermann rhermann@csustan.edu

Effects of Nutrition on Cognition and Learning in Adolescents

Your son or daughter is being invited to participate in a research project that is being done to fulfill requirements for a Master's degree in Counseling at CSU Stanislaus). I hope to learn links between the quality in diet and nutrition and their effects on learning in both improved cognition and academic results. Participation will require approximately 20 minutes and is completed online during class time. The survey will be followed by the in-class Healthy Psychology unit, and an in-class group discussion.

There are no known risks in regards to participation in this study. It is the hope that an incorporation of healthy food choices will not have a negative impact on cognition and learning, rather, that there will be a positive correlation between healthy dietary choices and academic performance. There is also the hope that by incorporating a more nutritious diet into one's life, there will be an improvement in overall health.

Taking part in this study is completely voluntary. Responses will be kept strictly confidential, and digital data will be stored in secure computer files. Any report of this research that is made available to the public will not include your son or daughter's name or any other individual information by which they could be identified. If you have questions or want a copy or summary of this study's results, you can contact the researcher at the email address above. If you have any questions regarding your rights and participation as a research subject, please contact the IRB Administrator by phone (209) 667-3493 or email IRBAdmin@csustan.edu. You may also choose to directly contact the researcher through the [high school] email at [teacher school email] or the thesis supervisor, Dr. Susan Neufeld at (209) 664-6719. Please feel free to print a copy of this consent page to keep for your records.

I am providing consent for (please check all that apply)

- My son/daughter to participate in the in-class survey
- My son/daughter's feedback and responses during the discussion to be used as part of the above study.

Parent Signature _____ *Date* _____

Parent Name (Print) _____

Please return this form to the researcher to --- High School room A--- by 1-October 2017. A lack of receipt of form will suggest non-consent for participation.

APPENDIX B

DISCUSSION FEEDBACK STUDENT CONSENT FORM

Dear Participant:

You are being asked to participate in a thesis research project that is being done to fulfill requirements for a Master's degree in counseling at CSU Stanislaus. We hope to learn the role or effects of nutrition on learning and cognition. If you decide to volunteer, you will be asked to verbally participate in an open forum discussion in class and have your feedback included in the study's results and analysis.

Alternatives to participating in the study include sitting and observing in class without oral participation or participate in the discussion but have your responses omitted from the study.

Risk may include discomfort due to speaking out loud within the group or feeling your contributions are not accepted by members of the group.

It is possible that you will not benefit directly by participating in this study. Others may benefit by learning how the information covered in the unit affected them; learning through the experiences of other participants. The information collected will be protected from all inappropriate disclosure under the law. All data will be kept in a secure location. Only the researcher will have direct access to the data collected. Any use of the statements or comments made during the discussion will remain anonymous.

There is no cost to you beyond the time and effort required to complete the procedure(s) described above. Your participation is voluntary. Refusal to participate in this study will involve no penalty or loss of benefits. You may withdraw at any time without penalty or loss of benefits.

If you agree to participate, please indicate this decision by signing below. If you have any questions about this research project please contact me, Rachel Hermann, at ***-***-**** or my faculty sponsor, Dr. Susan Neufeld at (209) 664-6719. If you have any questions regarding your rights and participation as a research subject, please contact the IRB Administrator by phone (209)667-3493 or email IRBAdmin@csustan.edu .

Sincerely,
Rachel Hermann
MA in Counseling student/researcher

I have read and understand the information provided above. All of my questions, if any, have been answered to my satisfaction. I consent to take part in this study. I have been given a copy of this form.

(participant's signature)

Signature _____ Date _____

Name (printed) _____

Signature of person obtaining consent _____ Date _____

Printed name of person obtaining consent _____

(as needed)

In addition to agreeing to participate, I also consent to having the interview video/audiotape-recorded.

Signature _____ Date _____

Name (printed) _____

APPENDIX C

SURVEY

In- Class Survey

Please answer each of the following to the best of your ability.

1. Age _____ Decline to State _____ Student Id _____
2. Gender M F Transgender Decline to state
3. Grade level 9 10 11 12 Decline to state
4. List extracurricular activities (sports, music, clubs, etc....) in which are you are currently participating in.
5. List extracurricular activities you have participated in during the past 12 months.
6. List extracurricular activities that you plan to participate in within the next 12 months.

Physiological Needs*Sleep:*

7. On average, how many hours of sleep to you typically get each night?
 3-4 5-6 7-8 9-10 11+
8. Do you sleep with a cell phone next to you? Yes No Is it turned on?
 Yes No
9. What time do you typically go to bed at night? _____
10. What factors play a role in determining when you go to sleep?

