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GRIT AND FOOD SECURITY AMONG FEMALE CAREGIVERS IN A RURAL,
APPALACHIAN MISSISSIPPI COUNTY

by
Mary Frances Buzhardt

A thesis submitted to the faculty of The University of Mississippi in partial fulfillment of the requirements of the Sally McDonnell Barksdale Honors College.

Oxford, MS
May 2022

Approved by

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DEDICATION

To everyone who believed in me and guided me through the busiest and most life-giving season
of my life. Thank you.

ACKNOWLEDGEMENTS

Thank you to my thesis advisor, Dr. David H. Holben, for his constant guidance, wisdom,
and support throughout this entire process.

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their counsel and contributions.

Thank you to the Sally McDonnell Barksdale Honors College for giving me the opportunity
to grow and learn the past four years.

ABSTRACT

Grit and food security among female caregivers in a rural, Appalachian Mississippi county.

Background: Grit is the determination and resolve required for accomplishing long term goals.

Research Outcome: This study examined: 1) differences in grit by household food security status; and 2) relationship between grit and household food security status among female caregivers of elementary school children in a rural, Appalachian Mississippi county after participation in a produce voucher intervention.

Methods: Female caregivers (n=1,144) were recruited at three elementary schools in MS in November 2017 and enrolled into a produce voucher intervention (\$11/week over 10 weeks). Validated measures of household food security status (10-item USDA survey) and grit score (8-item Duckworth survey) were measured at both pre- and post-intervention.

Analysis: Differences in grit between food security groups were assessed using independent samples t-tests. Relationship between grit and household food security status was assessed using Pearson r correlation.

Results: Female caregivers (n=185) responded to pre-survey [185/1084, 17.1% response rate], with 76/185 completing both pre- and post-surveys (41.1%). Overall response rate was 7.0% (76/1084). Participants were 37 ± 9 years (n=73), primarily Caucasian (n=54/75, 72.0%), and living in fully food secure households (n=50/76, 65.8%). Post grit score was 3.8 ± 0.5 (Range: 2.4-4.7) and was significantly higher among those living in fully food secure households

(3.8 ± 0.5), compared to those living in non-fully food secure households (3.6 ± 0.5) (t-test, $p=.040$). Grit score was significantly associated with number of positive household food security responses (Pearson $r=-.271$, $p=.018$), with higher grit being associated with better household food security.

Conclusions: Grit is associated with food security among female caregivers of children in Mississippi. Exploring interventions that improve grit is warranted and may be a solution to improving food insecurity.

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CHAPTER I: INTRODUCTION

Food security is when a household has access to adequate food necessary for an active, healthy lifestyle (USDA, 2021a). Households that experience difficulty in having enough food for all members at some point during the year due to a lack of resources are defined to be food insecure (Rabbit et al., 2017). The United States Department of Agriculture (USDA) assesses household food security status by issuing an annual, nationally representative survey (Coleman-Jensen et al., 2018). The frequency of households experiencing food insecurity conditions annually can range from a single episode to chronic episodes (USDA, 2021c). Ranges of food security can be defined for households (USDA, 2021b). Household food security status can be classified as being high, marginal, low, or very low (USDA, 2021b). Food secure households are those with high or marginal food security status, and food insecure households are those with low or very low food security status (USDA, 2021b). Furthermore, fully food secure households are those with high food security, while non-fully food secure households are those with marginal, low, or very low food security (USDA, 2021b). In 2017, an estimated 11.8% of U.S. households were food insecure, with 7.8% displaying low food security and 4.5% displaying very low food security (Coleman-Jensen et al., 2018). Consequences of food insecurity have been associated with poor physical and mental health (Gundersen & Ziliak, 2015). The prevalence of food security ranges among different groups of the U.S. population and can be used in determining which groups might exhibit a higher need for assistance to alleviate consequences associated with food insecurity (Rabbit et al., 2017).

Federal food and nutrition assistance programs exist to provide services that reduce the severity of food insecurity (Coleman-Jensen et al., 2018). One method of intervention includes providing vouchers that can be exchanged for food (Bihan et al., 2012). In Appalachian Mississippi, food insecurity is associated with decreased produce intake (Shirley et al., 2018). The use of fruit and vegetable vouchers help to alleviate financial barriers associated with a fruit- and vegetable-poor diet in lower-income subgroups (Shirley et al., 2018). Fruit and vegetable vouchers, used in conjunction with education intervention, lower the proportion of consumers with a fruit- and vegetable-poor diet (Bihan et al., 2012). Further studies are needed to assess the effects of fruit and vegetable vouchers on other health outcomes associated with food insecurity, such as mental health.

Grit is a term used to describe the passion and perseverance for achieving long-term goals and includes the endurance of hard work and effort despite possible failures or adversities (Duckworth et al., 2007). Duckworth et al. (2007) initially measured grit using the 12-item Grit Scale (Grit-O), but later adapted the survey to become the 8-item Short Grit Scale (Grit-S), which was found to be more accurate and psychometrically stronger. Grit-S uses a 2-factor structure, measuring perseverance of effort and consistency of interest (Duckworth & Quinn, 2009). Grit is positively correlated with levels of education, academic success, fewer career changes, self-control (Duckworth et al., 2007), health management skills, mental and physical health-related quality of life (Sharkey et al., 2017), and social and personal wellbeing (Sheridan et al., 2015; Datu et al., 2016; Salles et al., 2014; Singh & Jha, 2008; Von Culin et al., 2014).

