THE RELATIONSHIP BETWEEN ENTRANCE AGE AND ACADEMIC ACHIEVEMENT IN LITERACY SKILLS FOR KINDERGARTEN STUDENTS IN A RURAL SCHOOL

by

Rebecca Ann Brower

Liberty University

A Dissertation Presented in Partial Fulfillment

Of the Requirements for the Degree

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ABSTRACT

Parents and teachers are faced with the difficult question of when to enroll their children in kindergarten to be the most academically successful in a rural area. Some parents have started enrolling children in kindergarten at the age of four, despite not being cognitively ready based on the information-processing theory. The purpose of this study is to determine the relationship between entrance age and the academic achievement of literacy skills for kindergarten students in a rural area. A correlational design was utilized to test the strength and direction of the relationship between two quantitative variables: age and reading achievement in a rural school district. A correlational design was appropriate for this study since in order to measure the degree and direction of the relationship between two or more variables and to explore the magnitude among variables. A scatter plot was used to determine the differences between the predictor variable, age, and criterion variable achievement in reading in a rural school district. The researcher failed to reject the null hypothesis. A total of 221 students participated in the research from three separate public schools in rural Virginia. The results of the study did not indicate a relationship between entrance age measured in months and academic achievement in literacy skills scores. Future research to include how age impacts kindergarten students in other demographic regions, with a larger sample size, would aid in further development of this research.

Keywords: rural, achievement, literacy, age

Dedication

This paper is dedicated to my dear husband and to my three daughters. First, Jason I owe you so much. You have been more than patient with all the years of college, papers, research, and running the girls everywhere so I can complete assignments. You supported me through all the late nights, restless days, and frustrating assignments. You have been my driving force to finish this journey. You are my world and words cannot ever explain how much I love you!

To my three daughters, I know you thought this day would never come, but I promised you that I would finish. I just hope you dedicate your lives to overcoming challenges and go further in your education than you ever dream you were able to. Thank you for being patient with me over the past few years. I love you all!

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List of Abbreviations

Every Student Succeeds Act (ESSA)

Highly Qualified Teacher (HQT)

No Child Left Behind Act (NCLB)

Phonological Awareness Literacy Screening-Kindergarten (PALS-K)

CHAPTER ONE: INTRODUCTION

Overview

Chapter One will introduce the background related to the relationship between entrance age and academic achievement in literacy skills in reading for kindergarten students in a rural school district. In this chapter, the purpose and significance of the proposed study will be discussed. The research question will be introduced and definitions central to the study will be provided.

Background

Kindergarten is the foundational grade for future academic success, yet various students are not learning the necessary academic literacy skills, including self-regulation (Shaul & Schwartz, 2013), working memory (Fitzpatrick & Pagani, 2012), or foundational reading proficiencies at the same rate as their peers (Miller, 2011). Rural students who enroll in kindergarten at a younger, chronological age questionably may not be as academically successful in literacy skills compared to older students (Justice, Jiang, Khan, & Dynia, 2017) with age as a contributing theory of academic success in reading at this educational level (Lubotskya & Kaestner, 2016).

Kindergarten curriculums are becoming more demanding with classrooms becoming similar to the first-grade, causing more significant concerns in academic achievement in kindergarten (Walsh, 1989). Kindergarten expectations have evolved over recent decades with modern-day teachers reporting parents should teach the alphabet, and students should receive formal reading and math instruction before entering kindergarten (Bassok, Latham, & Rorem, 2016). Research reflects students learn approximately 17% of their life-long academic skills in kindergarten, which is significantly higher than years past.

Students who reside in rural communities may achieve at lower academic levels than their non-rural peers (Fedora, 2016). Research conducted by Roscigno and Crowle (2001) stated, “Rural adolescents exhibit lower academic achievement and a higher rate of dropping out of high school than do their non-rural counterparts" (p. 289). Additionally, rural teachers have fewer years of teaching experience compared to more urban locations (Yau-ho, 2016), which may contribute to lower academic achievement (Zhang, Jin, Torero, & Li, 2018).

Lower academic achievement in literacy skills in a rural area may influence the community. Research on retention rates revealed that younger students might be five times more likely to be retained compared to the oldest student (Huang, 2014b), verifying that repeaters are more likely to withdraw from social activities, have lower levels of self-confidence, and self-esteem (Hong & Yu, 2008). Student retention could influence graduation rates. Students who repeat a grade are significantly more likely to drop out (Stearns, Moller, Blau, & Potochnick, 2007). Retention contributes to lower rates of college attendance and higher rates of participation in public assistance programs (Ou & Reynolds, 2010).

The information-processing theory is essential to understanding the foundational skills for students entering kindergarten. This theory provided by several theorists, including George Miller, provides a framework for this study regarding when a student should enter kindergarten. Humans may experience restrictions in the quantity of information processed and the speed this same information can be processed (Miller, 2011). Working memory skills of younger kindergarten-aged students may be impacted due to their chronological age. These mental capacities may contribute to student performance in the academic world (Stamovlasis & Tsaparlis, 2012). Research provided evidence that when the working memory is over-loaded or immature, long-term memory components are affected (Stamovlasis & Tsaparlis, 2012). When the functions of the brain, which contribute to the information-processing theory, are impaired, the ability to recall information can be limited. According to Miller (2011), "humans are limited in the amount of information that can be attended to simultaneously and in speed with which this information can be processed" (p. 267). Miller (1994) stated how humans are likely to make more errors in recalling information when higher amounts of data are presented. The information-processing theory additionally correlates to the ideologies of executive functions relating to the performance of rural kindergarten-aged students.

Working memory can predict kindergarten academic achievement, especially in the area of reading (Clements, Sarama, & Germeroth, 2016). Investigative research revealed how working memory skills predict kindergarten readiness levels and how psychology, neuroscience, education, and economics determine a child's success in school. Research collected from 1,824 children with a working memory age of 29 to 41 months, with the same students reassessed at 74 months of age (approximately 6 years, 1 month), showed working memory scores contributed to the overall success of a student in the academic world (Fitzpatrick & Pagani, 2012).

Additional components of cognitive control could contribute to kindergarten entrance age. Cameron et al. (2012) questioned foundation skills such as fine motor and executive functioning proficiencies. Skills such as fine motor and executive functioning may contribute to literacy and mathematics levels. Cameron et al. collected data from 213 children, with ages ranging from 3 to 5 years, that looked at a variety of cultural backgrounds and educational background of the mother. Students were tested at the start of their kindergarten school year and again at the end of the kindergarten school year. Students who were older (closer to the age of 6), scored higher on all assessments given including: executive functioning, fine motor skills, copying skills, decoding, reading comprehension, and overall reading, questioning if age was a factor of success.

Kindergarten expectations have evolved over previous decades with a higher level of rigor influencing academic achievement for students within a rural community. Research conducted by Durham and Smith (2006) discovered that students who reside in rural communities have lower reading scores, especially for certain levels of socioeconomic status. Younger students could be less cognitively prepared with age-related deficits in their working memory, executive functioning, and self-regulation. Vocabulary and language development could influence rural students. As stated by Johnson, Aviner, and Cassels (2017), "Research claimed that by 3 years of age, children from more affluent households were exposed to approximately 30 million more words than children from lower socioeconomic status backgrounds. This 'language gap' is attributed to inferior cognitive development and lower academic achievement of communities from economically disadvantaged backgrounds" (p. 6). Retention rates are higher for students who are chronologically younger than their peers (Huang, 2014a), which contributes to lower rates of college attendance and higher rates of participation in public assistance programs (Ou & Reynolds, 2010).

Problem Statement

Kindergarten requirements have significantly grown over previous decades with children learning approximately 17% of life-long academic skills in kindergarten (Bassok & Latham, 2017). These academic demands contribute to higher rates of retention (Ou & Reynolds, 2010), with rural students at a higher risk. As stated by Vernon-Feagans, Gallagher, and Kainz (2010), "Rural children, a largely understudied population in the research literature, are likely to have unique risk and protective factors as they enter school" (p. 163). Kindergarten curriculums are becoming more demanding (Walsh, 1989) with rural students not obtaining achievement rates compared to non-rural peers (Roscigno & Crowle, 2001). Additional research completed by Shaul and Schwartz (2013) examined how a student's executive functions, including short-term memory and vocabulary skills, impact academic abilities. Cognitive development and the ability to regulate behaviors were included as part of Shaul and Schwartz's (2013) research proving emergent literacy, phonological awareness, orthographic knowledge, and emergent mathematics knowledge are factors of executive function domain. Shaul and Schwartz (2013) discovered executive functions played a significant role in the three domains of pre-academic skills and academic development, math, literacy, and orthographic skills. Their research unveiled older students, closer to the age of six, exhibited stronger executive functioning skills and academic skills, suggesting students who entered kindergarten at an older age, closer to the age of six, are more likely to be successful compared to younger students aged five or under.

Coldren (2013) examined further investigation of cognitive concerns. Coldren (2013) investigated the overwhelming number of students who fail in the United States' school systems, questioning how cognitive control predicted academic achievement. Coldren (2013) completed research on kindergarten students to answer his question of whether or not cognitive control is an indicator of academic performance. A sample population of 65 kindergarten age students with a mean age of 71 months (approximately five years, nine months) was tested in the areas of reading, math, and additional cognitive assessments. Findings of this experiment indicated that cognitive control is an essential factor for academic achievement in kindergarten children, with a correlation of students who *redshirted*, or entered kindergarten at an older age to be more mature and developmentally ready for kindergarten demands.

Research collected indicated that most of the students who entered kindergarten at the median age of 5.2 (five years, two months) performed at a lower academic level in reading and math compared to older kindergarten students with a median age of 5.6 (five years, six months) (Lubotskya & Kaestner, 2016). Additional research verified a correlation between kindergarten entry age and educational outcome, with older students having an advantage over their younger peers; the students who entered kindergarten at an older age were more likely to be identified as gifted and talented (Huang, 2014a). The problem is rural students who enter kindergarten at a younger, chronological age may achieve lower academic accomplishments in the area of reading than their older classmates.

Purpose Statement

The purpose of this quantitative, correlational study is to examine the relationship between the entrance age and academic achievement of literacy skills in reading for kindergarten students in a rural school district. A correlation design is appropriate for this study due to the relationship between two variables; the strength and direction of the relationship (Gall, Gall, & Borg, 2007). The chronological age, or the time elapsed since birth (Age, 2004), will be used as the predictor variable and literacy skills, or early reading skills, including alphabet knowledge, letter sounds, spelling, concept of word, and word recognition in isolation (Invernizzi, Juel, Swank, & Meier, 2015) will be used as the criterion variable. This study will take place in a rural elementary school located in a southern state.

Significance of the Study

Parents, educators, and members of the community need additional guidance on when a rural student should enter kindergarten to be academically successful. Annually more students are beginning their kindergarten year at the age of four due to states permitting entrance. Elder and Lubotsky (2009) found and stated, “In October 1980, 9.8 percent of five-year-olds were not yet enrolled in kindergarten; by October 2002, that figure had risen to 20.8 percent. Much of this increase stems from changes in state-mandated cutoff dates that require children to have reached their fifth birthday before a specific day to be eligible to begin kindergarten each fall” (p. 642). Younger kindergarten students may not be cognitively prepared for the academic challenges of reading (Miller, 2011) due to underdeveloped mental capacities such as working memory skills (Stamovlasis & Tsaparlis, 2012), cognitive control (Coldren, 2013), and executive functioning skills

(Shanmugan and Satterthwaite, 2016). Data collected showed younger children (ages 3-4) mostly viewed kindergarten as a place to play, while older students (ages five to six) viewed kindergarten as a place to learn or follow the rules (Di Santo & Berman, 201). Retention in kindergarten due to lower achievement may lead to students being viewed as failures (Stearns et al., 2007) and susceptible to the pressures of society (Stearns & Glennie, 2006).

This study is important since more students are entering kindergarten at a younger, chronological age than in years past and may not be as academically successful as their older peers who are exposed to the same level of instruction. Retention rates of younger kindergarten students contribute to higher rates of public assistance and lower college programs (Ou & Reynolds, 2010), with repeaters more likely to withdraw from social activities and have lower levels of self-confidence and self-esteem (Hong & Yu, 2008). Enrollment of younger kindergarten students affects all stakeholders, including parents and educators, and limits the growth of the community. This study is essential since more students are entering kindergarten at a younger, chronological age than in years past and may not be as academically successful as their older peers who are exposed to the same level of instruction.

Research Question

RQ1: Is there a relationship between age upon entering kindergarten and academic achievement of literacy skills of kindergarten students in a rural school district?

Definitions

1. *Reading Achievement* (Kindergarten)- An accomplishment in early reading achievement including awareness of sound within spoken words, phonological awareness, and alphabet recognition (Invernizzi et al., 2015)
2. *Chronological Age*- Time elapsed since birth (Age, 2004)

3. *Rural*- Non-urban, places with fewer than 2,500 people (United States Department of Agriculture, 2018)
4. *Relationship*- a state of being connected
5. *Executive function*- cognitive processes involved in goal-oriented behavior, such as planning and sequencing (Miller, 2011)
6. *Working Memory*- The ability to retain and manipulate verbal, written, or spatial information (Hudson, Scheff, Tarsha, & Cutting, 2016)
7. *Cognitive control*- Cognitive system composed of perception–action cycle, memory, attention, intelligence, and language (Esch, 2012)
8. *Redshirting*- The practice of holding a younger kindergarten student back to repeat kindergarten to be an older student due to the lack of preschool experience (Lincove & Painter, 2006)
9. *Literacy Skills*- Early reading skills, which include alphabet knowledge, letter sounds, spelling, concept of word, and word recognition in isolation (Invernizzi et al., 2015)

CHAPTER TWO: LITERATURE REVIEW

Overview

In this chapter, information will be presented to justify the need for theoretical frameworks and related literature to support the research question. The information-processing theory, along with the theory of cognitive development with supporting information from the theorist, aspects of child cognitive development, and the impact of kindergarten entrance age will be supported. Additional details regarding government concerns through federal requirements, rural achievement, and the impact of rural communities in education will also be explored. Lastly, the need for this study to examine the Phonological Awareness Literacy Screening-Kindergarten (PALS-K) in a literacy skill achievement will be explained.

Theoretical Framework

Information Processing Theory

This research study was designed around the information processing theory. This theory is essential to understanding the foundational skills for academic performance relating to rural kindergarten students and the obtainment of literacy skills. The information processing theory explains how people manipulate or perform mental operations with the information they obtain. These operations include cognitive behaviors that are comprised of maneuvering, accumulating, joining, or recovering information (Rosnov & Roberts, 2005).

The information processing theory was developed initially in the 1940's with further development in the 1950's to "explain how the mind functions and encompasses a range of processes, including gathering, manipulating, storing, retrieving, and classifying information" (Gentile, 2018, p.2). In the 1970's, Arthur Jenson (1973) further contributed to the theory of information processing, focusing on the developmental differences of learning in education, including the stages of developmental psychology. Jenson (1973) stated, “Each phyletic level possesses all the learning capacities (although not necessarily the same sensory and motor capacities) of the levels below itself in addition to new emergent abilities, which can be broadly conceived as an increase in the complexity of information processing” (p. 383). Jenson’s research relied on the information from the 1960’s, including cognitive development stages and analysis conducted by theorist Jean Piaget. Jenson (1973) researched cognitive development within qualitative levels, including the levels of thinking and problem solving in a child at a variety of ages. Jenson (1973) discovered and concluded that forcing students to learn when they are not developmentally ready can cause educational implications for students in the long-term with more significant concerns for students with diverse backgrounds. This further verified the need for research to understand the foundational skills for academic performance relating to rural kindergarten students and the obtainment of literacy skills.

George Miller (2011) further researched and contributed to the information processing theory. Miller(2011) was one of the first theorists to compare how the brain processes information to a high-speed computer. Miller discovered the human brain receives information, executes operations, collects and receives data, and produces a variety of output (Rosnov & Roberts, 2005). According to Miller (2011), “humans are limited in the amount of information that can be attended to simultaneously and in speed with which this information can be processed,” (p. 267) with only accumulating five to nine pieces or chunks of meaningful components of information in their short-term memory (Rosnov & Roberts, 2005). Miller (1994) stated how humans are likely to make more errors in recalling information when a higher amount of data is presented based on the age of the person. The information processing theory additionally correlates to the ideologies of executive functions relating to the performance of rural kindergarten-aged students. These executive functions include, but are not limited to, the working memory, cognitive flexibility, and self-control.

Information is processed within a sequence of stages. When oral or visual information is presented, this information is processed comparable to a computer program with the human brain processing the data in a sequence of stages (Barber, 2016). The brain receives the information through the body's senses, processed through the short-term memory component, with the final stage occurring in the long-term memory section of the brain. When the information enters the long-term memory section of the brain, this information is then reprocessed into three types of knowledge, including "declarative (knowing that), procedural (knowing how), and episodic (personal stories)" (Gentile, 2018, p. 2). Once the information has been received and stored in the long-term memory center of the brain, this information can be returned to working memory and used to process additional details relating to this data (Sweller, Ayres, & Kalyuga, 2011). When an individual's working memory is over-loaded or immature, long-term memory components are affected (Stamovlasis & Tsaparlis, 2012). Younger students may not be cognitively prepared for the academic challenges of reading (Miller, 2011) due to underdeveloped mental capacities such as working memory skills (Stamovlasis & Tsaparlis, 2012).

The information processing model includes the working memory and has constraints in regards to the mental capacity of students when considering age (Stamovlasis & Tsaparlis, 2012). These mental capacities are significant elements of student performance in the academic environment. Stamovlasis and Tsaparlis (2012) further researched the aspects of the working memory and conferred that when the working memory is over-loaded or immature, including how long-term memory components are likely to be impacted. When the intellectual functions of the brain associated with the information processing theory are compromised, the ability to retain and retrieve information is expected to be restricted, influencing overall performance. As students age, they develop more significant enhanced methods of acquiring, processing, and preserving knowledge. Therefore, the ability to process information becomes greater established with age (Rosnov & Roberts, 2005).

Cognitive Development Theory

The theory of cognitive development provides additional insight into the theoretical framework. The theory of cognitive development contributes to this study to explain how a child's development relates to education and the demands of academics. Information presented by Ghazi, Khan, Shahzada, & Ullah (2014) shared that Jean Piaget was a psychologist from Switzerland and developed the 1952 Cognitive Development theory. Theorist Piaget was interested in the development of children's cognitive learning and how they respond to their physical surroundings. Piaget believed the developmental stages of psychology was the foundational groundwork to the growth of social sciences and could solve "the riddle of the historical development of mind, philosophy, and sciences" (Oesterdiekhoff, 2016, p. 118). As researched by Molenaar and Raijmakers (2000), Piaget contributed to the developmental changes in the general cognitive design and the conceptual content that could be mastered by children of different ages. As stated by Cherry (2018),

> Piaget believed that children take an active role in the learning process, acting much like little scientists as they perform experiments, make observations, and learn about the world. As kids interact with the world around them, they continually add new knowledge, build upon existing knowledge, and adapt previously held ideas to accommodate new information. (para. 2)

Piaget’s theory evolved around children and their physical and cognitive growth. Piaget's theory was fostered around the research of cognitive development and how research evolves within the sequence of four separate stages with each stage contributing to the next. As researched by Wadsworth (2003), Piaget believed that cognitive development was an evolving progress of the mind and a direct result of genetic, biological maturation and surrounding exposures. Piaget also believed that a child’s cognitive development must pass through each of the four stages of cognitive development all the way up to adulthood. Cherry (2018) contributed to the information relating to this theory exclaiming that Piaget’s four stages consist of the Sensorimotor stage (birth to 2 years), Preoperational stage (ages 2 to 7), Concrete Operational stage (ages 7 to 11), and Formal Operational stage (ages 12 and up). Feldman (2004) researched the stages of Piaget’s theory and found that the sensorimotor behavior stage (birth to 2 years) provides the foundation for the remaining stages.

Table 1

Piaget's four major domain-general stages of cognitive development

	Age Range
Sensorimotor	Birth to about 24 months Substages: Reflexes: 0–2 months Primary circular reactions: 2–4 months Secondary circular reactions: 4–6 months Coordination of secondary schemes: 6–12 months Tertiary circular reactions: 12–18 months Transition to symbolic thinking: 18–24 months
Preoperational	24 months to about 6 years
Concrete operations	6 years to about 12 years
Formal operations	12 years to about 18 years and beyond

Note. Adapted from Feldman, D. H., (2004). P*iaget's stages: The unfinished symphony of cognitive development. New Ideas in Psychology, 22(3),* 184.

Piaget's first stage of the cognitive development theory is named the sensorimotor stage, which consists from birth to 2 years of age. Sensorimotor development fosters motor activity, and knowledge is developed through physical interactions with children learning through trial-and-error (Vatavu, Cramariuc, & Schipor, 2015, p. 57). Information presented by Feldman (2004) shared information relating to the sensorimotor stage and showed how this stage consists of six sub-stages. These sub-stages include reflexes, primary circular reactions, secondary circular reactions, coordination of secondary schemes, tertiary circular reactions, and transition to symbolic thinking.

Within Piaget's sensorimotor stage, the first substage is called reflexes due to the nature of its development. Piaget (1953) stated, "Almost since birth, therefore, there is "behavior" in the sense of the individual's total reaction and not only a setting in motion of particular or local automatizations only interrelated from within" (p. 24). Aguilar and Pérez (2015) discussed this substage for children and found an infant starts to comprehend their environment around them through a set of instinctive structures that correspond to reflex behaviors. These movements begin to occur between 0-2 months of age. Examples of these behaviors consist of a child closing their hand when an object makes contact with the palm (Aguilar & Pérez, 2015) and the instinctive act of sucking (Piaget, 1953). These actions are solely considered voluntary and are reactions to the situations around them (Boyle, 1969).

The second substage is titled the primary circular reactions and occurs between the ages of two and four months of age (Feldman, 2004). Aguilar and Pérez (2015) stated during this substage, a child utilizes their reflexes to adapt to the environment around them and instinctive schemas are "replaced by newly constructed schemas, and actions are repeated because they have pleasurable effects on the infant" (p. 18). Aguilar and Pérez (2015) provided examples of this substage, which includes a baby sucking their thumb by accident, which causes the infant pleasure, so the infant repeats this action to continue to receive this same level of pleasure. Schroepfer (2014) found during this substage, infants explore pre-adaptive behaviors to seek pleasure and these actions are consistent with unique movements.

The third substage of the cognitive development theory is called the secondary circular reactions. Aguilar and Pérez (2015) stated during this substage a child intentionally repeats behaviors and movements to obtain a desired response in the environment. Feldman (2004) continued to contribute to this substage verifying that these behaviors occur between the ages of four to six months. An example of this behavior includes a baby repeatedly squeezing a squeaking toy to hear the sound and repeating this action to obtain the noise from the toy for pleasure. Schroepfer (2014) found this level of "exploration and variation in activity testifies to the infant's growing" (p. 361).

The fourth substage within the sensorimotor stage is called the coordination of secondary schemes and occurs between six to twelve months of age (Feldman, 2004). During this substage, Aguilar and Pérez (2015) found the baby or infant starts to explore their "environment and imitating the behavior of others, often combining different schemas in acting to obtain a desired effect" (p. 18). Piaget (1963) declared during the coordination of secondary schemes reveals the first acts of intelligence, and the external environment around them influences these acts.

During the fifth substage of this theory, called the tertiary circular reactions, which occurs between twelve and eighteen months of age, a substantial shift in development occurs (Feldman, 2004). Aguilar and Pérez (2015) found during the tertiary circular reactions stage a child completes a large volume of trial-and-error behaviors or experiments to discover new methods of how to obtain the desired outcome. Examples of these behaviors may include but are not limited to repeatedly stepping on a toy to hear the desired sound. Feldman (2004) contributed to this substage and revealed that when children start to understand the world around them, children are more inclined to repeat these behaviors and develop a higher level of understanding, influencing building from these foundational experiences. Piaget's (1963) research discovered that when a child repeats movements during this substage, these variations in movements might create new varieties of intelligence contributing to sensorimotor intelligence.

The last substage of Piaget's theory of the sensorimotor stage is called the transition to symbolic thinking and occurs between eighteen and twenty-four months of age (Feldman, 2004).

During this substage, Aguilar and Pérez (2015) discovered a child begins to develop early representational thoughts that "marks the beginning of the development of symbols representing objects or events, and the understanding of the child's world begins to be done through mental operations, and not merely through actions" (p. 18). Piaget (1963) declared that these behaviors, which occur within this substage, are considered systematic intelligence and are original due to the situations presented to the child.

Piaget declared the development through the different substages and stages are phases contributing to the cognitive development of children (Aguilar & Pérez, 2015). The second stage of Piaget's cognitive development theory is named the preoperational stage and occurs between the ages of twenty-four months to the age of six (Feldman, 2004). Piaget divided this stage into two substages for the preoperational stage. The first substage occurs during the ages of two to four years of age and is called the symbolic functional state with the second substage occurring between the ages of four to seven (Hanfstingl, Benke, & Zhang, 2019), which is called the intuitive sub-stage of preoperational stage (Asokan, Surendran, Asokan, & Nuvvula, 2014). Vatavu and Schipor (2015) researched the sensorimotor stage and determined that during this stage a child's motor activity develops with knowledge and exposure through physical interactions and the trial-and-error method. Children also develop language skills and further develop their motor skills and memory skills with imagination abilities. Hanfstingl et al. (2019) found during this age children start to use language for communication; however, children are unable to develop thoughts and resolve their thoughts within a coherent manner.

The third stage of Piaget's cognitive development theory is called concrete operations and occurs between six to twelve years of age (Feldman, 2004). According to McLeod (2018), Piaget considered the concrete stage the turning point in marking the start of logical and operational thought. Information provided by Brouse and Chow (2009) stated children start to "display intelligence through logical and systematic manipulation of symbols related to concrete objects" (p. 221), and this stage is considered a milestone within the child's life. Boyle (1969) added to this stage by stating children learn to solve problems and solutions, which arise through direct situations, and children are now able to think logically through problems that they face directly (Eni Astuti, 2018).

The final stage of Piaget's cognitive development theory is the formal operations stage and occurs between the ages of twelve and eighteen years (Feldman, 2004). Cherry (2019) found during this stage a child begins to think more rationally, understands concepts of discussions, their thoughts are more organized, and they start to use a higher level of logic. Children also start to become less insensitive and start to think more about how others feel. Children have now developed intellectual abilities and within this final stage have started to develop knowledge, which is no longer about how this content is acquired.

Related Research

Executive Functions

Executive functions of the brain may affect a child's ability to achieve grade-level material in a general education, public school setting. Ahmed and Miller (2011) defined an executive function as "higher-order cognitive processes involved in goal-oriented behavior, such as planning and sequencing" (p. 668). Executive function, located in the prefrontal cortex of the brain, matures later in childhood (Long et al. 2010) with domains developing at different stages (Shanmugan & Satterthwaite, 2016). Executive functions assist in impulsive responses and contribute to emotional control, including problem-solving and adequate planning (Blair, 2016). Executive functions may contribute to the impact of academic skills for children in the education environment. Attention and working memory contribute to the makeup of the cognitive process within the executive function region of the brain (Shanmugan & Satterthwaite, 2016). Reading comprehension is a complex task which consists of many aspects including decoding, listening comprehension, and domain-general processes not specific to reading; these are also components of the executive functioning region of the brain (Hudson et al., 2016). Research has been conducted on the executive functions in several academic areas, including mathematics and literacy skills for students attending preschool. This research concluded that executive functions could indicate academic performance in the areas of mathematics, literacy skills (Welsh, Nix, Blair, Bierman, & Nelson, 2010), and use of visual motor skills (Sulik, Haft, & Obradović, 2018). Research conducted by Mann, Hund, Hesson-McInnis, and Roman (2017) on executive functioning and how cognitive function contributes to academic success for early education found a direct link between executive functions of the brain and school readiness. Mann et al. (2017) concluded and stated from their research that "cool aspects of executive functioning are linked directly with academic readiness, whereas hot executive functioning is linked directly with social-emotional readiness and with academic readiness by way of social-emotional readiness" (p. 28). Additional research conducted by Fuhs, Nesbitt, Dong & Farran (2014) evaluated preschool students at the beginning of their preschool year and again at the end of their kindergarten year with each student's executive function and academic ability measured. The researchers concluded that executive functions are strong predictors of academic achievement in math and a moderate indicator of language (Fuhs et al., 2014).

Executive functions contribute to academic performance. Executive functions influence the educational levels of students, with cognitive development and self-regulation influencing proficiency levels (Shaul & Schwartz, 2013). Phonological awareness, emergent literacy, orthographic knowledge, and developing mathematics knowledge were further developed with findings on executive functions relating directly to a significant role in the three domains of pre-academic skills and academic development. New research unveiled older kindergarten students, closer to the age of 6, exhibited stronger executive functioning skills and academic skills, suggesting students who enter kindergarten at an older age are more likely to be academically successful compared to a younger student, 5 and younger. Shaul and Schwartz (2013) concluded younger students' executive functions are less likely to be developed compared to their older counterparts. Foundational or basic skills such as fine motor and executive functioning skills are often examined due to kindergarteners displaying weaknesses when attempting to master the foundational behaviors that make them successful in the classroom. Coordination of multiple skill sets, such as fine motor and executive functioning skills, have experts questioning for a more detailed definition of school readiness beyond traditional measures of literacy and mathematics (Cameron et al., 2012).

Working Memory

Working memory is an essential element of academic performance. Working memory, defined by Hudson et al. (2016), is "the ability to hold and manipulate verbal (or spatial/written) information in one's mind while simultaneously dealing with new incoming information, and has relevance for reading in that one has to hold previously read information in memory, while simultaneously integrating new information into this existing information" (p. 24). Attention and working memory contribute to the makeup of the cognitive process within the executive function region of the brain. This area of cognitive development continues to develop or mature throughout adulthood, while other cognitive domains such as spatial memory and verbal memory do not continue to advance (Shanmugan & Satterthwaite, 2016).

Working memory skills may predict readiness proficiencies in many core areas within the educational environment. Working memory skills, found within the domain of the executive function, promote constructive learning behaviors by becoming aware of problem-solving tasks, holding information, and increasing attention to tasks (Fitzpatrick & Pagani, 2012). Research conducted by Clements et al. (2016) found that working memory skills may predict growth in early reading and math proficiencies as early as preschool through kindergarten. Fitzpatrick and Pagani (2012) gathered data from 1,824 children with a working memory age of 29 to 41 months, with the age of a child, temperament or personality, amount of nightly sleep, weight of population, or breastfed versus non-breast fed, or age of mother as a factor of performance of working memory. Overall, the final findings of their research verified that working memory scores contributed to the overall success of a student in the academic world.

Cognitive Control

Cognitive control may influence the achievement of students enrolling into kindergarten. As defined by Esch (2012), "Cognitive control is part of a wider framework called cognitive dynamic systems, which builds on a paradigm of cognition composed of five elements: perception-action cycle, memory, attention, intelligence, and language" (p. 3154). The demands on education, with the lack of flexibility, have affected cognitive control over previous decades. Cognitive control contributes to academic achievement (Coldren, 2013). Cognitive control coordinates internal thoughts and actions into internal goals (Haykin, Fatemi, Setoodeh, & Xue, 2012) and permits individuals to manage risks more effectively (Esch, 2012). Research collected by Coldren (2013) reviewed the number of students who fail in the United States' school system and verified how cognitive control predicts academic achievement through a population size of 65 kindergarten age students with a mean age of 71 months (approximately 5 years, 9 months).

Cognitive Flexibility

Kindergarten students may not be mentally prepared for the challenges of the academic environment due to lack of cognitive flexibility. Cognitive flexibility, otherwise known as shifting, or the ability to switch between mental sets, tasks, and goals (Follmer, 2018) may influence academic achievement. This prefrontal cortex of the brain evolves during preschool years (Diamond, 2002). This cognitive development emerges between the ages of two and five, with more pronounced development following the age of six (Diamond, 2006). Cognitive flexibility influences problem-solving skills and switching between activities. Guajardo and Cartwright (2016) researched the impact of cognitive flexibility in preschool to elementary age students. Their research concluded cognitive flexibility was a predictor of reading comprehension including vocabulary skills and the ability to decode.

Entrance Age

Kindergarten entrance age varies among states with no established parameters. Research completed by Elder and Lubotsky (2009) found and stated,

> In October 1980, 9.8 percent of five-year-olds were not yet enrolled in kindergarten; by October 2002, that figure had risen to 20.8 percent. Much of this increase stems from changes in state-mandated cut-off dates that require children to have reached their fifth birthday before a specific day to be eligible to begin kindergarten each fall. (p. 642)

Entrance age makes a difference in school success and the effects of the birthday cut-off date among states. Lloyd (2015) researched and discovered that students who entered kindergarten at a later date within the calendar year or were delayed one year or more, compared to the peers in the same classroom, had an academic advantage over younger peers receiving the same instruction. Various school divisions are altering entrance age requirements to address the concerns of academic achievement in kindergarten. Research conducted shows a positive correlation between academic success and kindergarten entry cut-off dates (Liu, 2016). In 2008, the state of Kentucky previously had a cut-off date of October 1 as a requirement for students to enter kindergarten and was ranked tenth in education among the other states. Since then, Kentucky altered their enrollment date to September 1 and data collected now shows Kentucky is currently ranked between fifth and eighth. Research collected also showed students who entered kindergarten at the earlier September 1 date, had an increase in overall academic scores up to their fourth-grade year (Liu, 2016). Table 2 examines regulations for each of the 50 states within the United Sates of America and entrance age restrictions per state.

Table 2

Kindergarten Entrance Age by State

State	State Kindergarten Entrance Age
Alabama	Age 5 on or before September 1
Alaska	Age 5 on or before September 1
Arizona	Age 5 before September 1
Arkansas	Age 5 on or before August 1
California	Age 5 on or before September 1
Colorado	Age 5 on or before October 1
Connecticut	Age 5 on or before January 1 of the school year
Delaware	Age 5 on or before August 31
District of Columbia	Age 5 on or before September 30
Florida	Age 5 on or before September 1
Georgia	Age 5 by September 1
Hawaii	Age 5 on or before July 31
Idaho	Age 5 on or before September 1
Illinois	Age 5 on or before September 1
Indiana	Age 5 on August 1
Iowa	Age 5 by September 15
Kansas	Age 5 on or before August 31
Kentucky	Age 5 by August 1
Louisiana	Age 5 by September 30
Maine	Age 5 on or before October 15
Maryland	Age 5 by September 1
Massachusetts	Established by each school division
Michigan	Age 5 by September 1
Minnesota	Age 5 on or before September 1
Mississippi	Age 5 on or before September 1

Missouri	Age 5 before August 1. Metropolitan districts child must be 5 on or before any date between August 1 and October 1.
Montana	Age 5 on or before September 10
Nebraska	Age 5 on or before July 31
Nevada	Age 5 on or before September 30
New Hampshire	Not specified in statute, rules or regulations
New Jersey	Children aged 4 & 5, must admit children aged 5 to 6. The cutoff date must be after October 1
New Mexico	Age 5 before September 1
New York	Must be between the ages of 4 and 6
North Carolina	Age 5 on or before August 31
North Dakota	Age 5 before August 1
Ohio	Established by each school division
Oklahoma	Age 5 on or before September 1
Oregon	Age 5 on or before September 1
Pennsylvania	Minimum age for kindergarten entrance is 4 years 7 months before the first day of the school year
Rhode Island	Age 5 on or before September 1
South Carolina	Age 5 on or before September 1
South Dakota	Age 5 on or before September 1
Tennessee	Age 5 on or before August 15
Texas	Age 5 on or before September 1
Utah	Age 5 before September 2
Vermont	Age 5 on or before August 31 and January 1
Virginia	Age 5 on or before September 30
Washington	Age 5 on or before August 31
West Virginia	Age 5 prior to September 1

Wisconsin	Age 5 on or before September 1
Wyoming	Age 5 on or before September 15

Note: Adapted from Education Commission of the States website. Copyright 2018 by Education Commission of the States. Utilized with permission

School divisions with kindergarten programs have a variety of school entrance ages, which may contribute to the academic success or downfall of students. Over the last four decades, a vast majority of states have altered their kindergarten entry cut-off dates to earlier in the school year (Liu, 2016). The issue of whether or not kindergarten entrance age makes a difference in school success, along with questioning the effects of the birthday cut-off among states, is frequently questioned and examined. Lloyd (2015) researched and discovered that students who entered kindergarten later, or were delayed one year or more compared to peers in the same classroom, had an overall academic advantage. These initial advantages in kindergarten were in reading, mathematics, and global general knowledge. This same population of students had fewer problematic behaviors (Lloyd, 2015). Additional research conducted by Lubotskya and Kaestner (2016) found and stated that, "the achievement of children who entered school at an older age (and thus at a higher level of both cognitive and non-achievement) experienced larger gains in reading and math test scores" (p. 196), verifying age is a factor in academic achievement. Students who enter kindergarten at a younger age have a steeper slope of academic gains to acquire and are less likely to make the necessary gains compared to the older students. Problematic behaviors were at a significantly higher level and were a factor of performance (Lloyd, 2015).

Delayed Enrollment

Enrollment into the academic environment contributes to the question of when parents should register their children into school. Kindergarten enrollment in the 20th century significantly increased from 0% to 60%, with almost all five-year-olds entering into the education system.

During this period, kindergarten became an established part of the public school system (Bassok & Reardon, 2013). Information on the effects of students who enter kindergarten at an early age may be controversial. Parents and guardians may need guidance of the best time or age to enroll their student into the education system. Age can be an indicator of academic achievement with research suggesting students who enter kindergarten prior to the age of six may experience difficulties within the cognitive domains, including executive function skills and working memory (Aro, Laasko, Maatta, Tovanen, & Poikkeus, 2014; Cameron et al., 2012; Coldren, 2013; Fitzpatrick & Pagani, 2012).

Evidence examined shows how delayed enrollment influences executive function skills, working memory abilities, and how these domains may predict kindergarten readiness levels. These executive function skills, along with the working memory, foster behaviors for problem-solving tasks, holding information, and encourage attention to tasks (Fitzpatrick and Pagani, 2012). Data collected from 1,824 children with a working memory age of 29 to 41 months, then reassessed at 74 months of age (approximately 6 years, 1 month), verified that the age of a child contributes to working memory scores and the overall success of a student in the academic environment (Fitzpatrick & Pagani, 2012). Students with an older entry age into kindergarten have more developed and a higher level of cognitive skills.

Delaying kindergarten for students may contribute to higher levels of performance relating to a variety of skills. Cameron et al. (2012) collected data from 213 children, with ages ranging from three to five years of age. Students were tested at the start of their kindergarten school year and again at the end of the kindergarten school year. Students who were older in age (closer to the age of six), received higher achievement scores on all assessments. Final findings verified that executive function skills and fine motor skills, particularly copying skills, are strongly associated with fall–

spring success in decoding, reading comprehension, and overall reading. Children who enter kindergarten already having fine motor skills can divert their attention to learning higher level of skills, such as reading or higher level of sentence writing (Cameron et al., 2012).

Regulatory skills, such as attention/executive control, along with regulation of behavior, emotions, and social interchanges are needed for competent functioning in the home, school, and social community (Aro et al., 2014). Delayed enrollment may promote higher academic achievement. Research verified the students who entered kindergarten at the median age of 5.2 (five years, two months) performed at a lower educational level compared to older kindergarten students with a median age of 5.6 (five years, six months). Research collected in the areas of reading and math showed kindergarten students who entered kindergarten at an older age scored higher on cognitive and non-cognitive achievements at the start of their kindergarten year. This same population of students scored higher on cognitive assessments along with cognitive and non-cognitive achievements at the end of kindergarten and at the start of first grade (Lubotskya & Kaestner, 2016). Younger students (under the age of six) who entered kindergarten were more likely to have problems in self-regulation, delayed language development (Aro et al., 2014), and more significant problematic behaviors (Lloyd, 2015).