Nutrition:

11. How many days per week do you typically eat breakfast?
 0 1-2 3-4 5-6 everyday
12. How many days per week do you each lunch?
 0 1-2 3-4 5-6 everyday
13. How many days per week do you typically eat dinner?
 0 1-2 3-4 5-6 everyday

14. How many snacks do you typically have each day?
0 1 2 3 5 6+
15. You eat healthy foods? Never Seldom Often Frequently Only
16. How many cups (8 oz) of water do you drink per day?
0 1 2 3 5 6+
17. How often do you consume milk (whole, low fat, and/or skim)
never 1-2x per month 1-2x per week 3-5x per week daily
18. How often do you consume nondairy milk such as soy, almond, or rice?
never 1-2x per month 1-2x per week 3-5x per week daily
19. never 1-2x per month 1-2x per week 3-5x per week daily
20. How much soda do you typically drink per day?
0 8-12 oz 16-24oz 32-48oz 48oz+
21. How often do you consume energy drinks (excluding coffee)?
Never 1-2x per month 1-2x per week 3-5x per week daily
22. How often do you consume juice drinks such as apple, orange, lemonade, etc..
never 1-2x per month 1-2x per week 3-5x per week daily
23. How often do you drink caffeinated coffee/ coffee drinks (hot or cold)?
Never 1-2x per month 1-2x per week 3-5x per week daily
24. How many servings of fruit do you have per day?
0 1-2 3-4 5-6 7+
25. How many servings of vegetables do you have per day?
0 1-2 3-4 5-6 7+
26. How many servings of treats, candies, cookies, ice cream, etc... do you have per day?
day? 0 1-2 3-4 5-6 7+
27. You eat low or nonfat frozen desserts
never 1-2x per month 1-2x per week 3-5x per week daily
28. You eat ice cream and milkshakes
never 1-2x per month 1-2x per week 3-5x per week daily
29. You eat pudding, custard, and/or flan
never 1-2x per month 1-2x per week 3-5x per week daily
30. You eat doughnuts, pies, and pastries
never 1-2x per month 1-2x per week 3-5x per week daily

31. You eat cakes and cookies
 never 1-2x per month 1-2x per week 3-5x per week daily
32. You eat chocolate, candy bars, and/or toffee
 never 1-2x per month 1-2x per week 3-5x per week daily
33. You eat other types of candy such as Skittles™, Starburst™, licorice, etc...
 never 1-2x per month 1-2x per week 3-5x per week daily
34. How often do you eat fast food/drive through (i.e. McDonalds, Burger King, etc...)?
 never 1-2x per month 1-2x per week 3-5x per week daily
35. How often do you eat at casual dining establishments (i.e. Applebees, Chili's, etc...)?
 never 1-2x per month 1-2x per week 3-5x per week daily
36. On average, how many home cooked meals do you eat per week?
 rarely 1-4x per week 4-10x per week 11-15x per week Nearly all
37. List your five most commonly consumed foods or types of foods and how often:
- 1.
 - 2.
 - 3.
 - 4.
 - 5.
38. How often do you eat foods that are deep fried in fat (oil, butter, or lard)
 never 1-2x per month 1-2x per week 3-5x per week daily
39. What motivates you in choosing the foods you eat: taste, availability, cost, health, peers, family. Please rank in order of importance with the most important first (1), least important at the bottom (6).
- 1.
 - 2.
 - 3.
 - 4.
 - 5.
 - 6.

40. How do you identify your diet (Please circle one)?

Vegan Vegetarian Pescatarian Omnivore (eat any type of food)
 other(describe)

41. Do you feel your dietary habits affect your learning?

Yes No Sometimes/Maybe

Explain:

Cognitive Assessment

42. How many days per week do you typically do homework?

Never 1-2 3-4 5-6 Everyday, including weekends

43. What is the average length of time you spend on homework per night?

0 10-30 min 40-60 min 60-80 min 80-120 min 2 hours+

44. What is your current GPA? _____

45. What is your non-weighted GPA for high school? _____

46. What are your education goals for the next:

2 years?

5 years?

10 years?

General Information for cross-reference

47. Rank in order the following priorities: homework, club activities, sport activities, attending art events (musical, drama, exhibits, etc....), or other (home responsibilities, work/job, time with friends, etc...please write in) with most important first (1) and least important at the bottom (5).

1.

2.

3.

4.

5.

48. How many AP/IB courses are you currently taking:

0 1-2 3-4 5-6 7-8

Aesthetics Needs

49. How much time each day do you spend on personal grooming?

0 10-30 min 40-60 min 60-80 min 80-120 min 2 hours+

50. On a scale of 1-10, 1 being not very and 10 being very important, how important are your looks to you?

1 2 3 4 5 6 7 8 9 10

51. About how much money do you spend on clothing and accessories per month?

0 - \$10 \$10-\$30 \$30-\$50 \$50-\$70 \$70-\$100

\$100-\$150 \$150+

Self-Fulfillment

52. On a scale of 1-10 (1 being the low, 10 being high) what role does working towards personal growth and self-fulfillment play in the choices you make?

Rating (1-10) _____

--Please explain: