

The Relationship Among Food Security and
Inattention, Executive Functioning, and Learning
Problems

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Under the Supervision of Dr. Mary Beth Leibham

The current study examined the relationship between food security and academic performance, specifically inattention, executive functioning, and learning problems. Using a food security module from the USDA to assess food security and the Conners 3-Parent Short form to assess inattention, executive functioning, and learning problems, parents reported their family's current level of food security and their child's current school-related behaviors and performance. Parent reports revealed a proportionate amount of concerns for inattention in households classified as high or marginal food security and low food security and a higher rate of concern for learning problems and executive

functioning in households classified as low food
security.

Thesis Adviser (Signature)

Date

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CHAPTER I

LITERATURE REVIEW

Prevalence of Food Insecurity

Food *security* is defined as consistent, dependable access to enough food for an active and healthy lifestyle. Food *insecurity* is present when a household's access to adequate food is limited by a lack of money and other resources (Coleman-Jensen et al., 2019). The United States Department of Agriculture (USDA) monitors food security through a nationally representative self-report survey sponsored by the USDA's Economic Research Service (ERS). Based on their answers to questions assessing the quality and consistency of food intake among members in their households, respondents are classified as having high food security, marginal food insecurity, low food security, and very low food security.

In 2018, using information from the food security survey, the USDA estimated that 88.9% of U.S. households were food secure throughout the year, with consistent access to enough food for an active, healthy life for all household members. The remaining 11.1% of households were classified as *low* food security at least sometime during the year, including 4.3% of households that met the criteria for *very* low food security. Households classified as *low* food security reported reduced quality, variety, or desirability of diet with little or no indication of reduced food intake. Households classified as having *very* low food security have one or more household members that have their eating patterns disrupted at times because the household lacked money and other resources for obtaining food. In 2018 the rate of food security declined for the first time since pre-recession levels in 2007 (Coleman-Jensen et al., 2019).

It's important to note that food insecurity rates vary by household type. In 2018, the rates of food insecurity among households with children was 13.9%, which was higher than the national average of 11.1%. Among households with children under 6 years old the rate of food insecurity was 14.3%. Clearly, children are not immune from food insecurity and may be more likely to be impacted by this hardship than adults. In fact, we know that children are disproportionately represented among the nation's poor in that they comprise 23% of the population but 32% of all individuals in poverty. Therefore, it is not surprising that we see children disproportionately represented among those individuals living in food-insecure households (Coleman-Jensen et al., 2019).

Importance of Nutrition for Development

Nutritious foods are essential for healthy physical and cognitive development, but households that experience food insecurity are likely to consume less nutritious foods (Coleman-Jensen et al., 2019). Morales and Berkowitz (2016) found that both adults and children who experienced food insecurity are more likely to consume foods of lower quality, have less healthy eating behaviors, and have lower intakes of fresh produce. Thomas et al. (2019) examined the physical health of children between the ages of 2 and 17 who were experiencing food insecurity. Food insecurity was measured using the 10-item version of the USDA 30-day food security measure. Four domains of physical health (general health, chronic health, acute health, and healthcare access) were determined using information from the National Health Interview Study (NHIS). Results suggested that food insecurity was linked to poor health even after controlling for the composition of children's homes, the safety of the neighborhoods, their receipt of public assistance, and their household income.

Similarly, Drennen et al. (2019) investigated the relationship between food insecurity and various health indices (e.g., body weight, physical growth, fine and gross motor skills) in a multiethnic sample of children four years old and younger. They concluded that children from food-insecure households were more at-risk for fair or poor health and developmental delays, likely due to low quality nutrition and a lack of a consistent food source.

In addition to physical health and development, cognitive development is a factor that is associated with nutrition. According to Northstone et al. (2012), poor diets that are comprised of high fat, sugar and processed food in early childhood may be affiliated with small reductions in IQ, as measured by the Wechsler Intelligence Scale for Children-Third Edition, in later childhood, while diets comprised of high intakes of nutrient-rich foods may be associated with small increases in IQ. Additionally, overall dietary patterns in early childhood are associated with both later child behavior, in particular hyperactivity, and school performance.