Delayed enrollment benefits students in the area of mathematics when comparing four and five-year-old students who may consider entering kindergarten. Early interventions showed learning mathematics at an early age had a long-lasting outcome. These skills include verbal counting, knowing number symbols, recognizing patterns, comparing numbers, and estimation. Students who performed below their peers in kindergarten tended to remain behind in math throughout their education (Toll & Van Luit, 2014). Children who do not learn basic math skills fall behind in their early numeracy knowledge by five years of age. Research also concluded that older students (ages

5.5-6.0) tend to be further behind compared to students who entered kindergarten at a younger age (ages 4.0-5.4). This is due to the lack of exposure and the lack of interventions at a younger age (Toll &Van Luit, 2014).

Personal opinions of the academic environment from the view of children may be a factor in academic success to justify enrollment delay. Perceptions about starting kindergarten, transitions, and social implications affect the overall outcome of success in kindergarten (Di Santo & Berman, 2011). Research gathered from 33 kindergarten children in focus groups revealed opinions about kindergarten with three main focus areas presented in the study: play versus academics and homework, getting bigger, and rules in school. Research verified younger children (ages three to four) mostly viewed kindergarten as a place to play, while older students (ages five to six) viewed kindergarten as a place to learn or follow the rules (Di Santo & Berman, 2011).

Academic Redshirting

Kindergarten "redshirting" is a way parents may determine when to enroll their child into school. According to Bassok & Reardon (2013), "6-year-olds are repeating kindergarten and should be considered "redshirters," as they were 5 when they first entered kindergarten" (p. 289). Research reveals almost 17% of kindergarten students who were nearly six years old and between 4% and 5.5% of children who *redshirted* kindergarten, were male, white, and had a high socioeconomic status. Students who entered kindergarten at a younger age had a low socioeconomic status, with parents who spent a minimum of 16% of their income on childcare. Additionally, some parents delayed kindergarten due to the personal view that their child was not prepared for kindergarten and educational demands. Specific demographics reflect boys are more likely to *redshirt* than girls, with 6% of Caucasian children considered *redshirters* (Bassok & Reardon, 2013). Data gathered from Cameron et al., (2012) reflected student ages ranging from three to five years and looked at a variety of cultural backgrounds and educational backgrounds of the mother when determining if *redshirting* is appropriate. Bassok & Reardon (2013) determined *redshirting* kindergarten benefited students cognitively in the long-term. Students who have been identified as a kindergarten *redshirt* have more cognitive control, show higher levels of maturity, and are developmentally ready for the academic demands of school (Coldren, 2013).

Federal Guidelines and Rural Students

Federal initiatives may impact the overall performance of students who reside in rural areas. The No Child Left Behind Act, signed into effect by President George W. Bush, may contribute to the development of rural schools and the growing concerns of these demographic regions. The No Child Left Behind Act, referred to as NCLB, was signed into law in 2001, in an attempt to redesign education (Heise, 2017). According to Ladd (2017),

> under the No Child Left Behind Act (NCLB), the federal government required all states to assess every student annually in Grades 3 through 8 and once in high school in math and reading and to set annual achievement goals so that 100 percent of the students would be on track to achieve proficiency. (p.1)

Students were now expected to take a high stakes test in a variety of academic areas. These summative assessments were designed to measure each student's achievement following an established period of instruction. These assessments were used to determine educational and financial needs for each school or school division (Skubiszyn and Borich, 2016). These high stakes tests were a way to inform the public of a school's quality, a way to measure accountability, and provide detailed information about each student's individual achievement (Jones, Jones, & Hargove, 2003).

Under No Child Left Behind, schools were required to prove they have achieved Adequate Yearly Progress (AYP) toward state-established goals (Dee, Jacob, & Schwartz, 2013) with AYP a critical tool to measure the pass/fail system. This included the progress measurement, which is the progress of all students of "different ethnicities, socioeconomically disadvantaged, English learners and students with disabilities in English, math, and attendance" (Genao, 2013, p.159). Attendance is also a significant factor under the NCLBand may be used as a performance indicator. At the beginning of the NCLB Act, 37 states use attendance as an indicator for making AYP, with a target attendance rate for these schools ranging from 80% to 95% (Christie, 2005). When schools do not meet the AYP requirements, schools do not receive needed funding, which is a critical part of the education system and growth of school systems. Funding preserves highly qualified teachers, maintains building, purchases programs, and provides additional educational funding. Polikoff, McEachin, Wrabel, and Duque (2013) discovered that the NCLB required states to implement a set of school accountability mandates to receive federal Title I funding. When schools do not make Adequate Yearly Progress, Title I funding is subject to additional sanctions (Polikoff et al., 2013, p. 53). Attendance as an Adequate Yearly Progress indicator affects school funding and the students within the declining school system.

Due to growing concerns of rural achievement, the federal government determined the "one size fits all" approach of NCLB did not meet the needs of students residing in rural areas. Federal officials determined that students do not learn the same, receive the equivalent education, or come from the same demographic backgrounds (Phillips, 2006) in regards to testing requirements of the NCLB. In 2015, the NCLB was overhauled, redesigned, and signed into effect by President Barack Obama. The new act was renamed the Every Student Succeeds Act (ESSA) (Egalite, Fusarelli, & Fusarelli, 2017). Sindelar, Pua, Fisher, Peyton, Brownell, & Mason-Williams (2018) stated, "Under

ESSA, states have more authority in accountability, teacher licensing, the use of funds, and the contentious HQT (Highly Qualified Teacher) requirement was eliminated" (p. 17). Although the original act was redesigned, the new federal policies and regulations concerned rural school divisions since rural schools do not benefit from federal funding equal to suburban and urban areas (Brenner, 2016). Additionally, under ESSA, the Department of Education was required to take actions to ensure geographic diversity or equal distribution among rural, suburban, and urban schools (Brenner, 2016).

The ESSA encouraged equal funding to disadvantaged, high-poverty schools since the previous Title I funding was initially dispersed based on student enrollment. This caused rural schools to receive less funding due to rural schools dominantly having lower enrollments compared to suburban and urban counterparts (Egalite et al., 2017). Under ESSA, The Small Rural School Achievement (SRSA) program was created to support rural schools. These rural schools consist of less than 600 students or 10 persons per square miles. This program permitted schools to apply for additional grants from the Department of Education ranging from $20,000 to $60,000 (Brenner, 2016). Additionally, the Rural and Low-Income Schools (RLIS) program, also developed under ESSA, provided additional funding resources for rural schools. This funding source serves at least 20% of children identified as living in poverty (Brenner, 2016). With the development of ESSA, Title II funding could now be reallocated to Title I to support professional development programs in high poverty school divisions, including technology and STEM (Egalite, et al., 2017), an area of need in rural education (Player, 2016). ESSA also eliminated the highly qualified teacher (HQT) provision established initially under NCLB, which went into effect in the 2017-2018 school year. This permits each state to develop their own definitions of unqualified, inexperienced, and ineffective teachers (Saultz, White, Mceachin, Fusarelli, & Fusarelli, 2017) assisting with hard to feel positions such as special education teachers (Sindelar et al., 2018).

The impact of high-stakes testing under the NCLB and ESSA may contribute to rural education. Students who live in rural communities within poverty or lower-income families are more likely to drop out of school and produce lower test scores than children from families with higher incomes (US Department of Agriculture, 2017). Research completed by Reardon and Galindo (2002) verified the probability of dropping out of school for lower socioeconomic students in schools with and without high stakes test requirements. Reardon and Galindo (2002) discovered a correlation between high-stakes testing and students of lower socioeconomic status stating students who are required to take high-stakes tests have a higher rate of dropping out of school. Additionally, rural students who are required to take high-stakes tests perform at a lower level of achievement compared to non-rural counterparts (Roscigno & Crowle, 2001). Students who resided in rural communities are an understudied population and have higher risk factors for academic acquisition as they enter the educational environment (Vernon-Feagans et al., 2010). Educators who teach in rural areas have fewer years of teaching experience compared to urban territories (Yau-ho, 2016), justifying the need for further research of academic achievement of literacy skills for kindergarten students in a rural school.

Rural Communities

Rural achievement in education influences accomplishments in the academic community. Player (2016) stated, “Rural schools are located in census-defined rural territories that are located at least five miles from an urban area and/or at least 2.5 miles from an urban cluster (town)” (p. 3). Strange (2011) stated the word “rural” may just not have a single meaning such as, “small and remote in our cultural lexicon,” but this terminology also can be defined as removed from the modern influences of life (p. 9). It is estimated that half of the rural students in the United States live in just 10 states, including: Indiana, Virginia, North Carolina, Georgia, Ohio, Texas, New York, Pennsylvania, Alabama, and Michigan (Showalter, Klein, Johnson, & Hartman, 2017). As stated by Vernon-Feagans et al., (2010), “Rural children, a largely understudied population in the research literature, are likely to have unique risk and protective factors as they enter school” (p. 163). Fisherman (2015) stated one in four children who reside in a rural community live in poverty and “of the fifty U.S. counties with the highest child-poverty rates, 48 are rural” (p. 9). Kentucky, Texas, Mississippi, South Dakota, Louisiana, and Alabama have 66 out of the 100 poorest counties in the United States (Fishman, 2015). Information presented by Phi Delta Kappan (2017) revealed 28.5% of schools within the United States were considered rural with a student body population of 7,093,246. Additional information presented by Pullman, VanHooser, Hoffman, & Heflinger (2010) showed students who attend rural schools might encounter learning and academic problems due to poverty, challenges to obtain transportation, and inadequate housing. Rural children who live in poverty are less likely to have up-to-date immunizations (Schaefer et al., 2016). Research conducted by Hoffman, Anderson-Butcher, Fuller, & Bates (2017) researched academic achievement with a population size of 2,462 middle school students who attended a school identified as rural. Research reflected 77% reported a higher level of academic achievement and 23% reported lower academic achievement. Hoffman et al., (2017) concluded 66.6% of the students who reported low academic achievement were students receiving free or reduced lunch and 48.6% of grandparents are responsible for their grandchildren compared to 38.7% in an urban area (Strange, 2011).

Table 3

Percent rural students, by state, 2013-2014

State	
Alabama	35.5%
Alaska	25.2%
Arizona	5.3%
Arkansas	28.4%
California	3.1%
Colorado	6.2%
Connecticut	10.9%
Delaware	17.4%
Florida	4.3%
Georgia	22.3%
Hawaii	No data reported
Idaho	17.8%
Illinois	8.7%
Indiana	24.5%
Iowa	31.4%
Kansas	21.5%
Kentucky	30.1%
Louisiana	12.6%
Maine	51.4%
Maryland	7.2%
Massachusetts	3.3%
Michigan	17.2%
Minnesota	17.2%
Mississippi	43.7%
Missouri	21.4%
Montana	32.3%
Nebraska	22.7%

Nevada	1.7%
New Hampshire	33.6%
New Jersey	6.6%
New Mexico	18.4%
New York	11.1%
North Carolina	39.4%
North Dakota	37.5%
Ohio	22.5%
Oklahoma	28.6%
Oregon	8.8%
Pennsylvania	17.5%
Rhode Island	3.6%
South Carolina	15.9%
South Dakota	40.4%
Tennessee	22.3%
Texas	12.3%
Utah	4.7%
Vermont	54.7%
Virginia	21.2%
Washington	7.1%
West Virginia	32.8%
Wisconsin	18.9%
Wyoming	19%

Note: Adaptive from *Out of the Loop* (p. 2), by M. Lavalley. Copyright 2018 by the Center for Public Education

Rural Achievement

Graduation rates for rural students may affect the growth of the community. According to the National Center for Education Statistics (2013), in 2010-2011, 99,000 public elementary and secondary schools, located in over 14,000 school divisions, served over 49 million students in the United States, with 57% percent of these schools being considered rural. Within these rural counties, 64% of these counties have high rates of poverty compared to 47% of urban counties (Schaefer, Mattingly, & Johnson, 2016). Many of these rural areas are severely underfunded with some schools spending less than $4,400 per student in areas such as rural Idaho and Oklahoma, while also battling significant teacher shortages (Phi Delta Kappan, 2017).

Research conducted by Roscigno and Crowle (2001) stated, “Rural adolescents exhibit lower academic achievement and a higher rate of dropping out of high school than do their non-rural counterparts” (p. 289) contributing to the concerns of rural student achievement. Durham and Smith (2006) discovered students who reside in rural communities have lower reading scores, especially for certain levels of socioeconomic status. National statistics show that 23% of rural youths living in poverty drop out of school, as compared with 18% of impoverished youths in urban and suburban areas (Provasnik et al., 2007). Research on high school graduation rates using national data have produced conflicting results (Jordan, Kostandini & Mykerezi, 2012), with rural students being more expensive to educate than their urban counterparts (Strange, 2011). Lavalley (2018) found graduation rates of rural high school students exceed the national average with rural low-income families more likely to graduate over their urban counterparts. Eighty-seven percent of rural high school students graduate within the expected four years, but only 77% of rural students of color graduate within the same timeframe (Showalter et al., 2017).

Rural states may have varying impacts among growth of the community. Mississippi, Alaska, Colorado, Florida, Washington, and Wyoming have the lowest graduation rates among rural states (Showalter et al., 2017). Rural children perform at lower academic levels, are less engaged in school activities, and have higher exposure to legal issues in their adolescent years (Schaefer et al., 2016). Mississippi has one of the highest percentages of rural students with an estimate of 43.7% of rural students within the state. Mississippi also has half the state identified as a rural school division with poverty contributing to the problem (Lavalley, 2018); this state is spending less than $4,700 per student on instruction (Showalter et al., 2017).