Some methods to improve grit include changing processes of thought, such as pursuing interests, connecting to a higher purpose, embracing challenges, and cultivating hope (Duckworth, 2016). Education intervention in a classroom setting aims to increase grit score.

Students treated with intervention are more likely to set difficult goals, engage in skill-accumulation activities, and acquire more skills (Alan et al., 2019). Further studies on the specific effects of interventions that improve grit are warranted.

No direct relationship exists between grit and socioeconomic status. However, in disadvantaged households, young adults who exhibit success in overcoming challenges are associated with a higher grit score (Kundu, 2017). Disadvantaged households may also increase the prevalence of food insecurity, as lower socioeconomic status is a determinant of food insecurity (Ramsey et al., 2012). Other predictors of household food insecurity include lower education level, single-headed households, younger age, and racial and ethnic minority status (Nickolaus et al., 2019).

A potential predictor of household food insecurity is grit, which is a possible explanation for why some impoverished households are food secure (Nickolaus et al., 2019). In Appalachian Mississippi, food insecurity is associated with a lower grit score (Dees et al., 2018). Because both grit and food insecurity may be improved through interventions, and a characteristic of grit is resilience through adversity, further examination of the link between grit and household food security may help reduce the severity of food insecurity. Although research has been conducted in rural, Appalachian Mississippi related to grit, food security, and Supplemental Nutrition Assistance Program (SNAP) usage in male and female caregivers (Dees et al., 2018), to our knowledge, no research has been conducted in rural, Appalachian Mississippi related to grit and household food security among female caregivers. Therefore, the purposes of this study were to examine: 1) differences in grit by household food security; and 2) the relationship between grit and household food security among female caregivers of elementary school children in a rural,

Appalachian Mississippi county after participation in a produce voucher intervention. The specific research questions and hypotheses for this study are summarized in Table 1.

Table 1

Research Questions and Hypotheses of the Study

Research Question	Hypothesis
Does grit score differ by household food security status among female caregivers of elementary school children after participation in a produce voucher intervention?	Grit score will be higher in female caregivers living in fully food secure households, compared to non-fully food insecure households following participation in a produce voucher intervention.
What is the relationship between grit and household food security status among female caregivers of elementary school children after participation in a produce voucher intervention?	Grit will be significantly, positively correlated to better household food security status following participation in a produce voucher intervention.

CHAPTER II: REVIEW OF LITERATURE

The purposes of this study were to examine: 1) differences in grit by household food security; and 2) the relationship between grit and household food security among female caregivers of elementary school children in a rural, Appalachian Mississippi county after participation in a produce voucher intervention.

Food Security

Food security is defined as a household's access to adequate food necessary for an active, healthy lifestyle. Households having "limited or uncertain ability" in the availability or acquisition of "acceptable foods in socially acceptable ways" at some point during the year are defined by the USDA as having food insecurity (USDA, 2021a). Socially acceptable ways of acquiring food include households not having to resort to coping strategies, such as emergency food supplies or stealing. The status of food security is measured by the USDA and is used to examine the extent of food insecurity. Prevalence can then be used to target the groups exhibiting a higher need for assistance in alleviating problems associated with food insecurity, allowing further improvement of federal food and nutrition assistance programs (Rabbitt et al., 2017).

Measurements of Food Security Status

The USDA Economic Research Service measures food security status with various survey modules. These include the U.S. Household Food Security Survey Module, U.S. Adult Food Security Survey Module, Six-Item Short Form of the Food Security Survey Module, and Self-Administered Food Security Survey Module for Youth Ages 12 and Older. (USDA, 2021d).

The U.S. Household Food Security Survey Module and the U.S. Adult Food Security Survey module have a three-stage design with screeners to minimize response burden and ensure reliable data (USDA, 2021d). The U.S. Household Food Security Survey Module contains 18 questions and includes questions pertaining to children if present in the household (USDA, 2021d). The U.S. Adult Food Security Survey Module, shown in Appendix A, contains 10 questions and excludes questions pertaining to children (USDA, 2021d). The Six-Item Short Form of the Food Security Survey Module uses a subset of the 18-item survey if neither the 18-item nor 10-item measurements can be implemented (USDA, 2021d). The Self-Administered Food Security Survey Module for Youth Ages 12 and Older is used by children ages 12 and older (USDA, 2021d).

For all USDA measures of food security status, the nature of the questions aims to assess behaviors and experiences relating to the difficulty of acquiring food adequate for the entire household (USDA, 2021d). The frequency of households experiencing food insecurity conditions annually can range from a single episode to chronic episodes (USDA, 2021a). Ranges of food security can be defined from any of the USDA survey modules by using a scale score ranging from 1-10 (USDA, 2021d). The scale score is determined from the number of positive responses on any of the USDA survey modules and classifies food security status as being high, marginal, low, or very low (USDA, 2021b; USDA, 2021d). Food secure households are those with high or marginal food security status, and food insecure households are those with low or very low food security status (USDA, 2021b). Furthermore, fully food secure households are those with high food security, while non-fully food secure households are those with marginal, low, or very low food security. (USDA, 2021b). Table 2 summarizes these definitions.

Table 2

Household Food Security Status Categorization

Ranges of Food Security	Definition	Classification (Food Secure, Food Insecure)	Classification (Fully Food Secure, Not Fully Food Secure)
High	No reported indications of food-access problems or limitations.	Food Secure	Fully Food Secure
Marginal	One or two reported indications—typically of anxiety over food sufficiency or shortage of food in the house. Little or no indication of changes in diets or food intake are present.	Food Secure	Not Fully Food Secure
Low	Reports of reduced quality, variety, or desirability or diet. Little or no indication of reduced food intake.	Food Insecure	Not Fully Food Secure
Very Low	Reports of multiple indications of disrupted eating patterns and reduced food intake.	Food Insecure	Not Fully Food Secure

“Definitions of Food Security.” Economic Research Service (2021b). USDA.

Prevalence of Food Insecurity in the United States

In 2017, the timeframe for this research study, an estimated 15.7% of households with children under age 18 were food insecure, with 8.0% comprising of only food insecure, and 7.7% having both food insecure adults and children (Coleman-Jensen et al., 2018). Considering households with children, 0.7% of households (250,000 households) reported child food insecurity so severe that children “were hungry, skipped a meal, or did not eat for a while day because there was not enough money for food” (Coleman-Jensen et al., 2018).

Food insecurity prevalence varies with demographic and economic characteristics (Coleman-Jensen et al., 2018). Of households with annual incomes below the official poverty line, 36.8% were food insecure (Coleman-Jensen et al., 2018). Food insecurity was higher than

the 2017 national average for households with children, households with children under age six, households with children headed by a single woman or man, women living alone, men living alone, households headed by Black non-Hispanics and Hispanics, and households with incomes below 185 percent of the poverty threshold (Coleman-Jensen et al., 2018). Regionally, food insecurity was more prevalent for households in principle cities of metropolitan areas and in rural areas, as well as in the South and Midwest (Coleman-Jensen et al., 2018). Furthermore, the Southern region of the United States had the highest average nonmetro poverty rate (19.7%) from 2015-2019, when compared to the Northeastern, Midwestern, and Western regions (USDA 2021c). In a sample of households with children enrolled in the Head Start program in rural, Appalachian Ohio, 48.8% of households were food insecure, 30.3% had experienced hunger in the previous 12 months, and 13.8% were food insecure with childhood hunger (Holben et al., 2014).

Food Security Associations

Food insecurity is associated with many negative health outcomes, such as physical impairments, psychological issues, and sociofamilial disturbances (Holben & Marshall, 2017). Disrupted eating patterns often result from food insecurity and can lead to suboptimal nutritional status, as well as contribute to an increased risk for disease (Holben & Marshall, 2017). Among children, food insecurity is associated with increased risks of “some birth defects, anemia, lower nutrient intakes, cognitive problems, aggression and anxiety...being hospitalized and poorer general health, and with having asthma, behavioral problems, depression, suicide ideation, and worse oral health” (Gundersen & Ziliak, 2015). In rural, Appalachian Ohio, BMI and obesity were greater among food insecure households (Holben & Pheley, 2006). Federal food nutrition

programs exist to help alleviate some of these outcomes associated with food insecurity (USDA, 2021h).

Food Insecurity Alleviation Methods

Households experiencing food insecurity have access to a variety of resources to overcome associated challenges, such as federal nutrition assistance programs and community-based programs (Holben & Pheley, 2006). Among the largest programs are the Supplemental Nutrition Assistance Program (SNAP), the National School Lunch Program (NSLP), and the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) (USDA, 2021h). SNAP works to provide benefits to households for the purchase of healthy foods, such as certain produce, meats, and grains (USDA, 2021f). NSLP provides schools with cash subsidies and donated commodities, required that the schools serve lunches meeting federal guidelines and offer eligible children lunches at free or reduced prices (USDA, 2021e). WIC provides to low-income pregnant, breastfeeding, and non-breastfeeding postpartum women; as well as infants and children up to age five who are regarded with having nutritional risk (USDA, 2021g). This aid includes federal grants to states for “supplemental foods, health care referrals, and nutrition education” (USDA, 2021g).

Grit

Grit is defined as the “perseverance and passion for long-term goals” (Duckworth, Peterson, Matthews, & Kelly, 2007). The essence of grit emphasizes working through obstacles, as well as the ability to keep effort and attentiveness over a long period of time—even in the face of shortcomings, failure, adversity, and plateaus in progress (Duckworth et al., 2007). Grit may be a better predictor of achievement when compared to other traits, such as intelligence and innate talent (Duckworth et al., 2007).

Duckworth et al. (2007) initially measured grit using the 12-item Grit Scale (Grit-O), but later adapted the survey to become the validated 8-item Short Grit Scale (Grit-S), which was found to be more accurate and psychometrically stronger. Grit-S uses a 2-factor structure, with four items measuring perseverance of effort and four items measuring consistency of interest (Duckworth & Quinn, 2009). The response to each question is given a score of one to five, and the total score after eight items is averaged (Duckworth & Quinn, 2009). The average score ranges one to five, with five reflecting extreme grit and one reflecting no grit (Duckworth & Quinn, 2009). The survey questions and scoring methods for the Grit-S survey are shown in Appendix B and C, respectively.

Grit Associations

Grit is positively correlated with levels of education, academic success, fewer career changes, self-control (Duckworth, Peterson, Matthews, & Kelly, 2007), health management skills, mental and physical health-related quality of life (Sharkey et al., 2017), and social and personal wellbeing (Sheridan et al., 2015; Datu et al., 2016; Salles et al., 2014; Singh & Jha, 2008; Von Culin et al., 2014).

Some methods to improve grit include changing processes of thought, such as pursuing interests, connecting to a higher purpose, embracing challenges, and cultivating hope (Duckworth, 2016). Education intervention in a classroom setting aims to increase grit score. Students treated with intervention are more likely to set difficult goals, engage in skill-accumulation activities, and acquire more skills (Alan et al., 2019). Alan et al. (2019) found that students treated with grit intervention are more likely to set difficult goals, engage in skill accumulation activities, and acquire more skills. Vanhove et al. (2015) examined the effectiveness of resilience-building programs (comparable to grit interventions) that exist to

provide resources and skills necessary in preventing various negative effects associated with future stressors. Vanhove et al. (2015) found that the programs had significant proximal effects on improving performance, enhancing well-being, and preventing psychosocial deficits, such as depression, lack of social support, and lack of acceptance of disability (Vanhove et al., 2015). Further studies on the specific effects of interventions that improve grit are warranted.

Food Security and Grit

In households with children, parent grit score may be a determinant of household food security. Among parents and their teenagers, higher grit was associated with lower chances of food insecurity (Nickolaus et al., 2018). Grit is also shown to increase after intervention (Alan et al., 2019). However, further research to determine if grit itself is a protective antecedent to food insecurity (Nickolaus et al., 2018). In Appalachian Mississippi, food insecurity is associated with a lower grit score in male and female caregivers of children, as caregiver grit score was significantly higher in fully food secure households when compared to non-fully food secure households (Dees et al., 2018). Further research on the associations between food security and grit is warranted and may help alleviate consequences associated with food insecurity.