In addition to physical and intellectual development, children's social and emotional skills are two other aspects of development that may be linked with nutrition. Tanner and Finn-Stevenson (2002) critically reviewed existing research and found that a lack of appropriate nutrition, hunger, and food insecurity has a detrimental impact on social and emotional and cognitive development due to micronutrient deficiencies (i.e., protein, iron, iodine, zinc, vitamins) in young children in the United States.

Longitudinal research by Belsky et al. (2010) has been conducted on the relationship between food insecurity, cognitive abilities, and behavioral and emotional development in children. The sample in this study was comprised of 2,232 British

children. Food security status was measured using a 7-item USDA scale when the children were aged 7 and 10 years. Cognitive abilities were measured using the Wechsler Intelligence Scale for Children. Behavioral problems were measured by teacher report and self-report. All outcomes were measured when the children were aged 5 and 12 years. They found that children from food-insecure households had lower cognitive functioning and higher levels of behavioral and emotional problems relative to children from food-secure households independent of family income, mothers' personalities, and their households sensitivity to children's needs.

Food Insecurity and School Performance

Cognitive Ability/Intelligence

As previously stated, cognitive ability is associated with development. Children are more likely to have cognitive and language development impairments when a lack of food is involved in a child's life (Helton et al., 2018). In addition, specific nutrients are important at different developmental stages (Cusick & Georgieff, 2016). For example, an iron deficiency during the fetal/newborn period of life and during adolescence for menstruating females can be consequential for neurological development. Given the clear role of nutrition in development, it is not surprising that food insecurity is associated with school performance and cognitive ability.

Shankar et al. (2017) systematically reviewed 23 peer reviewed articles from developed countries on the associations between food insecurity and adverse childhood developmental behavioral, emotional, and academic outcomes including cognitive development. The studies reviewed were both cross-sectional and longitudinal in design. Studies that did not use explicit metrics to measure food insecurity were excluded. In

total, 23 peer-reviewed articles were used. Of those 23 studies, 11 used a cross-sectional design and 12 used a longitudinal design. One study reviewed found infants and toddlers with food insecure mothers scored 1.5 points lower on cognitive assessments. The same study showed that children 24 months old experienced small but immediate negative effects on their cognitive development and health status if they resided with an adult temporarily experiencing food insecurity. Unfortunately, research has not been conducted on the relationship between food insecurity and cognition for adolescents.

Executive Functioning

Executive functioning is an important part of cognitive processing and is defined as, “the mental capacity to make goal-directed behaviors, including inhibitory control, working memory, attention and planning.” Executive functioning skills develop throughout childhood and adolescence and closely align with brain development during this time. Executive functioning skills are an important aspect of academic performance and have been linked to nutrition and development (Cohen et al., 2016). Research suggests a moderately strong correlation between executive function, intelligence, and achievement scores later in childhood for children as young as 2.5 years (Duncan et al., 2007).

Cognitive deficits that can result from food insecurity can lead to a lack of attentional control which may mimic symptoms of attention deficit hyperactivity disorder. Attentional control is a core component of executive functioning and is a vital skill within the classroom setting. Longitudinal research suggests self-discipline in attentional control and behavior is associated with positive academic outcomes for adolescents, even more positively than intelligence quotient (Duckworth & Seligman,

2005). Findings from this study are consistent with other research that found an association between food insecurity and self-control among school-aged children (Shankar et al., 2017)

According to Grineski et al. (2018), households transition within the varying levels of food security (e.g., from low food security to very low food security) and also stay static (e.g., persisting marginal food security). Transitions within the varying levels can be related to a child's social and emotional functioning and academic achievement, specifically, academic competencies, executive functioning, and social skills (i.e., self-control, interpersonal skills, externalizing behaviors, and internalizing behaviors). Their research focused on longitudinal information collected on 11,958 kindergarten and 1st grade students during 2010-2011. Food security was measured using the USDA 18-item food security module. Academic achievement was measured using direct assessments in reading, mathematics, and science by trained professionals. Executive functioning was measured using two measures from the Early Childhood Longitudinal Study, Kindergarten Class of 2010-11 for working memory and cognitive flexibility. Working memory and cognitive flexibility were assessed using a standardized assessment. Social skills were rated by the child's teacher using the Social Skills Rating System. Overall, households that experienced going from higher to lower food security and persisting marginal food insecurity were the most detrimental to children's social and emotional and academic development.

Academic Performance

By definition, food insecurity can have a negative impact on a child's eating patterns and diet quality. For the purposes of this section, academic performance includes

both achievement and behavior behaviors associated with achievement. Fu et al. (2007) assessed unhealthy eating patterns and overall school performance, including academic functioning, for children aged 6 to 13 years. Florence et al. (2008) assessed how school performance is related to a well-rounded diet consisting of a diverse selection of foods in order to meet the suggested number of servings from each food group in a sample of 5th graders. Both used a standardized assessment of academic functioning. They noted previous research had primarily focused on the role of individual nutrients or foods. Results from the Fu et al. (2007) study revealed an association between school performance and the quality of food intake, such that school performance declined as the intake of low-quality food increased. The results from the Florence et al. (2008) study were similar in that they revealed undernourished children had decreased attendance, attention, and academic performance and also experienced more health problems compared to well-nourished children.

Johnson and Markowitz (2018) used data from the Early Childhood Longitudinal Study-Birth Cohort (ECLS-B), a nationally representative study of children born in 2001 studied through kindergarten entry, to investigate associations between the timing and level of food insecurity during the first five years of life and kindergarten readiness skills (i.e., reading, math, social-emotional skills) predictive of later academic success and social-emotional outcomes. The Early Childhood Longitudinal Study (ELCS) was developed by the National Center for Education Statistics and includes four longitudinal studies that examine child development, school readiness, and early school experiences, each following a group of children for multiple years. In the Johnson and Markowitz (2018) study, food insecurity was measured by parent-report on the USDA Core Food

Security Module. Academic outcomes were measured by direct assessment by trained data collectors using a measure developed specifically for the ECLS-B. Social-emotional skills were measured by the child's kindergarten teacher completing the Preschool and Kindergarten Behavior Scales, 2nd ed. (Merrell, 2003) and the Social Skills Rating Scale (Gresham & Elliott, 1990) completed by kindergarten teachers.

Results of the systematic review by Johnson and Markowitz (2018) revealed food insecurity, regardless of the level, is associated concurrently and with subsequent behavioral, academic, and emotional problems from infancy to adolescence even after controlling for confounding variables like parental distress and maternal mental health. Food insecurity, as measured primarily by parent report on the 18 item USDA Core Food Security Module, was associated with decreased academic performance and more internalizing and externalizing behaviors, including inattention and self-control deficits. Academic performance was measured directly by trained data collectors as part of the ECLS-B. Behaviors were measured by teacher report on standardized instruments. Also, increasing episodes of food insecurity from infancy to kindergarten were associated with poorer kindergarten outcomes across all readiness skills measured. Additionally, mothers in food-insecure households may be more withdrawn, distracted, stressed, and depressed, which previous research has shown to lessen healthy parent-child interactions and lessen learning opportunities. These findings are consistent with previous research that also found an association between food insecurity and lower scores on a standardized academic measure, the Wide Range Achievement Test-Revised, for both math and reading (Shankar et al., 2017).

Jyoti et al. (2005) examined the relationship between food insecurity and school-aged children's academic performance, weight gain, and social skills. The sample consisted of approximately 21,000 children in grades kindergarten to 3rd grade from the 1998 Early Childhood Longitudinal Study-Kindergarten Cohort. Food security was measured using a modified USDA module. Reading and mathematical performance were assessed directly through individually-administered assessments in kindergarten and 3rd grade. Social skills were measured by teacher report. Results suggested even marginal food insecurity predicted lower test scores for math and reading among children between kindergarten and third grade. Boys were more likely to experience social skills deficits. Additionally, caregivers of "hungry" school-aged children reported higher rates of special education services and grade repetition for their children compared to their "at-risk-for hunger" and "non-hungry" peers.