Lower educational exposure contributes to continuation of the cycle of poverty in rural education. Children who live in rural communities within poverty or lower-income families are more likely to drop out of school and have lower test scores than children from families with higher incomes (US Department of Agriculture, 2017). Additionally, as stated by Lavalley (2018), “Poverty in rural areas is also more persistent than in urban areas, and can be more likely to last for generations” (p. 4). Financial earnings for rural communities may be a factor to this never-ending cycle. Urban employers tend to offer higher wages for employees with larger gaps at higher levels of education (US Department of Agriculture, 2017).

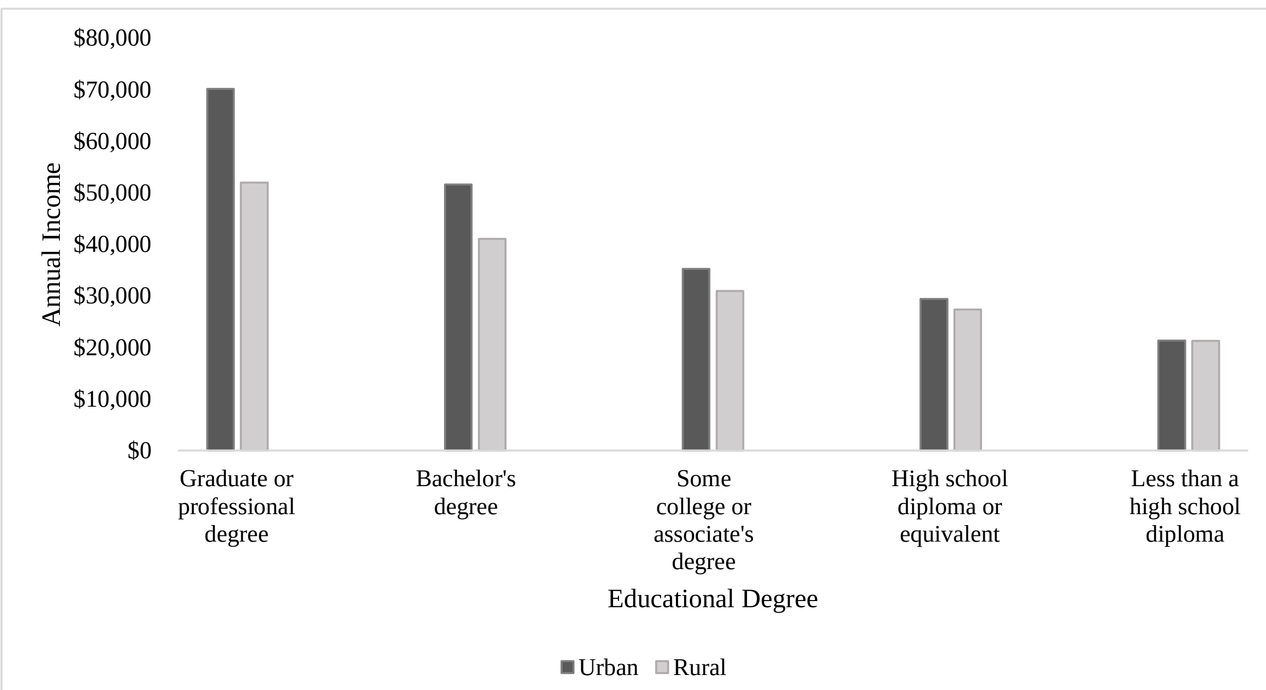


Figure 1. Rural-urban median earnings for earners 25+ by education attainment, 2015. Adapted from Rural Education at a Glance, 2017 edition. United States Department of Agriculture, Economic Information Bulletin 171, page 4. April 2017

Teacher performance

Students who resided in rural communities may achieve at lower academic levels compared to their non-rural peers due to the quality of teachers (Fedora, 2016). Schools throughout the country have a difficult time recruiting and retaining highly qualified teachers (Reininger, 2012), with people who reside in a rural community being identified as less qualified to become teachers (Player, 2016). Comparative to suburban teachers, rural teachers are 20% less likely to hold a master's degree (Player, 2016). Geographic mobility studies proved that teachers early in their careers, in their early 20's, are more likely to be flexible in their demographic demands, but most teachers are married and over 30 years old (Reininger, 2012). Teacher recruitment for rural communities is a challenge with college attended, standardized testing, level of degree, and experience contributing to the concern (Lavalley, 2018), with 80% of teachers staying within thirteen miles of their hometown (Lavalley, 2018). Reininger (2012) found that teachers are more likely, than any other college graduates, to live in the area in which they lived as a child, contributing to the "localness" concerns (Reininger, 2012). Fishman (2015) researched and found in a suburban area located in Philadelphia that they may yield over 400 applicants for a single teaching position compared with a rural teaching position that may only have a single applicant. The lack of highly qualified teachers, in rural communities with concerns in academic success, supports the need for research of rural achievement.

Teacher experience, education, and rural teachers have fewer years of teaching experience compared to more urban locations (Yau-ho, 2016), which may contribute to lower academic achievement (Zhang et al., 2018) in rural areas. People who grow up in rural areas are less likely to be qualified to be a teacher and are unlikely to receive higher levels of professional development from colleges and universities due to rural demographic challenges (Player, 2016). Female students have higher odds of becoming a teacher than males at 2.47%, with the odds for college graduates with a parent already a teacher having 1.59% greater odds compared to a non-teacher parent (Reininger, 2012). Rural schools reported at least one teacher vacancy, 73% more than their urban (76%), suburban (78%), and town (76%) counterparts with a higher degree in difficulties in obtaining a teacher for Science, Technology, Engineering and Math (STEM) programs (Player, 2016). Rural Idaho was reported to have more STEM vacancies than any other rural state (Player, 2016). Elementary school positions were reported to be easier to fill than any other level of education regardless of the demographic area (Player, 2016).

Phonological Awareness Literacy Screening-Kindergarten

The Phonological Awareness Literacy Screening-Kindergarten (PALS-K) is a reading achievement assessment to measure basic literacy within six subtests. This instrument is a diagnostic tool "to identify students who perform below grade-level expectations in several important literacy fundamentals, and thus are at risk of reading difficulties and delays" (Invernizzi et al., 2015, p. 5). The University of Virginia and the Curry School of Education developed the Phonological Awareness Literacy Screening-Kindergarten (PALS-K) as a screening tool for the Virginia Early Intervention Reading Initiative (EIRI) for kindergarten-aged students. This assessment was developed following the Early Intervention Reading Initiative established by the 1997 Virginia Acts of Assembly, when funding was created to help school divisions identify children in need of additional instruction and early intervention services (Invernizzi et al., 2015). The assessment has two domains (Phonological Awareness and Literacy Skills) with seven subtests; Rhyme Awareness, Beginning Sound Awareness, Alphabet Knowledge, Letter Sounds, Spelling, Concept of Word, and Word Recognition in Isolation are included within the screener. Refer to Table 4 for a more detailed description of each subtest.

This instrument was used in numerous studies to assess early literacy skills in Spanish-speaking students (Yaden, Marx, Cimetta, Alkhadim, & Cutshaw, 2017), assessing students with hearing impairments (Werfel, Douglas, & Ackal, 2016), and evaluating students with dyslexia (Catts, Mcilraith, Bridges, & Nielsen, 2017). These studies show the importance of the PALS-K instrument for students with disabilities, how this assessment is diverse, and shows validity in testing literacy skills for all kindergarten students. The number of questions for the entire instrument consists of 137 components and 102 opportunities for a student to answer (excluding individual rhyme and individual beginning sound if benchmark is met), with each subtest having a different number of questions; Group Rhyme-10, Group Beginning Sound-10, Individual Rhyme-10, Lower-case Alphabet-26, Spelling-20, Concept of Word-25, and Word List-20. Scoring procedures include assigning one point per correct answer with a minimum score of zero and a maximum score of 102. A total sum score of 83 shows a student met the spring benchmark.

The validity of the PALS assessment may be viewed as trusted information. Developers of the Phonological Awareness Literacy Screening (PALS) states, “validity refers to the extent to which one can trust that a test measures what it is intended to measure” (Invernizzi et al., 2015, p. 27). PALS-K uses three types of validity and has been verified through pilot studies, statewide PALS data, and research over five years (Invernizzi et al., 2015). Additionally, PALS researchers use three types of validity, including content validity, criterion-related validity, including predictive and concurrent, and construct validity using different groups of students (Invernizzi et al., 2015).

PALS-K developers used content validity, which is defined by Brod, Tesler, & Christensen (2009) as “the measurement property that assesses whether items are comprehensive and adequately reflect the patient perspective for the population of interest” (p. 1263). Developers of PALS wanted to ensure the PALS-K assessment had sufficient content validity and chose specific items to represent literal items (Invernizzi et al., 2015). Developers used all 26 letters of the alphabet for letter recognition, but not all the letters for letter sound recognition with the letters Q and X excluded due to these letters being difficult to pronounce (Invernizzi et al., 2015). Word recognition was also assessed with word list through the end of first grade. Concept of word, including finger-pointing, was also included within the developer's research (Invernizzi et al., 2015).

Researchers also used criterion-related validity in the form of predictive validity when developing the PALS-K assessment. In the fall of 1998, 74 were screened using the PALS assessment with all students receiving the same instruction throughout the school year. The same 74 students were given the Stanford-9, an additional educational screener, in the spring of 1999. The two assessments, PALS and Standford-9, showed a significant correlation at $p < .001$, with a correlation between fall PALS summed scores and spring Stanford-9 Total Reading scaled scores was .70 (Invernizzi et al., 2015).

A second study using predictive validity was used using Virginia's end-of-year state assessments; name Standards of Learning (SOL). Discriminant analysis, with a sample size of 61,124 third grade students' Standards of Learning (SOL) scores, was used to "access the relationship between the 2012 Reading SOL scores in the spring of third grade and the students' spring PALS-K scores three years earlier" (Invernizzi et al., 2015, p. 28). Developers found a medium to the medium-high correlation between kindergarten students' summed scores ($r = .56$) (Invernizzi et al., 2015). This verified a correlation of PALS-K to future PALS scores in higher grades.

Concurrent validity was used as a final measure-to-measure validity. Using the independent standard, PALS-K compared to the Stanford-9 assessments, Sounds, and Letters, Word Reading, and Sentence Reading were administered in Spring 1999 to 137 kindergartners, who had also been given

PALS two weeks prior (Invernizzi et al., 2015). A direct medium to high correlation was established between each assessment. As stated by Invernizzi et al., (2015),

> The correlations between the PALS Summed Score and the three Stanford-9 subtests scaled scores were also medium to high and significant (Sounds and Letters, *r* = .79; Word Reading, *r* = .74; and Sentence Reading, *r* = .58). Correlations between the PALS Summed Score and the Stanford-9 raw scores were similar: medium to high and significant (Total Reading, *r* = .79; Sounds and Letters, *r* = .80; Word Reading, *r* = .78; Sentence Reading, *r* = .56). (p. 29)

PALS-K researchers used construct validity as part of their final research. This research was based on a three-part theoretical model consisting of sound, reading, and print. Researchers used principal components analysis to determine the relationship between sounds and print (Invernizzi et al., 2015). PALS-K researchers conducted a principal components analysis on PALS data to verify the principal factor structure, conducted discriminant analyses on PALS data to regulate the extent to which group membership could be predicted accurately from PALS subtask scores, and organized the operating characteristic analysis to verify the diagnostic accuracy of PALS-K (Invernizzi et al., 2015).

Under construct validity, factor analysis was used to test the factor structure of PALS-K. Data collected using this approached looked at 2,844 public education kindergarten students with the sample size split in two forms, exploratory and confirmatory samples (Invernizzi et al., 2015). PALS-K researchers stated, “An overall general factor of early literacy influenced three first-order factors of alphabet knowledge, phonological awareness, and contextual knowledge” (p. 30). Researchers also compared English language learners (ELL’s) and non-English language learners with metric invariance and determined that this assessment supported both populations (Invernizzi et al., 2015).

CHAPTER THREE: METHODS

Overview

Chapter Three introduced the correlational design, age as the predictor variable, and the achievement in reading in literacy skills in a rural school district as the criterion variable. The research question was asked to include the relationship between entrance age and achievement in reading of literacy skills, along with the hypotheses of the study. The participants, kindergarten students in a rural school district, and instrument, PALS-K, are also discussed. The procedure is reviewed with a concluding data analysis.

Design

For this study, a quantitative, correlational design is used. A correlational design was appropriate for this study since its purpose was to measure the degree and direction of the relationship between two or more variables and to explore the magnitude among variables (Gall et al., 2007). Age of the students entering kindergarten is used as the predictor variable and achievement in literacy skills scores as the criterion variable.

The predictor variable, age, is defined as the chronological amount of time elapsed since birth (Age, 2004) measured in months, and determined by when the student enrolls in kindergarten. The age of students was collected through the school district's central information system. Ages of students were verified during student enrollment process with parents or guardians being required to provide state-issued birth certificates.

The criterion variable, reading achievement, is defined as an accomplishment in early reading achievement, including awareness of sound within spoken words, phonological awareness, and alphabet recognition (Invernizzi et al., 2015). Reading achievement was measured using the Phonological Awareness Literacy Screening for Kindergarten test.

Research Question

RQ1: Is there a relationship between entrance age and academic achievement in literacy skills scores for kindergarten students in a rural southwestern school district?

Hypotheses

$H_0$1: There is no statistically significant relationship between the chronological entrance age, measured in months, and academic achievement in literacy skills scores as measured by the Phonological Awareness Literacy Screening for Kindergarten (PALS-K) for kindergarten students.