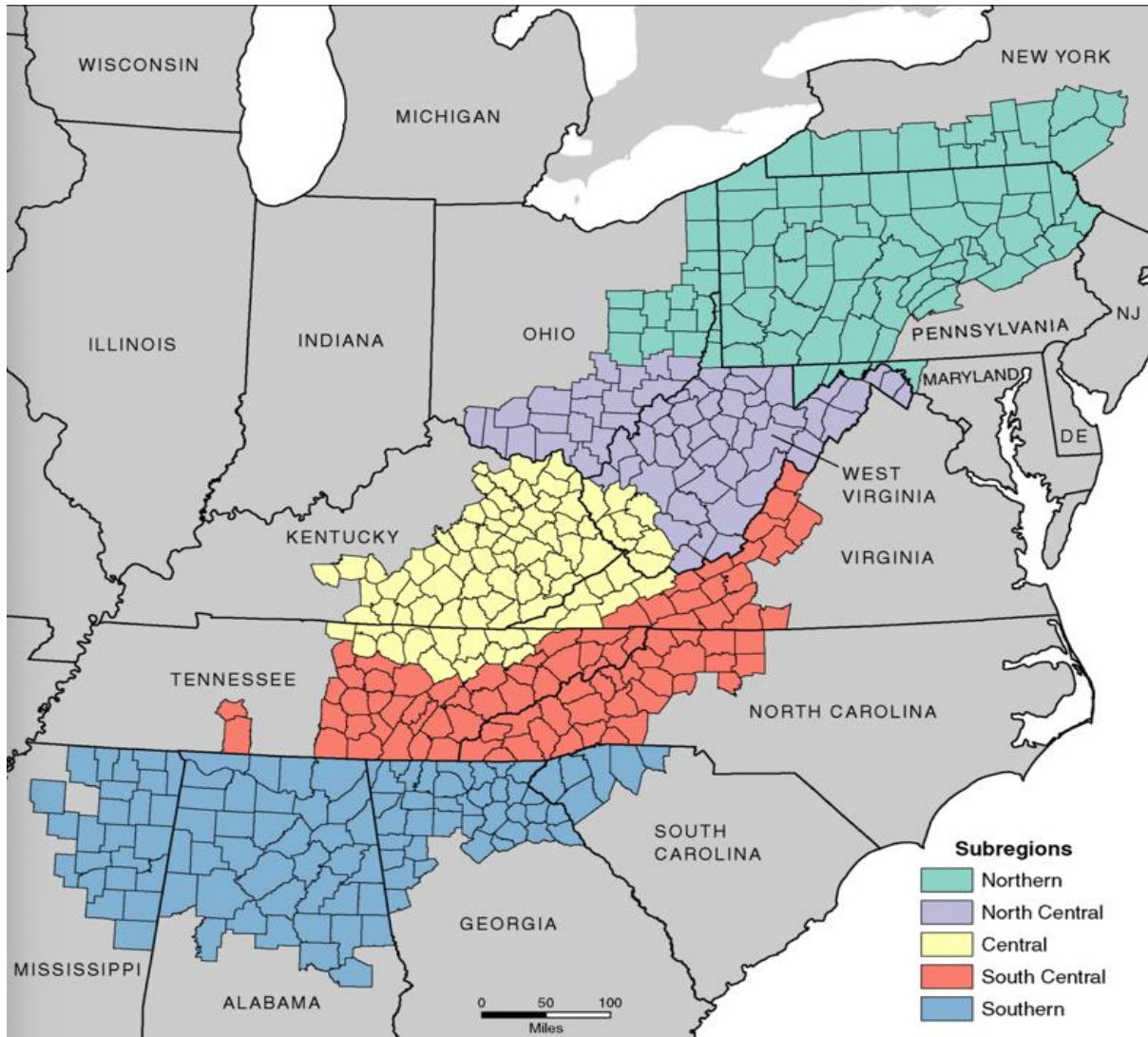
Appalachia

The Appalachia Regional Commission (ARC) defines Appalachia as a region spanning across 13 states, including Alabama, Georgia, Kentucky, Maryland, Mississippi, New York, North Carolina, Ohio, Pennsylvania, South Carolina Tennessee, Virginia, and West Virginia (ARC, 2021). Of Appalachian residents, 42% live in a rural setting, and 18% live below the poverty threshold (Gutschall et al., 2017). An impoverished economy reduces meal preparation

and exercise time due to individuals working long hours far from home (Gutschall et al., 2017). Appalachian residents are more likely than other populations to have decreased access to healthful foods, exhibit a diet low in nutrient density, and display cultural preferences for foods high in fat and meat (Gutschall et al., 2017). Specifically, the Southern Appalachian region has high levels of food insecurity and economic instability (Ramsey 2018). There are 14% less grocery stores in Appalachia compared to the national average, and rural areas with access to a grocery store may experience higher food costs (Wilson et al., 2016). In Appalachian households with children, female members are seen as responsible for the overall health of the family (Schoenberg et al., 2008). Females in rural Appalachia perceived the main threats to community health to be chronic disease, diet, and lack of exercise (Schoenberg et al., 2008). A map of the Appalachian region is shown in Figure 1.

Figure 1

The Appalachian Region, 2021. (Appalachian Regional Commission, 2021).



CHAPTER III: METHODOLOGY

The purposes of this study were to examine: 1) differences in grit by household food security; and 2) the relationship between grit and household food security among female caregivers of elementary school children in a rural, Appalachian Mississippi county after participation in a produce voucher intervention.

Context of Thesis

In the midst of the COVID-19 pandemic, in-person data collection was not possible for a variety of reasons. This study utilized an existing data set from a 2017 intervention study. After the study, it was determined that the intervention was flawed and/or not effective in improving food security status or grit, as summarized in Appendix D. Therefore, for the purposes of this thesis, only post-grit score was utilized in examining both differences in grit by household food security and the relationship between grit and household food security.

Approval for the Study

This study was approved by the University of Mississippi Institutional Review Board prior to the collection of any data.

Settings and Participants

Setting for the Study

This study was conducted in Calhoun County, Mississippi. Calhoun County contains seven municipalities and covers approximately 588 square miles in North Mississippi (U.S. Census Bureau, 2021). In 2017, the year of this study, the total population was estimated to be 14,617. The total population was 40.5 ± 0.4 years, White ($66.9\% \pm 1.1$), female ($52.2\% \pm 0.4$),

married (n=11,682, 46.9% ± 2.7), with a high school diploma or the equivalent (GED) education (n=9,908, 35.9% ± 2.4), with a median individual income of \$19,326 (n=11,682), and at or above 150% of the poverty level (n=14,275, 60.4% ± 3.4) (U.S. Census Bureau, 2017).

The USDA Economic Research Service uses the Rural-Urban Continuum Codes for measuring rurality and evaluating the diversity of rural areas (USDA, 2020). Calhoun County is classified as a code 9 nonmetropolitan area that is “completely rural county, or with less than 2,500 of its urban population not adjacent to a metro area” (USDA, 2020). The Southern region of the United States, which includes Calhoun County, had the highest average nonmetro poverty rate (19.7%) from 2015-2019, when compared to the Northeastern, Midwestern, and Western regions (USDA 2021c).

Calhoun County is included in the Appalachian region, as defined by the Appalachia Regional Commission (ARC, 2021). Calhoun County’s economic status is currently classified as being “at-risk,” defined as “those at risk of becoming economically distressed” that “rank between the worst 10% and 25% of the nation’s counties (ARC, 2021). However, in the 2018 fiscal year, the ARC classified Calhoun County’s economic level as being “distressed,” defined as “the most economically depressed counties” that “rank in the worst 10 percent of the nation’s counties” (ARC, 2021).

Study Participants

Participants were caregivers (n=1,144) of children who were recruited at three elementary schools in November 2017. Participants were enrolled into a produce voucher intervention that provided \$11 per week over a ten-week period from November 2017 to January 2018.

Study Procedures and Analyses

Survey Instrument and Measures

Following enrollment, participants completed a pre-intervention survey. At the conclusion of the ten-week intervention, participants completed a post-intervention survey. The pre- and post-intervention surveys measured participant demographics, household food security status, and grit score. Demographic questions examined gender, age, race, education, marital status, and occupation.

Household food security status was measured using the validated 10-item USDA survey, as shown in Appendix A (USDA, 2021d). The number of positive responses was used to determine a food security scale score ranging from 0-10, as shown in Appendix B (USDA, 2021d). The scale scores were then utilized to place participants in classifications reflecting ranges of food security status, with participants living in households having high food security, marginal food security, low food security, or very low food security (USDA, 2021d). Food security status was additionally classified into households being either food secure or food insecure, in which food secure households included those with high or marginal food security status, and food insecure households included those with low or very low food security status (USDA, 2021b). Further classifications included households being categorized as either fully food secure or non-fully food secure, with fully food secure households having high food security, and non-fully food secure households having marginal, low, or very low food security. (USDA, 2021b). Table 2 summarizes these definitions.