Mental Health/Behavioral

The systematic review by Shankar et al. (2017) also included findings on the associations between food insecurity and inattention, externalizing behaviors. Overall, results suggested a bivariate association between food insecurity and subsequent adverse childhood behavioral, emotional, and cognitive function for all age groups (infants and toddlers, preschoolers, school age, and adolescents). One study reviewed found infants and toddlers from households classified as low food security had a 3-fold increase in children's developmental risk according to parent report. Another study found that infants and toddlers that experienced increasing food insecurity levels at 9 months of age were associated with child attachment and lower mental proficiency at 24 months of age as measured by a standardized instrument. Results from the systematic review suggested

school aged children from food insecure households were more likely to have poorer interpersonal relations, previous mental health counseling, higher rates of hyperactivity and inattention, two times as likely to have seen a psychologist, 1.5 times more likely to show internalizing behaviors, and twice as likely to show externalizing behaviors. One study controlled for parental characteristics and found that the effect of food hardship disappeared, suggesting only an indirect association between food hardship and behavior problems.

The systematic review by Shankar et al. (2017) revealed the major correlates of household food insecurity were psychosocial for adolescents. Food insecurity was associated with mental health symptoms and diagnoses in multiple studies. One study found that 12 to 16 year olds, even those with a lower background demographic risk whose households experienced food insufficiency, were more likely to have been suspended, had seen a psychologist, had difficulty getting along with peers, and had fewer friends. Additional research discovered a 4-fold increase in food insufficient households in dysthymia, as well as an increase in the adolescent's reported want to die, history of suicide attempts, and unintentional weight loss or weight gain. Hunger at ages 0 to 11 and 14 to 18 was a predictor of depression and suicidal ideation in late adolescence and young adulthood up to age 25 with a greater impact among females.

When considering the association between food insecurity and school performance, three specific factors that are important to examine are inattention, executive functioning, and learning problems because these factors play important roles in academic success. According to Connors (2008), children who are inattentive may have poor concentration/attention or difficulty keeping their minds on work, make

careless mistakes, may be easily distracted, may give up easily or be easily bored, may avoid schoolwork, and may have difficulty starting and/or finishing tasks. Children who have weak executive functioning skills may have difficulty starting or finishing projects, may complete projects at the last minute, and may have poor planning, prioritizing, or organizational skills. Children who experience learning problems may have difficulty learning and/or remembering concepts, may need extra instructions, and may have executive functioning deficits.

Statement of the Problem

Given the prevalence of food insecurity among families with school-aged children and the associations between nutrition and school performance, this research study aims to determine if there is a link between food insecurity and executive functioning, inattention, and learning problems, given their relationship with academic performance. Further, since much of the research examining the link between food insecurity and school performance has focused on elementary-aged children, this current study will contribute to knowledge on food insecurity and school performance among adolescents. The primary reason for investigating this relationship is to inform educators on how food insecurity relates to development.

Research Question

1. Is food insecurity associated with adolescents' parent-reported inattention, executive functioning deficits, and learning problems?

CHAPTER II

METHODS

Participants and Setting

The initial sample of participants included eight English-speaking parents whose children attended an after-school club for children between the ages of 12-18. Two of the parents completed the surveys for children who did not meet the age criteria of 12-18 years old and consequently, this data was excluded as a result. The final sample nine adolescents and six parent raters (three of the parents completed surveys for two children each). The adolescents who were rated included five males (ages 13, 15, 16, 16, 18) and four females (ages 12, 12, 14, 15).

Materials

Parents completed the *USDA Food Security: Six-Item Short Form* (Economic Research Service, USDA, 2012) and the *Conners 3-Parent Short Form* (Conners, 2008). In total, there were six food security modules completed and nine *Conners 3-Parent Short Form* scales completed. All participants completed the English version of each survey.

Food Security. Household food security was assessed using the *USDA Food Security: Six-Item Short Form* (See Appendix A). The short form was developed by researchers at the National Center for Health Statistics in collaboration with Abt Associates Inc and was documented in “The effectiveness of a short form of the household food security scale,” by S.J. Blumberg, K. Bialostosky, W.L. Hamilton, and R.R. Briefel (published by the *American Journal of Public Health*, vol. 89, pp. 1231-34, 1999). The short form is an acceptable substitute for the 18-item *U.S. Household Food Security Survey Module* and has been shown to identify food insecurity with reasonably high accuracy and minimal bias compared with the full 18-item form (Coleman-Jensen et al., 2019). The short form was selected in order to lessen the burden of parent participation in this project. The short

form is an acceptable substitute for the 18-item *U.S. Household Food Security Survey Module* and has been shown to identify food insecurity with reasonably high accuracy and minimal bias compared with the full 18-item form (Coleman-Jensen et al., 2019). The short-form does not, however, directly ask about a child's food security, and does not measure the most severe range of adult food insecurity, in which a child's food intake is likely to be reduced.