Participants and Setting

Archival data was used for this study. A convenience sample was used for this study with participants from one public school district; this included three different elementary schools from within the division. All the participants will be kindergarten school students located in rural, southwestern Virginia during the spring semester of the 2017-2018 school year. The school district has a diverse income, but is mostly middle-class. The race is predominately Caucasian, with English as the primary language.

The data set consisted of 221 kindergarten students, from three different elementary schools. This will exceeded the 66-student minimum requirement for a medium effect size with the statistical power of .7 at the .05 alpha level (Gall et al., 2007). The sample consisted of 126 males and 95 females. The race consisted of 154 students who were identified as Caucasian, 42 as African-American, 16 as American Indian or Alaskan Native, and one as Asian within the kindergarten classes. Eight students identified as being more than one race. The average age of the kindergarten students was 64 months; five years, four months.

Instrumentation

The instrument used in this study was the Phonological Awareness Literacy Screening for

Kindergarten (PALS-K). See Appendix A for the instrument. The instrument is used to measure the reading achievement of students in a rural school district including the six subtests within the instrument. The purpose of the instrument is a diagnostic tool "to identify students who perform below grade-level expectations in several important literacy fundamentals, and thus are at risk of reading difficulties and delays" (Invernizzi et al., 2015, p. 5). The University of Virginia and the Curry School of Education developed the Phonological Awareness Literacy Screening for Kindergarten (PALS-K) as a screening tool for the Virginia Early Intervention Reading Initiative (EIRI) for kindergarten-aged students. This assessment was developed following the Early Intervention Reading Initiative established by the 1997 Virginia Acts of Assembly when funding was established to help school divisions identify children in need of additional instruction and early intervention services (Invernizzi et al., 2015). The assessment has two domains (Phonological Awareness and Literacy Skills) with seven subtests; Rhyme Awareness, Beginning Sound Awareness, Alphabet Knowledge, Letter Sounds, Spelling, Concept of Word, and Word Recognition in Isolation are included within the screener. Refer to Table 4 for a more detailed description of each subtest. Permission to utilize this assessment was not required per correspondence from The Phonological Awareness Literacy Screening for Kindergarten (PALS-K) developers. See Appendix B for verification.

Table 4

Description of Subtest from PALS-K

Subtest	Description	Reliability scores
Rhyme and beginning sound awareness	The ability to identify rhyming words and beginning letter sounds with pictorial support	.81
Alphabet knowledge	The ability to quickly identify random capital and lower-case letters of the alphabet	.92
Letter-sound awareness	The ability to orally state random letters and digraphs of the alphabet	.88
Spelling	The ability to write and spell short vowel, consonant-vowel-consonant (cvc) words	.89
Concept of word	The ability to match spoken words to written words when read aloud	.92
Word recognition in isolation	The automatic recognition of isolated words without decoding	.95

This instrument was used in numerous studies to assess early literacy skills in Spanish-speaking students (Yaden et al., 2017), assess students with hearing impairments (Werfel et al., 2016), and assess students with dyslexia (Catts et al., 2017). These studies show the importance of this instrument.

The construct validity of the instrument and all subtests is defined as “the degree to which the underlying traits of an assessment can be identified and the extent to which these traits reflect the theoretical model on which the assessment was based," with reliability coefficients for individual tasks range from .79 to .89, Pearson correlation coefficients, ranging from .96 to .99, indicating that PALS-K tasks can be scored consistently across individuals (Invernizzi et al., 2015, p. 29).

The number of questions for the entire instrument consists of 137 components and 102 opportunities for a student to answer (excluding individual rhyme and individual beginning sound if benchmark is met), with each subtest having a different number of questions; Group Rhyme-10, Group Beginning Sound-10, Individual Rhyme-10, Lower-case Alphabet-26, Spelling-20, Concept of Word-25, and Word List-20. Scoring procedures include assigning one point per correct answer with a minimum score of zero and maximum score of 102. A total sum score of 83 shows a student met the benchmark.

Administration of the instrument was given and scored by trained individuals with knowledge of the instrument. The instrument was given within the two-week assigned window without any time limits per subtest or question. The instrument should take less than 20 minutes to administer. Prior to administering the instrument, the entire Administration and Scoring Guide should be read in its entirety. See the Administration and Scoring Guide located through the University of Virginia (2017).

Procedures

Archival data was used in this study. Prior to receiving the data, approval was obtained from the Liberty Instructional Review Board (IRB). See Appendix C for IRB approval. Consent was obtained from the Supervisor of Assessment and Data for the archival data and student demographic data from in-person from the school division. See Appendix D for consent. All participants in the data set were identified as kindergarten students with verification from each school's registration system, within the school district, and within a rural area. All kindergarten teachers have been trained by district supervisors prior to administering the instrument, and all participants have completed the PALS-K assessment. The training to administer this assessment consists of knowledge of all domains of the assessment, including group assessments and individual assessments, benchmark scores for each subtest, and knowledge of all accommodations for each student, if applicable. PALS-K reports and student demographics were obtained from the Supervisor of Assessment and Data. The Phonological Awareness Literacy Screening-Kindergarten (PALS-K) report was obtained per student with the total sum score. Kindergarteners' dates of birth were obtained and verified through state-issued birth certificates during the school enrollment process and further obtained from each student's Phonological Awareness Literacy Screening-K (PALS-K) report. This process included providing a state verified birth certificate to each school's registration secretary, proof of residence, and verification of state physical.

The archival data was then collected by the researcher in the form of sum scores from PALS reports, birthdates, race, and gender from the Supervisor of Assessment and Data who keeps a digital file for each school participating within the setting. The PALS-K scores for each rural elementary school were obtained through digital format through interoffice correspondence, via an USB drive. Student's dates of birth were converted from year format to total number of chronological months to reflect their age at the time of enrollment into kindergarten. All participants' sum score and chronological age in months were entered into the SPSS software for analysis. All pertinent data provide to the researcher from the USB drive was kept secure and locked up in a secured filing cabinet.

Data Analysis

Following the data collection, including PALS-K assessments and converted dates of births, all information was entered into the SPSS software for analysis. Statistics for each variable were obtained with a Pearson product-moment correlation (*r*). Pearson correlations were utilized to test the strength and direction of the relationship between two quantitative variables: age and literacy skills in a rural school district. A correlational design was appropriate for this study since its purpose was to measure the degree and direction of the relationship between two or more variables and to explore the magnitude among variables (Gall et al., 2007). The assumption that age predicts literacy skills was examined therefore an assumption of bivariate outlier was performed with a scatterplot and any extreme outliers will be removed. The assumption of normality was examined using a histogram and Kolmogorov Smirnov test for normality. The assumption of linearity was examined using a scatterplot, with a line of fit added to ensure the assumption of linearity is met. The assumption of bivariate normal distribution was also examined using a scatterplot, completed to ensure the presence of the classic *cigar-shape*. The Pearson's correlation will be run at a 95% confidence level and the value of *r*-stat will be calculated to determine the strength of the linear relationship.

CHAPTER FOUR: FINDINGS

Overview

Chapter Four includes the findings for this study. The purpose of this quantitative study was to determine the relationship between entrance age and achievement in literacy skills, along with the hypotheses of the study. The research question is stated, along with the descriptive statistics and assumption testing for the hypothesis. The chapter concludes with a summary of the study results.

Research Question

RQ1: Is there a relationship between entrance age and academic achievement in literacy skills scores for kindergarten students in a rural southwestern school district?

Null Hypothesis

$H_0$1: There is no statistically significant relationship between the chronological entrance age, measured in months, and academic achievement in literacy skills scores as measured by the Phonological Awareness Literacy Screening for Kindergarten (PALS-K) for kindergarten students.

Descriptive Statistics

Archival data was utilized as a part of the research. Means and standard deviations for both the predictor variable (age) and the criterion variable (achievement in reading in literacy skills in a rural school district) were developed within the research. A convenience sample was used for this study with participants from one public school district, from three different elementary schools from within the same division. All the participants were kindergarten school students located in rural, southwestern Virginia during the spring semester of the 2017-2018 school year. Combined, 221 students participated in the research from three separate public schools in rural Virginia. This information can be located in Table 5.

Table 5

Descriptive Statistics of the Schools' Variables

School	Variable	*N*	Mean	*SD*
School A	Age	107	64.81	4.64
	Score	107	95.44	11.52
School B	Age	75	65.29	4.23
	Score	75	91.79	14
School C	Age	39	64.85	5.31
	Score	39	92.9	14.89

Each school's statistics, including variables, are provided including the sample size, mean, and standard deviation. Data are results prior to the removal of outliers.

For School A, a total of n = 107 kindergarten students participated in the current study, descriptive statistics reveal that most kindergarten students were Male n = 60 (56.1%), five years of age n = 69 (64.5%), White n = 68 (63.6%), No disability n = 101 (94.4%), and a Score of 100 or higher n = 57 (53.3%). This information can be located in Tables 6-10.

For School B, a total of n = 75 kindergarten students participated in the current study, descriptive statistics reveal that most were Male n = 45 (60.0%), five years of age n = 42 (56.0%), White n = 53 (70.7%), No disability n = 74 (98.7%), and a Score of 90-99 n = 29 (38.7%). This information can be located in Tables 6-10.

For School C, a total of n = 39 kindergarten students who participated in the current study, descriptive statistics reveal that most were Male n = 21 (53.9%), five years of age n = 19 (48.7%), White n = 33 (84.6%), No disability n = 39 (100.0%), and a Score of 90-99 n = 17 (43.6%). This information can be located in Tables 6-10.

Of the n = 221 All Schools kindergarten students who participated in the current study, descriptive statistics reveal that most were Male n = 126 (57.0%), five years of age n = 130 (58.8%), White n = 154 (69.7%), No disability n = 214 (96.8%), and a Score of 100 or higher n = 98 (44.3%).

This information can be located in Tables 6-10.

Table 6

Gender and Age of Kindergarten Students for all Three Schools (N=221)

Schools	A	A	B	B	C	C	All	All
	n	%	*n*	%	*n*	%	*n*	%
Gender								
Male	60.0	56.1	45.0	60.0	21.0	53.9	126.0	57.0
Female	46.0	43.0	30.0	40.0	18.0	46.1	94.0	42.5
Missing	1.0	0.9	0.0	0.0	0.0	0.0	1.0	0.5
Age, M (SD)	5.4	0.4	5.4	0.4	5.4	0.4	5.4	0.4
4 years	0.0	0.0	0.0	0.0	1.0	2.6	1.0	0.5
5 years	69.0	64.5	42.0	56.0	19.0	48.7	130.0	58.8
6 years	37.0	34.6	33.0	44.0	18.0	46.2	88.0	39.8
7 years	1.0	0.9	0.0	0.0	1.0	2.6	2.0	0.9

Table 7

Ethnicity of Kindergarten Students for all Three Schools (N=221)

Schools	A	A	B	B	C	C	All	All
	n	%	*n*	%	*n*	%	*n*	%
Ethnicity								
Am. Ind./AK Native	3	2.8	13	17.3	0	0	16	7.2
Asian	0	0	1	1.3	0	0	1	0.5
Black/Afr.-Am.	33	30.8	4	5.3	5	12.8	42	19
White	68	63.6	53	70.7	33	84.6	154	69.7
AK Native/White	0	0	1	1.3	0	0	1	0.5
Black and White	3	2.8	3	4	1	2.6	7	3.2

Table 8

Disabilities of Kindergarten Students for all Three Schools (N=221)

Schools	A	A	B	B	C	C	All	All
Disability	*n*	%	*n*	%	*n*	%	*n*	%
None	101.0	94.4	74.0	98.7	39.0	100.0	214.0	96.8
Multiple Disabilities	1.0	0.9	0.0	0.0	0.0	0.0	1.0	0.5
Spec. Learn. Dis.	2.0	1.9	0.0	0.0	0.0	0.0	2.0	0.9
Spch. /Lang Impair.	2.0	1.9	1.0	1.3	0.0	0.0	3.0	1.4
Autism	1.0	0.9	0.0	0.0	0.0	0.0	1.0	0.5

Table 9

Sum Scores of Kindergarten Students for all Three Schools (N=221)

Schools	A	A	B	B	C	C	All	All
	n	%	*n*	%	*n*	%	*n*	%
Up to 79	9	8.4	8	10.7	3	7.7	20	9
80-89	5	4.7	12	16	4	10.2	21	9.5
90-99	36	33.6	29	38.7	17	43.6	82	37.1
100 +	57	53.3	26	34.7	15	38.5	98	44.3

Table 10

Descriptive Statistics of All Schools' Independent and Dependent Variables

All Schools	*N*	Mean	*SD*	Minimum	Maximum
Age (Months)	196	64.63	4.01	53	76
Literacy Score	196	97.23	5.4	73	102

Data are results after the removal of outliers

Results for Null Hypothesis

Data Screening. Data screening was completed to check for missing data, inaccuracies, or outliers. Warner (2013) found data screening is used to display problems that tend to happen during data analyses, to discover what data is missing, and finding extreme outliers. Box plots were used to detect any outliers.

An outlier is an observation that lies an abnormal distance from other values in a random sample from a population. Given the boxplot of School A, ages in months (Figure 2), outliers were identified as being 89 and 76 months, which are above the maximum age of 74 months. Convention is that outliers affect the mean but not the median, which in this case is 64 months, which is a better indicator of the middle (central) age in months. These cases were removed as outliers.