Grit score was measured using the validated 8-item Duckworth survey (Duckworth, 2016). Responses to the survey were used to determine participant Short Grit Scale (Grit-S) score, ranging from 1-5, with 5 reflecting extreme grit and 1 reflecting no grit (Duckworth &

Quinn, 2009). Grit-S survey items and scoring are shown in Appendix C. Grit score at median score or higher was considered a high grit score.

Analysis

IBM SPSS was used for statistical analysis. Descriptive statistics were used to determine the number of participants living in: 1) high, marginal, low, or very-low food secure households; 2) food secure or food insecure households; and 3) fully food secure or not-fully food secure households. Descriptive statistics, including minimum, maximum, mean, and standard deviation, were reported for grit score. Differences in grit between food security groups (fully food secure versus not fully food secure) were assessed using independent samples t-tests, and the relationship between grit and household food security status was assessed using Pearson r correlation. Statistical significance was determined with a p-value lower than .05. The specific research questions and their associated statistical measures are summarized in Table 3.

Table 3

Research Questions and Statistical Measures of the Study

Research Question	Statistical Measure
Does grit score differ by household food security among female caregivers of elementary school children after participation in a produce voucher intervention?	Independent samples t-test
What is the relationship between grit and household food security among female caregivers of elementary school children after participation in a produce voucher intervention?	Pearson r correlation

CHAPTER IV: RESULTS

The purposes of this study were to examine: 1) differences in grit by household food security; and 2) the relationship between grit and household food security among female caregivers of elementary school children in a rural, Appalachian Mississippi county after participation in a produce voucher intervention.

Female caregivers responded to pre-survey (185/1084, 17.1% response rate), with 76/185 completing both pre- and post-surveys (41.1%). Overall response rate was 7.0% (76/1084). Female participants completing both surveys were 37 ± 9 years ($n=73$), primarily Caucasian ($n=54/75$, 72.0%), married ($n=52/76$, 68.4%), working full-time ($n=35/75$, 46.7%), with some college or higher education, non-EBT/SNAP Card users ($n=57/76$, 75.0%), and living in fully food secure households ($n=50/76$, 65.8%).

For female participants completing both pre- and post- surveys, Table 4 summarizes demographic characteristics, and Table 5 describes the household adult food security status.

Table 4

Demographic Characteristics of Female Participants Completing Both Pre- and Post- Surveys

Characteristic (n)	n (%)
<u>Race (n=75)</u>	
Black or African America	19 (25.0)
Hispanic	2 (2.6)
White	54 (71.1)
<u>Marital Status (n=76)</u>	
Married	52 (68.4)
Widowed	3 (3.9)
Divorced	7 (9.2)

<u>Marital Status (Continued)</u>	
Single	1 (1.3)
Single/Never Married	13 (17.1)
<u>Highest Level of Education Completed (n=75)</u>	
Less than High School	8 (10.5)
High School Graduate – high school diploma or the equivalent (GED)	22 (28.9)
Some College or Higher	45 (59.2)
<u>Occupation Type (n=75)</u>	
Working full-time (35 or more hours per week)	35 (46.1)
Working part-time (fewer than 35 hours per week)	9 (11.8)
Unemployed	17 (22.4)
Student (either full- or part-time)	1 (1.3)
Social Security Disability	6 (7.9)
Applying for Social Security	1 (1.3)
Other	6 (7.9)
<u>MDHS EBT/SNAP Card Usage for Food Purchase (n=76)</u>	
Yes	19 (25.0)
No	57 (75.0)

Table 5

U.S. Household Adult Food Security Status of Female Participants Completing Both Pre- and Post- Surveys

Household Adult Food Security Category			
Household Adult Food Security Label (n=76)			
High Food Security	Marginal Food Security	Low Food Security	Very Low Food Security
<u>n (%)</u>	<u>n (%)</u>	<u>n (%)</u>	<u>n (%)</u>
50 (65.8)	9 (11.8)	12 (15.8)	5 (6.6)
Food Secure vs. Food Insecure (n=76)			
Food Secure (High, Marginal)		Food Insecure (Low, Very Low)	
<u>n (%)</u>		<u>n (%)</u>	
59 (77.6)		17 (22.4)	

Fully Food Secure vs. Not Fully Food Secure (n=76)	
Fully Food Secure (High) n (%)	Not Fully Food Secure (Marginal, Low, Very Low) n (%)
50 (65.8)	26 (34.2)

Table 6 shows the descriptive statistics, including minimum, maximum, mean, and standard deviation, reported for grit score for female participants completing both pre- and post-surveys (n=76). Post grit score was 3.8 ± 0.5 and ranged from 2.38 to 4.63.

Table 6

Grit Score of Female Participants Completing Both Pre- and Post- Surveys

Grit Score				
n	Minimum	Maximum	Mean	SD
76	2.38	4.63	3.76	.50

Table 7 describes differences in grit score between food security groups of female participants completing both pre- and post- surveys. Post grit score was significantly higher among those living in fully food secure households (3.8 ± 0.5), compared to those living in non-fully food secure households (3.6 ± 0.5) (t-test, $p=.040$).