Two of the questions on the short form ask about household food security. For example, the first question asked, "The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more. Was that often, sometimes, or never true for (you/your household) in the last 12 months?" The respondent then checks "Often true," "Sometimes true," "Never true," or "DK or Refused." The remaining four questions ask about the adult's food security. For example, the adult must answer the question, "In the last 12 months, since (name of current month), did (you/you or other adults in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?" The respondent then checks "Yes," "No," or "DK".

The sum of affirmative responses is then totaled to create a raw score. Results of the ratings are categorized into three possible qualitative descriptors: high or marginal food security (raw score 0-1), low food security (raw score 2-4), and very low food (raw score 5-6).

Inattention, Executive Functions, and Learning Problems. The *Conners 3-Parent Short Form* is valid and reliable norm-referenced assessment tool used to obtain parent's observations of symptoms and behaviors characteristic of attention-deficit/hyperactivity disorder (ADHD) and its most common co-morbid problems. The tool is used for

children aged 6 to 18 years old. It yields subscale scores for inattention, hyperactivity/impulsivity, learning problems, executive functioning, defiance/aggression, and peer relations. It is typically used as a multi-informant assessment that takes into account home, social, and school settings, with rating forms for parents, teachers, and youth. Only the parent form was selected in order to lessen the burden of participation in this project. The parent respondent must answer “Not true at all (Never, Seldom),” “Just a little true (Occasionally),” “Pretty much true (Often, Quite a bit),” or “Very much true (Very often, Very frequently)” to 43 items assessing their child’s behavior over the previous month. For the purposes of this study, the inattention, executive functioning, and learning problems subscales were selected. Items that contribute to the inattention, executive functioning, and learning problems subscales assess the child’s ability to stay focused, accurately spell, and finish tasks

The results from the *Conners 3-Parent Short Form* are represented in T Scores. T Scores have a mean of 50 and a standard deviation of 10. According to the *Conners 3-Parent Short Form*, a score <40 is considered a low score, reflecting less levels parent-reported concerns, score of 40-59 is considered an average score reflecting typical levels of parent-reported concern. Scores between 60-64 are considered a high average score reflecting slightly more concerns than are typically reported. Scores between 65-69 are considered an elevated scores reflecting more concerns than are typically reported. A score 70 and above is considered a very elevated score reflecting many more concerns than are typically reported.

The *Conners 3-Parent Short Form* also provides an assessment of validity where parent-response style could yield an overly positive or overly negative impression score

based on parent responses to items specifically used to calculate the impression scores. Users of the tool may wish to review individual items used to calculate the impression scores if results indicate an abnormally positive or negative response style.

Procedure

Parents of adolescents in 8th – 12th grade were recruited on three separate occasions at an after-school community program facility devoted to serving students from low-income families. Specifically, the program director verbally notified parents that the researcher would be present during their “Family Night” (i.e., graduation celebration, job fair). Typically there are 20-30 parents/adult caregivers present on these nights with some attending multiple nights. On the nights that the researcher was present, parents were asked by the front desk agent to consider participating in the project when they checked in. They were reminded by the front desk agent that their participation was voluntary. Once in a confidential setting, the researcher asked each parent to read the cover letter and consent form, sign the consent form to participate, and then complete the surveys. The surveys were then placed into a sealed and numbered envelope. The consent forms were not numbered and were placed into a different container to protect anonymity. Participants were notified that their names would be entered into a drawing for a gift card for their participation. The drawings took place after data collection was completed on all three nights. Surveys were completed by hand on hard copy and took approximately 20 minutes to complete.

CHAPTER III

RESULTS

The purpose of this project was to determine if there is a relationship between food insecurity and adolescents' parent-reported inattention, executive functioning deficits, and learning problems. Given the low number of participants, the following is a descriptive analysis of *Conners 3-Parent Short Form* results based on level of food security as measured by the *USDA Food Security: Six-Item Short Form*. Any T score at or above 60 on the *Conners 3-Parent Short Form* will be treated as noteworthy due to being one standard deviation above the mean.