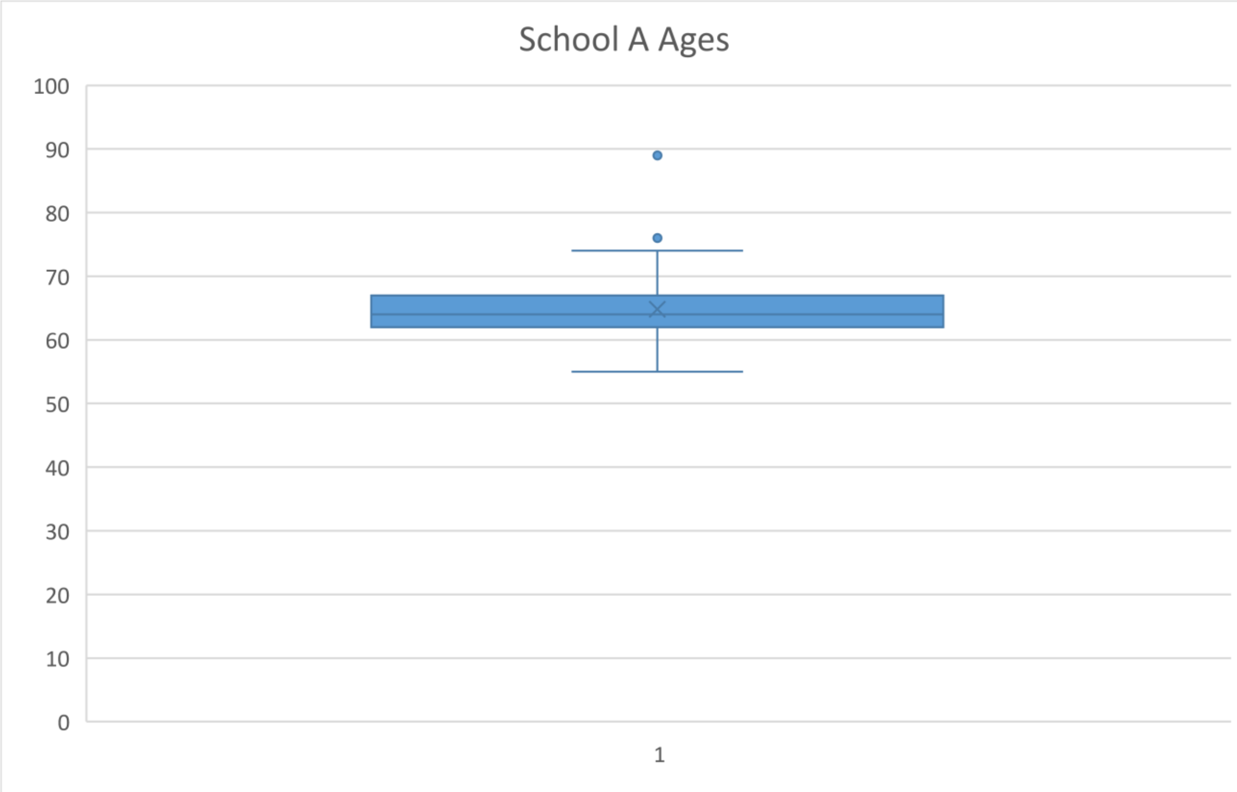


Figure 2. Boxplot of School A showing ages in months. A box plot was used to detect outliers in the data collected from students in School A.

Given the boxplot of School A scores (Figure 3), outliers were identified as being 27, 53, 60, 64, 75, 79, 82, 85, and 88 which are below the minimum score of 89. Convention is that outliers affect the mean but not the median, which in this case is 100, which is a better indicator of the middle (central) score. These cases were removed as outliers.

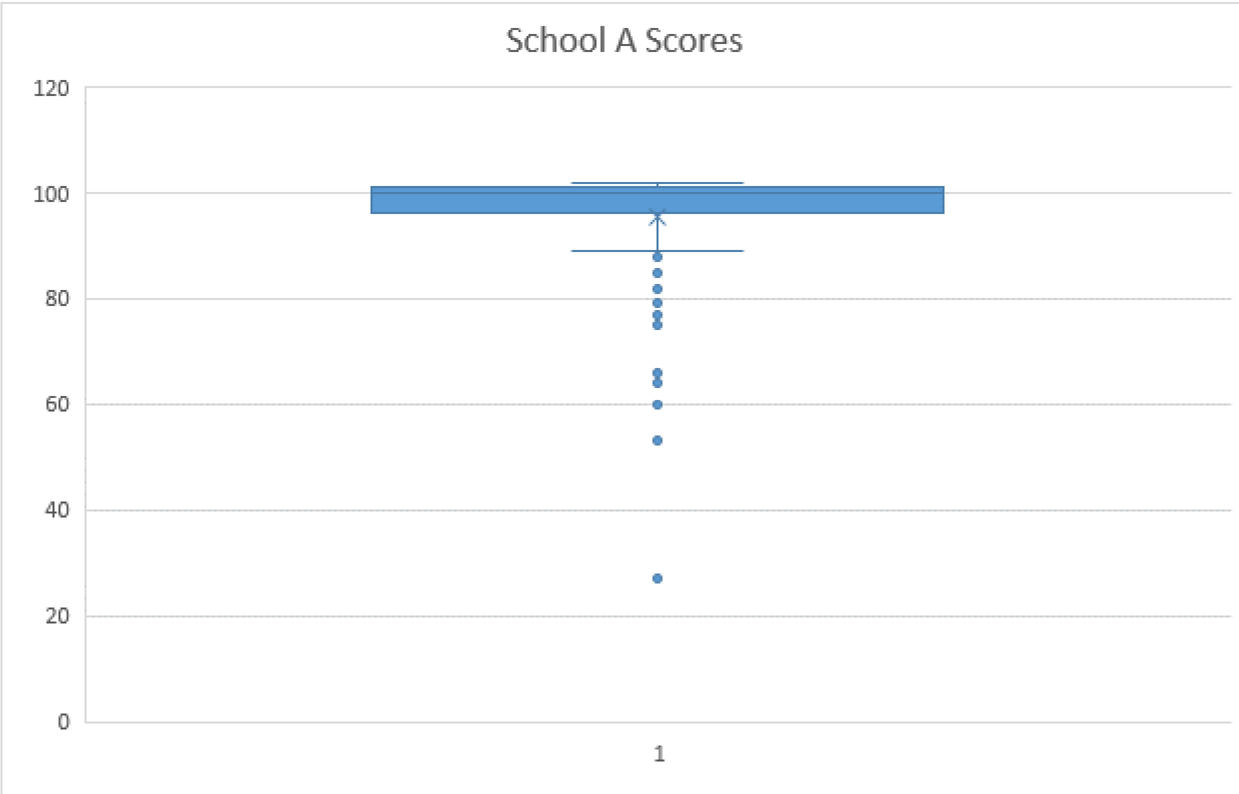


Figure 3. Boxplot of School A Scores. A box plot was used to detect outliers in the data collected from scores from the Phonological Awareness Literacy Screening-Kindergarten (PALS-K) for School A.

Given the below boxplot of School B ages in months (Figure 4), no outliers were identified as being above the maximum age of 76 months or below the minimum age of 59 months.

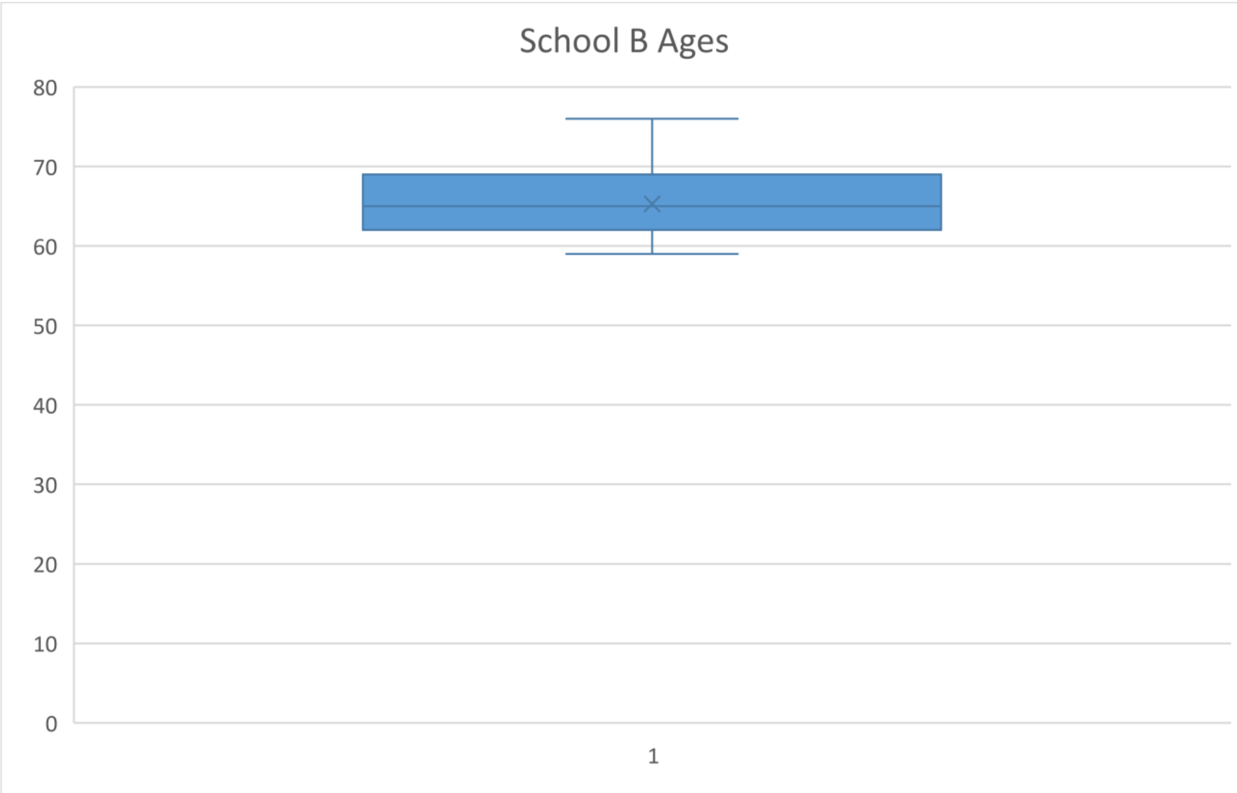


Figure 4. Boxplot of School B showing ages in months. A box plot was used to detect outliers in the data collected from students in School B.

Given the below boxplot of School B scores (Figure 5), outliers were identified as being 24, 44, 49, 63, and 70 which are below the minimum score of 73. Convention is that outliers affect the mean but not the median, which in this case is 100, which is a better indicator of the middle (central) score. These cases were removed as outliers.

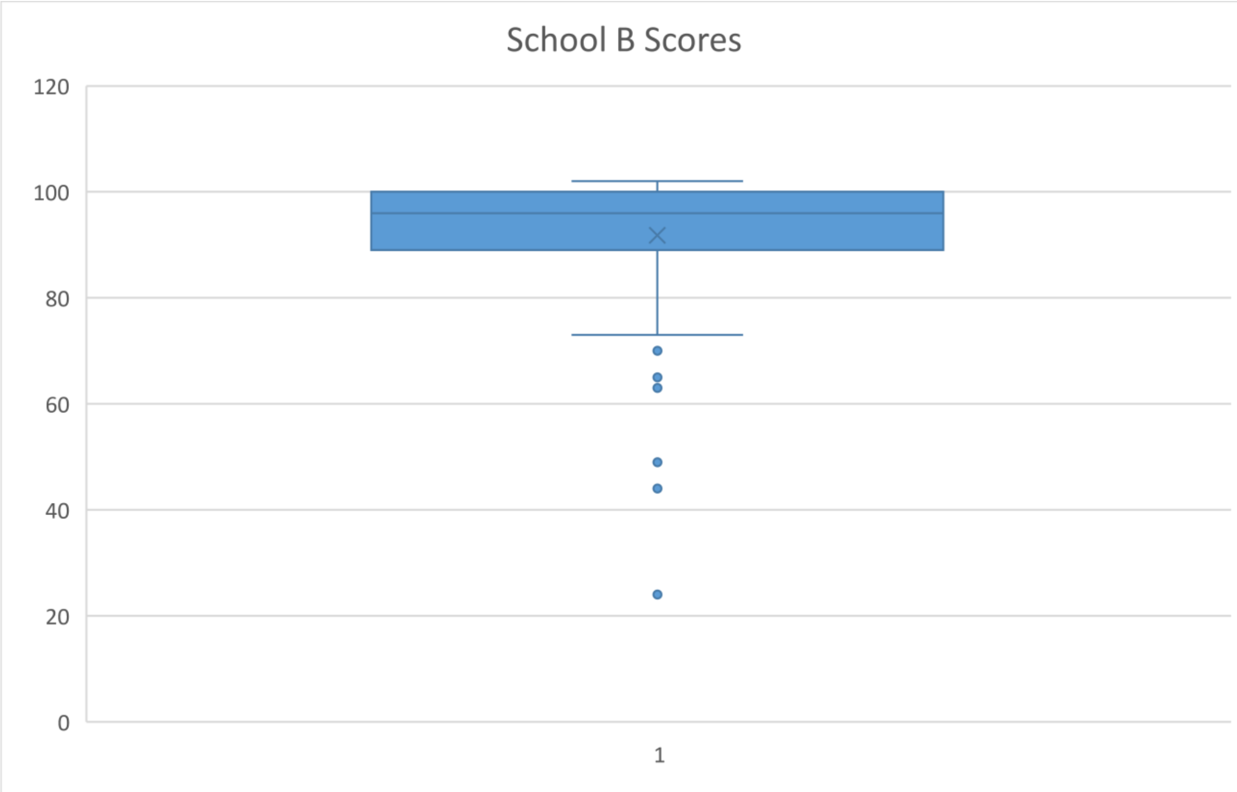


Figure 5. Boxplot of School B Scores. A box plot was used to detect outliers in the data collected from scores from the Phonological Awareness Literacy Screening-Kindergarten (PALS-K) for School B.