Table 7

Differences in Grit Score Between Food Security Groups of Female Participants Completing Both Pre- and Post- Surveys (n=76)

Food Security Category	n	Mean	SD	p-value ^a
Fully Food Secure	50	3.85	0.50	.040
Not Fully Food Secure	26	3.60	0.47	

^at-test for Equality of Means, equal variances not assumed

Table 8 describes the relationship between grit score and household food security status of female participants completing both pre- and post- surveys. Post grit score was significantly associated with number of positive household food security responses (Pearson $r=-.271$, $p=.018$) and food security scale score (Pearson $r=-.267$, $p=.020$) with higher grit being associated with better household food security.

Table 8

Relationship Between Grit Score and Household Food Security Status of Female Participants Completing Both Pre- and Post- Surveys

Factor	Correlation Coefficient	p-value
Food Security – Number of Positive Questions	-.271 ^a	.018
Food Security – Scale Score	-.267 ^a	.020

^aPearson r Correlation Coefficient

CHAPTER V: CONCLUSIONS

The purposes of this study were to examine: 1) differences in grit by household food security; and 2) the relationship between grit and household food security among female caregivers of elementary school children in a rural, Appalachian Mississippi county after participation in a produce voucher intervention.

Overall, the study associated with this thesis determined that grit is higher among those living in fully food secure households and is significantly associated with better food security among female caregivers of children in Mississippi, supporting the hypotheses summarized in Table 1. Grit score was significantly associated with number of positive household food security responses, with higher grit being associated with better household food security. Post grit score was significantly higher among those living in fully food secure households, compared to those living in non-fully food secure households.

Post Grit Score by Food Security Status

In the study associated with this thesis, post grit score was significantly higher in fully food secure groups compared to not fully food secure groups, supporting the hypothesis. The mean post grit score for fully food secure groups compared to not fully food secure groups was 3.85 ± 0.50 and 3.60 ± 0.47 , respectively. The findings also supported the hypothesis of a relationship between grit score and household food security status of female participants completing both pre- and post- surveys. Post grit score was significantly associated with number of positive household food security responses (Pearson $r=-.271$, $p=.018$) and food security scale

score (Pearson $r=-.267$, $p=.020$), with higher grit being associated with better household food security.

These findings are comparable to those of Nickolaus et al. (2019), who examined the predictive odds of food security by grit among adults and their children living in households in the United States with incomes below the 2015 median. Nickolaus et al. (2019) found that grit score was significantly higher for parents without food insecurity when compared to parents with food insecurity. Overall, grit score was associated with lower odds of household food insecurity in both parents and children (Nickolaus et al., 2019).

The findings associated with this thesis were also comparable to those of Dees et al. (2018), who investigated differences in grit by both household food security and SNAP participation in male and female caregivers of elementary school children in Appalachian Mississippi. Dees et al. (2018) concluded that caregiver grit score was significantly higher in fully food secure households compared to non-fully food secure households (Dees et al., 2018).

Limitations

Very few studies have examined grit and food security (et al., 2019; Dees et al., 2018). The study associated with this thesis sought to bolster the existing literature. However, limitations exist.

One limitation of the study is that responses to both the USDA household food security survey and Duckworth grit survey were self-reported. Self-serving and social desirability bias on the grit survey may have affected grit score, as some participants may have responded in a way that reflected higher grit than actual, and vice versa. As for the food security survey, unwillingness to report food insecure characteristics may have led to a decrease in the number of

positive responses. However, both the USDA household food security survey and Duckworth grit survey are validated measurements.

Another limitation of the study is that convenience sampling was utilized. As such, the sample may not be representative of Calhoun County, the entire Appalachian region, or the United States. It is also possible that the results of this study may differ from those conducted in other Appalachian regions, as well as regions throughout the United States. Additionally, both the total sample size (n=76) and the non-fully food secure group size (n=26) were small, so conducting studies with larger sample sizes would strengthen the findings. However, despite the small sample size utilized in this study, the results were significant, as shown in Tables 6 and 7. Further research including studies conducted in other regions of the U.S. containing a larger sample size is warranted and may allow more generalized findings.

Further Research

Based on these findings, further research is warranted to determine if grit is a protective antecedent to food insecurity. Additionally, further research is needed to explore if food security promotes grit. Grit emphasizes working through obstacles despite shortcomings, failure, and adversity (Duckworth, Peterson, Matthews, & Kelly, 2007). Although methods to improve food security exist, they may not be utilized by households with food insecurity. Federal nutrition assistance programs and community-based programs serve to improve food security (USDA, 2021h). Among the largest programs are the Supplemental Nutrition Assistance Program (SNAP), the National School Lunch Program (NSLP), and the Special Supplemental Nutrition Program for Women, Infants, and Children (WIC) (USDA, 2021h). In this study, of the 76 female participants completing both pre- and post- surveys, 26 were not fully food secure (n=26/76, 34.2%), but only 19 reported using MDHS EBT/SNAP cards for food purchases (n=19/76,

25.0%). While some of these participants may not qualify for participation, some may benefit by utilizing the program, if qualified. Other than the utilization of Federal and community programs to combat food security, personal behaviors such as budgeting, couponing, and minimizing food waste may improve food security (Nickolaus et al., 2019). Grit may reflect the determination and perseverance necessary to engage in these behaviors. Therefore, further research on these specific behaviors in relationship to grit is warranted and may be a solution to improving food security status.