Of the nine total adolescents whose behaviors were rated, three were classified as being from high to marginal food security households and six were classified as being from low food security households. Of the three adolescents in the high or marginal food security group, two were from the same household with a total of two households being represented in this group. Of the adolescents in the low food security group, four total households were represented.

High or Marginal Food Security Households

Table 1 represents the participant demographics and the results of the *Conners 3-Parent Short Form* scales for households identified as high or marginal food security by the *USDA Food Security: Six-Item Short Form*. Findings suggest adolescents from households that are classified as high or marginal food security may have fewer parent-reported concerns for learning problems and executive functioning. Furthermore, as Table 1 shows, two adolescents from the same household had very elevated scores for the inattention subscale. All other subscales were rated in the average score range. The response style on the *Conners 3-Parent Short Form* for the adolescent aged 15 yielded a

possible overly positive response style. This suggests results may have presented a more favorable impression of her behavior than warranted.

Table 1. Participant Demographics and Scale Results for High or Marginal Food Security Households

<i>Gender</i>	<i>Age</i>	<i>Grade</i>	<i>FS Module Raw Score²</i>	<i>Inattention (T Score)</i>	<i>Learning Problems (T Score)</i>	<i>Executive Functioning (T Score)</i>
Female ¹	12	8	1	86	50	55
Male ¹	13	9	1	78	50	52
Female	15	9	1	42	43	40

Note. ¹ siblings from same household, *Note.* ² FS=food security

Low Food Security Households

Table 2 represents the participant demographics and the results of the *Connors 3-Parent Short Form* scales for households identified as low food security *USDA Food Security: Six-Item Short Form*. Four out of the 6 adolescents were rated as having behavior or learning challenges. All adolescents in this group were rated as having difficulties in more than one area.

For inattention, one adolescent was rated in the very elevated range, three were rated in the high average range, and two were rated in the average score range. For learning problems, two adolescents were rated in the very elevated range, one was rated in the elevated range, and three were rated in the average score range. For executive functioning, one adolescent was rated in the very elevated range, one was rated in the high average range, three were rated in the average score range, and one was in the low score range.

One adolescent, 8th grade, was rated in the very elevated range for all three areas but the parent's response style did not classify as overly negative according to the scales'

assessment of validity. No parent ratings on the *Conners 3-Parent Short Form* yielded concern for an overly positive or negative response style.

Table 2. Participant Demographics and Scale Results for Low Food Security Households

<i>Gender</i>	<i>Age</i>	<i>Grade</i>	<i>FS Module Raw Score³</i>	<i>Inattention (T Score)</i>	<i>Learning Problems (T Score)</i>	<i>Executive Functioning (T Score)</i>
Female	12	8	3	90	90	90
Female ₁	14	9	2	59	43	51
Male ₁	16	11	2	58	54	57
Male	15	11	4	62	53	64
Male ₂	16	11	3	61	69	37
Male ₂	18	12	3	60	70	47

Note. ¹ siblings from same household, ² siblings from same household, *Note.* ³ FS=food security

Adolescents from the Same Household

While unexpected, three households had two adolescents rated in each. Further descriptive analysis shows two of the households rated as *low* food security had two adolescents rated each. Two adolescents from the same household, ages 14 and 16, were rated average in all areas. The other household comprised of two adolescents, ages 16 and 18, were both rated in the high average range for inattention. They also had noteworthy scores for learning problems (one elevated and one very elevated) and average range scores for executive functioning. These findings suggest similar parent-reported concern for adolescents living in the same household.

CHAPTER IV

DISCUSSION

The aim of this study was to investigate the relationship between food security and parent-reported inattention, executive functioning, and learning problems. Data were gathered via two scales, the *USDA Food Security: Six-Item Short Form*, assessing

household food security, and the *Conners 3-Parent Short Form*, which assessed inattention, executive functioning, and learning problems. Participants were recruited in person by the researcher with the help of the after-school community program's program director. Despite the researcher being present at the after-school community program and offering an incentive for participation, the sample size was very small. Therefore, conclusions can only be drawn on the group of adolescents involved in this project and must be interpreted cautiously.

Relation to Previous Research

Previous research has supported a link between food insecurity and inattention, executive functioning, and learning through similar methodology to this project (Grineski et al., 2018; Jyoti et al., 2005). Those projects assessed household food security and parent-rated child behaviors to determine a relationship between food security/insecurity and outcome variables important for school performance. Consistent with the Grineski et al. (2018) study, the present study assessed executive functioning behaviors by using a standardized assessment. Similar to how food security was measured in the current study, parents completed a modified USDA module in the Jyoti et al. (2005) study.

The same proportion of adolescents from households classified as *high or marginal food security* and *low food security* were identified as having inattention concerns. That is, there were no apparent parent-reported inattention differences between these two groups. On the other hand, more adolescents were identified as having executive functioning deficits and learning problems in households classified as *low food security* compared to those adolescents in households classified as *high or marginal food security*. All adolescents from households classified as *low food security* were rated as

having difficulties in more than one area measured. These trends are consistent with previous systematic review research that found children from food insecure households had lower school performance and higher rates of reported behavioral problems (Shankar et al., 2017).

Belsky et al. (2010) and Johnson and Markowitz (2018) also used a USDA developed food security module and a standardized assessment of behavior. Both studies used a longitudinal design to measure outcomes for children instead of a cross sectional design like the current study. Both studies used teacher report of behavior instead of parent report. Interestingly, Belsky et al. (2010) did not find that food insecurity was associated with behavioral problems after they accounted for differences in the child's home environment. Belsky et al. (2010) found mothers' personalities and household sensitivity to children's needs may present challenges to improving outcomes of children with food insecurity. Johnson and Markowitz (2018) did find an unfavorable association between food insecurity and social-emotional outcomes in kindergarten.

Limitations

The results of this analysis should be interpreted in the context of the study's limitations. Despite efforts to increase participation including multiple nights of data collection and participation raffles, the sample size of participants was very small. As a result, the findings are limited specifically to the participants involved and to the program where participants were recruited. Results should not be generalized to the broader population. There are also other possible explanations for the findings that were not measured or ruled out. The present study also includes limitations for how food security and outcome variables were measured.

Assessing Food Security

The *USDA Food Security: Six-Item Short Form* does not directly ask about the child's food security and does not measure the most severe levels of food insecurity in which children's food intake is likely to be reduced. It is important to consider measuring the most severe levels of food insecurity given its prevalence in the United States. In 2018, 0.6% (220,000) of households with children in the United States experienced instances of *very low food security among children*. These households reported that children were hungry, skipped a meal, or did not eat for a whole day because there was not enough money for food (Coleman-Jensen et al., 2019).

As noted by previous research (Grineski et al., 2018), households can transition within the varying levels of food security and also stay static in one. This project only assessed a household's food security status at one point in time, which further limits the interpretations of this data.

Assessing Inattention, Learning Problems, and Executive Functioning

The results are also limited in that only the parent form of the *Conners 3* was used. Typically, multiple forms of the *Conners-3* are used to gain information from multiple perspectives on a child's behaviors which in turn, increases the validity of children's reported behaviors. Also, participants were not asked if their child had prior or current diagnoses that might contribute to or better explain the elevated scores on the *Conners 3-Parent Short Form*.

Implications for Future Research

Future research on this topic is necessary to continue to increase awareness of the impact of food security on youth behaviors and school performance, as well as supports

for families that are experiencing food insecurity regardless of the level of food insecurity. Given the findings by Shankar et al. (2017), it is important to further investigate how food insecurity is related to social emotional and academic outcomes for adolescents in particular given multiple research findings suggesting a relationship between food insecurity and mental health, including suicidal ideation. While the current research findings suggest a bivariate association between food insecurity and concurrent and future negative developmental and behavioral outcomes, they are unable to show a direct effect. Regardless, food insecurity is a preventable and remedial threat to children's behavioral and emotional health, no matter what age and needs to be studied further. Shankar et al. (2017) suggests a formal meta-analysis to provide a greater understanding of the consistency and magnitude of food insecurity on child outcomes in the social and cognitive domains.