Some methods exist to improve grit. Changing thought processes to encourage pursuing interests, connecting to a higher purpose, embracing challenges, and cultivating hope can be used to learn grit (Duckworth, 2016). Alan et al. (2019) found that students treated with grit intervention are more likely to set difficult goals, engage in skill accumulation activities, and acquire more skills. Vanhove et al. (2015) examined the effectiveness of resilience-building programs (comparable to grit interventions) that exist to provide resources and skills necessary in preventing various negative effects associated with future stressors. They found that the programs had significant proximal effects on improving performance; enhancing well-being; and preventing psychosocial deficits, such as depression, lack of social support, and lack of acceptance of disability (Vanhove et al., 2015). Because grit may be related to individual behaviors and decision-making associated with food security, further research grit intervention for caregivers in households with children is warranted, as improving grit may be a solution to improving food security status.

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APPENDICES

APPENDIX A: VALIDATED 10-ITEM USDA ADULT FOOD SECURITY SURVEY

Question	Answer Options			
1. In the past 12 months, (I/We) worried whether (my/our) food would run out before (I/we) got money to buy more.	Often true	Sometimes true	Never true	Don't know or prefer not to answer
2. In the past 12 months, the food that (I/we) bought just didn't last, and (I/we) didn't have money to get more.				
3. In the last 12 months, (I/we) couldn't afford to eat balanced meals.				

Question (continued)	Answer Options		
4. 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	Don't know or prefer not to answer
5. In the last 12 months, were you every hungry but didn't eat because there wasn't enough money for food?			
6. In the last 12 months, did you lose weight because there wasn't enough money for food?			

Question	Answer Options			
7. 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 question 7a)	Don't know or prefer not to answer (skip question 7a)	
Question	Answer Options			
7a. If you answered yes to question 7, how often did this happen?	Almost every month	Some months but not every month	Only 1 or 2 months	Don't know or prefer not to answer

Question	Answer Options			
8. In the last 12 months, did (you/you or other adults in your household) ever not eat for a whole day because there wasn't enough money for food?	Yes	No (skip question 8a)	Don't know or prefer not to answer (skip question 8a)	
Question	Answer Options			
8a. If you answered yes to question 8, how often did this happen?	Almost every month	Some months but not every month	Only 1 or 2 months	Don't know or prefer not to answer

APPENDIX B: VALIDATED 10-ITEM USDA ADULT FOOD SECURITY SURVEY

SCORING

Number of Positive Questions/ Responses	Scale Score	USDA Food Security Category (Label)	USDA Food Security Category (Dichotomous)	Fully Food Secure versus Not Fully Food Secure
0	0.0	High Food Security	Food Secure	Fully Food Secure
1	1.2	Marginal Food Security		Not Fully Food Secure
2	2.2			
3	3.0	Low Food Security	Food Insecure	Not Fully Food Secure
4	3.7			
5	4.4			
6	5.0	Very Low Food Security		
7	5.7			
8	6.4			
9	7.2			
10	7.9			

APPENDIX C: VALIDATED 8-ITEM DUCKWORTH SHORT GRIT SCALE SURVEY

SCORING

Question	Answer Options				
	Very much like me	Mostly like me	Somewhat like me	Not much like me	Not like me at all
New ideas and projects sometimes distract me from previous ones.	Scored as 1	Scored as 2	Scored as 3	Scored as 4	Scored as 5
Setbacks don't discourage me.	Scored as 5	Scored as 4	Scored as 3	Scored as 2	Scored as 1
I have been obsessed with a certain idea or project for a short time but later lost interest.	Scored as 1	Scored as 2	Scored as 3	Scored as 4	Scored as 5
I am a hard worker.	Scored as 5	Scored as 4	Scored as 3	Scored as 2	Scored as 1
I often set a goal but later choose to pursue a different one.	Scored as 1	Scored as 2	Scored as 3	Scored as 4	Scored as 5
I have difficulty maintaining my focus on projects that take more than a few months to complete.	Scored as 1	Scored as 2	Scored as 3	Scored as 4	Scored as 5
I finish whatever I begin.	Scored as 5	Scored as 4	Scored as 3	Scored as 2	Scored as 1
I am diligent.	Scored as 5	Scored as 4	Scored as 3	Scored as 2	Scored as 1

Add up all scores and divide by 8. The maximum score on the scale is 5, extremely gritty, and the minimum score is 1, not at all gritty.

APPENDIX D: A NOTE ON THE STUDY ASSOCIATED WITH THIS THESIS

The efficacy of the intervention was determined using paired t-tests. Of female caregivers that completed both pre- and post- surveys (n=70), there was no significant difference in pre-intervention grit score ($3.71 \pm .60$) and post-intervention grit score ($3.77 \pm .49$), (t-test, $p=.329$). Similarly, household food security status (number of positive questions on USDA 10-item survey) did not significantly differ from pre-intervention (1.58 ± 2.64) to post-intervention (1.28 ± 2.31), (t-test, $p=.202$). Therefore, for the purposes of this thesis, only post-grit score was utilized in examining both differences in grit by household food security and the relationship between grit and household food security.