Sample and Demographics

Future research can improve on the current study by increasing the sample size and thus the generalizability of the results. A researcher trying to increase participation might try coordinating efforts with a school district where there is a large population of students in after-school programs. The surveys could possibly be mailed to those households with a return envelope along with an explanation of why the information gathered will help support food programs at the local, and possibly national level.

Parents were only asked to identify their adolescent's gender, age, and grade. Future research may consider asking more questions about the makeup of households with children to help determine if measured rates are consistent with what would be expected. The rates of food insecurity are higher than the national average (11.1%) in all

households with children (13.9%), households with children under age six (14.3%), households with children headed by a single woman (27.8%) or a single man (15.9%), and other households with children (21.1%) (Coleman-Jensen et al., 2019).

Future research may also consider asking about prior and current diagnoses (e.g., ADHD). Prior and current diagnoses may be a variable to control for before determining if food insecurity is negatively related to behavior.

Food Security

Future research may consider assessing the food security status at multiple time points over an extended period of time to determine if the food security stays static or varies and how the consistency of food security status relates to inattention, learning, and executive functioning. This would have the potential to add to previous longitudinal research (e.g., Grineski et al., 2018) that assessed how transitions within varying food security statuses related to academics, executive functioning, and behavior.

Parents were asked to rate their household food security status but were not asked if their child lived in any other households. This could be further investigated and could add to the research. Future research might also consider using the *U.S. Household Food Security Survey Module* to increase precision and reliability in measuring household food security. The *U.S. Household Food Security Survey* also asks directly about conditions of children in the home whereas the *USDA Food Security: Six-Item Short Form* does not.

Inattention, Learning Problems, Executive Functioning

Only one form of the *Conners 3-Parent Short Form* was used to gather data on adolescents' parent-reported inattention, learning, and executive functioning. Future research may consider a multi-informant approach where a teacher and self-report form

are used. This would have the potential to increase the validity for reported concerns for the areas measured. Future researchers may consider asking parents about their responses to individual items that comprise the impression scales if confidentiality can be maintained. Doing this could have the potential to increase the validity of the results.

Implications for Practice

Despite attempts to mitigate the impacts of food insecurity at the local, state, and national level through programs like the National School Lunch Program, Women, Infants, and Children (WIC), and the Supplemental Nutrition Assistance Program (SNAP), food insecurity rates continue to be a concern in the United States (Coleman-Jensen et al., 2019). Research suggests students are more likely to be successful at school when they receive proper nutrition (Florence et al., 2008; Fu et al., 2007). Additional research on the impact of food programs should be conducted to increase school psychologists' understanding of how to support students from food-insecure household. School psychologists have the potential to help support families experiencing food insecurity by connecting them with food assistance programs.

School psychologists are advocates for all students and use data to inform practices. School psychologists must be knowledgeable of any factors that may contribute to student behavior, development, and school learning. By understanding the research on how food insecurity relates to learning and analyzing data, they can advocate in a more targeted fashion at the school, local, state, and national level, and positively support a child's school performance as a result. They can also use their data based decision-making skills to gather data on the effectiveness of school nutrition programs and local programs to support the nutrition needs of all students. This work would have the

potential to support equitable practices as well. Equity requires all students have high expectations for school performance while being provided the necessary supports to attain those high expectations.

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Appendix A

Food Security Module

1. The food that (I/we) bought just didn't last, and (I/we) didn't have money to get more. Was that often, sometimes, or never true for (you/your household) in the last 12 months?

- Often true
- Sometimes true
- Never true
- DK or Refused

2. (I/we) couldn't afford to eat balanced meals. Was that often, sometimes, or never true for (you/your household) in the last 12 months?

- Often true
- Sometimes true
- Never true
- DK or Refused

3. In the last 12 months, since last (name of current month), did (you/you or other adults in your household) ever cut the size of your meals or skip meals because there wasn't enough money for food?

- Yes
- No (Skip 4)
- DK (Skip 4)

4. [IF YES ABOVE] How often did this happen—almost every month, some months but not every month, or in only 1 or 2 months?

- Almost every month
- Some months but not every month
- Only 1 or 2 months
- DK

5. In the last 12 months, did you ever eat less than you felt you should because there wasn't enough money for food?

- Yes
- No
- DK

6. In the last 12 months, were you every hungry but didn't eat because there wasn't enough money for food?

- Yes
- No
- DK