Given the below boxplot of School B ages in months (Figure 6), an outlier was identified as being 83 months which is above the maximum age of 71 months. Convention is that outliers affect the mean but not the median, which in this case is 61 months, which is a better indicator of the middle (central) age in months. These cases were removed as outliers.

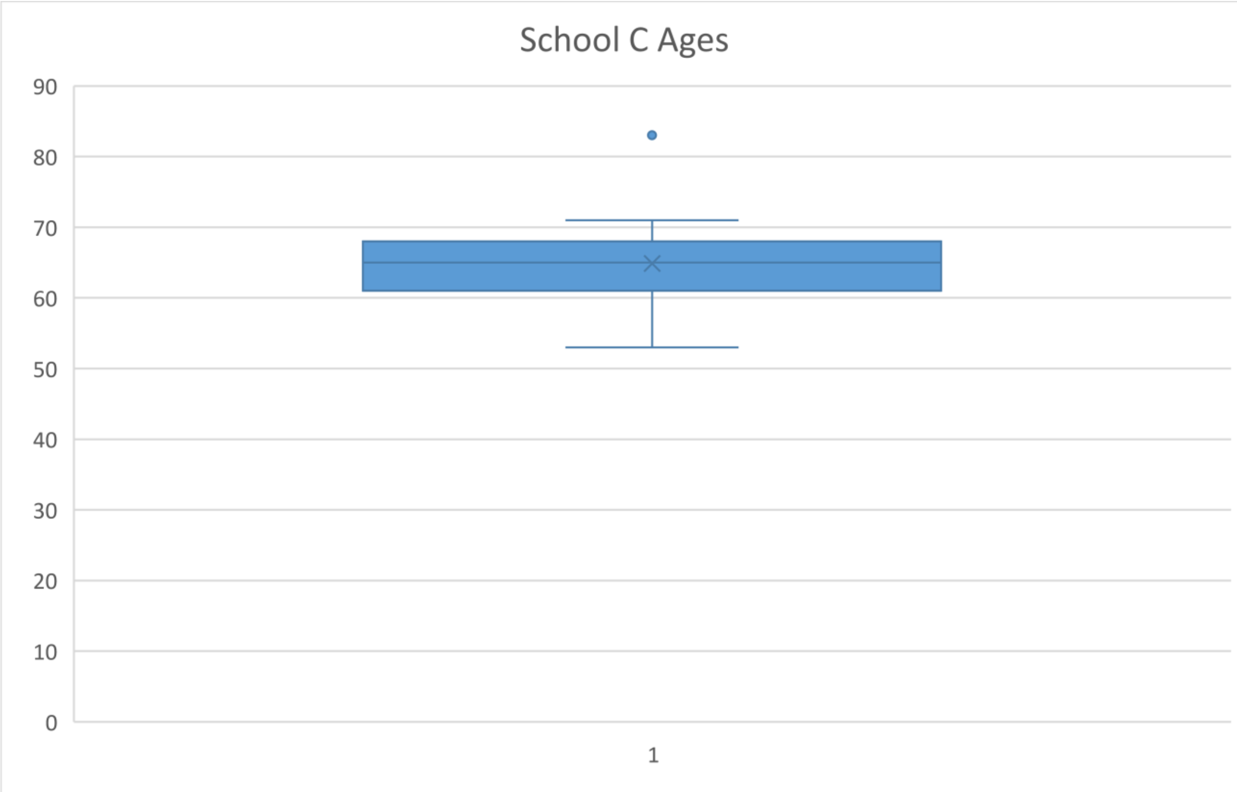


Figure 6. Boxplot of School C showing ages in months. A box plot was used to detect outliers in the data collected from students in School C.

Given the below boxplot of School C scores (Figure 7), outliers were identified as being 25, 56, and 67 which are below the minimum score of 81. Convention is that outliers affect the mean but not the median, which in this case is 101, which is a better indicator of the middle (central) score. These cases were removed as outliers.

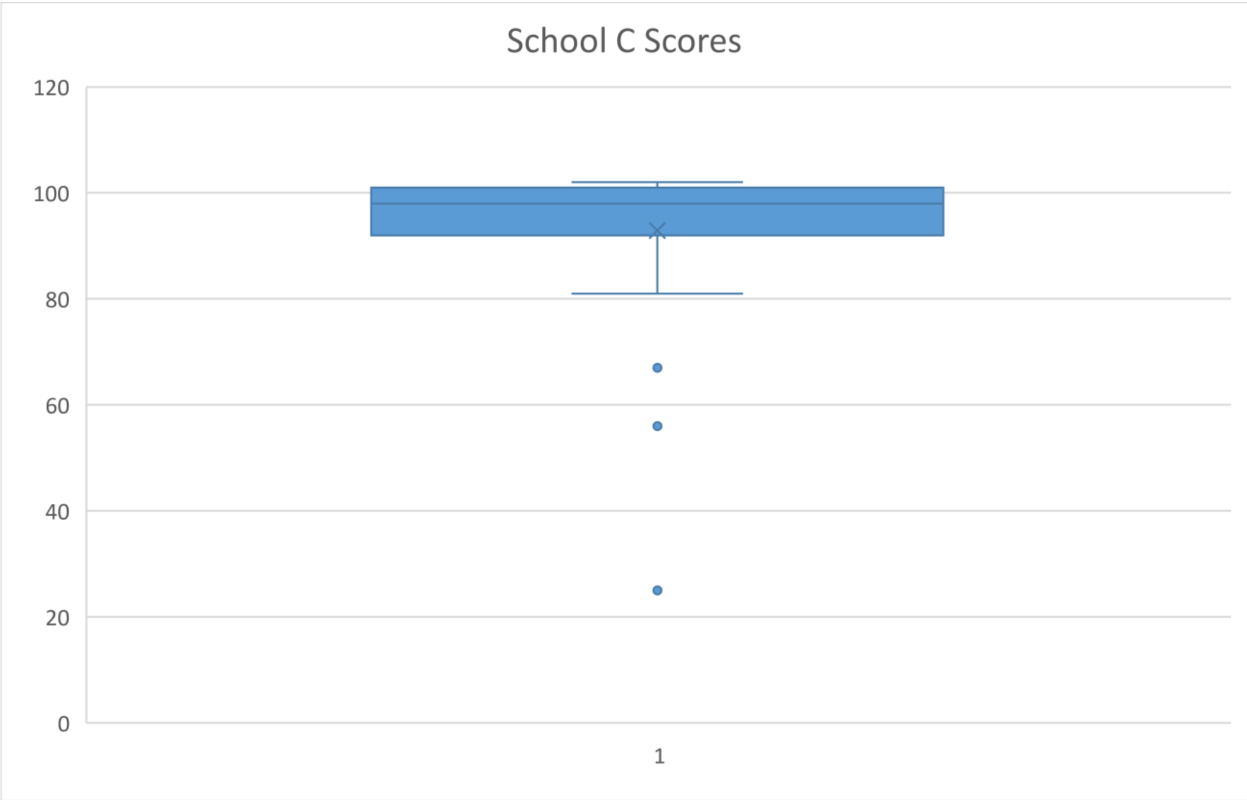


Figure 7. Boxplot of School C Scores. A box plot was used to detect outliers in the data collected from scores from the Phonological Awareness Literacy Screening-Kindergarten (PALS-K) for School C.

Given the below boxplot of all three schools' ages in months (Figure 8), an outlier was identified as being 53 months, which is below the minimum age of 55 months. Convention is that outliers affect the mean but not the median, which in this case is 62 months, which is a better indicator of the middle (central) age in months. This case was removed as an outlier.

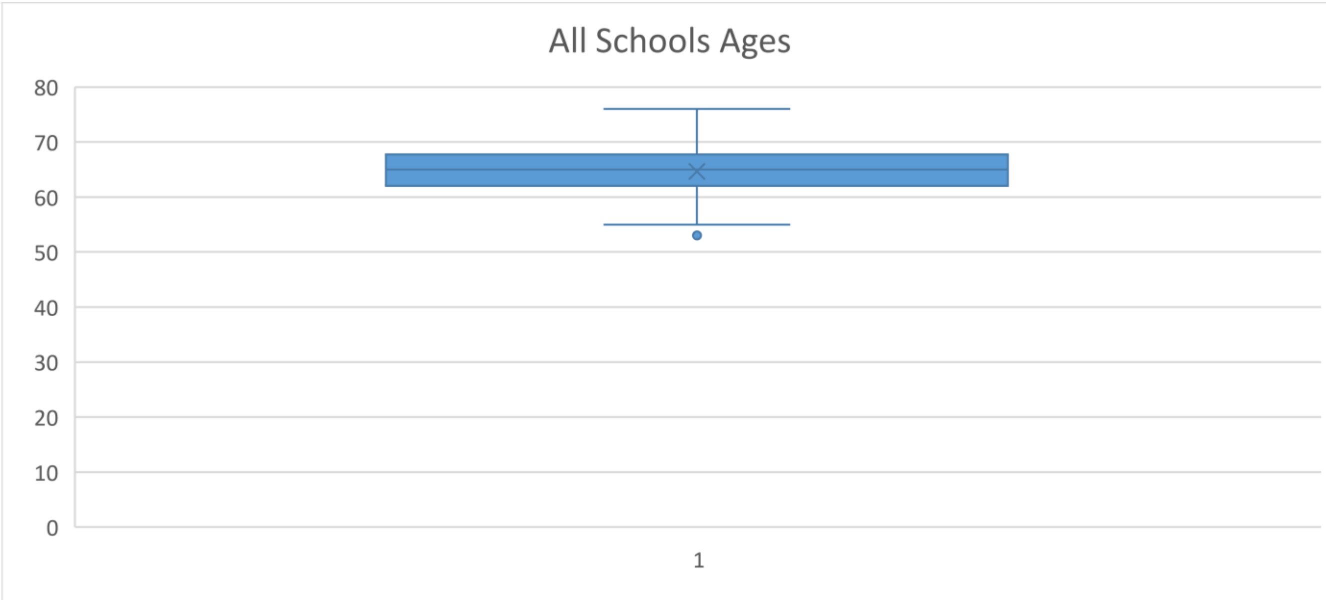
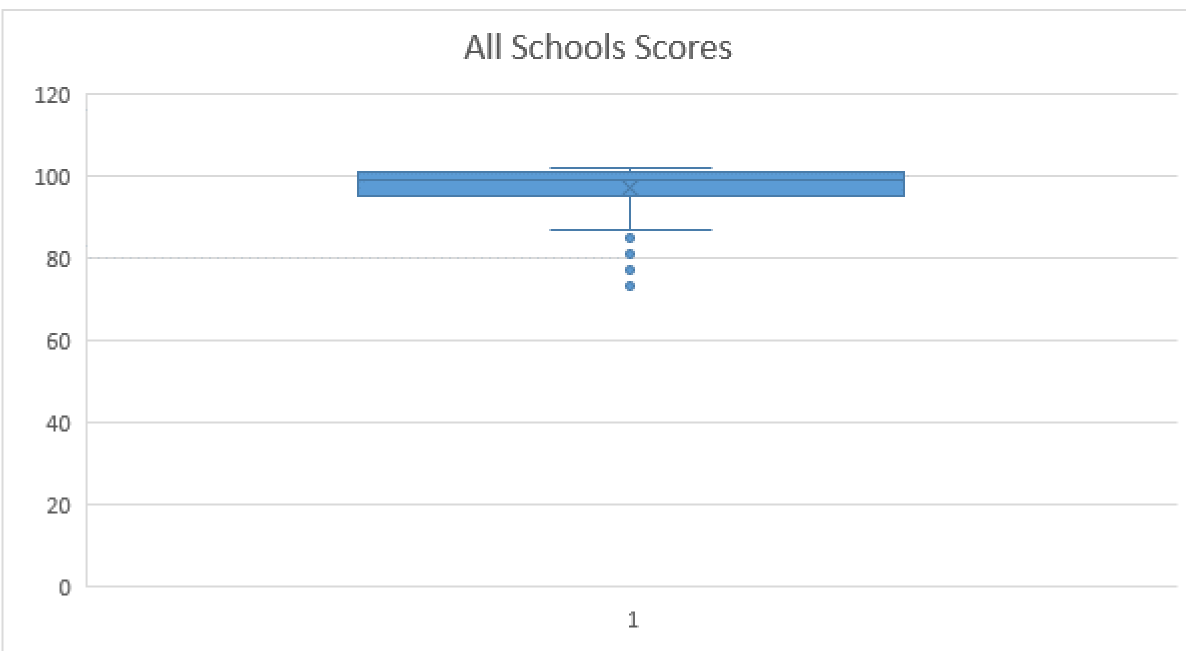


Figure 8. Boxplot of All Three Schools' Ages in Months. A box plot was used to detect outliers in the data collected ages in months from for all three schools.

Given the below boxplot of All Schools' scores (Figure 9), outliers were identified as being 73, 77, 81, and 85 which are below the minimum score of 87. Convention is that outliers affect the mean but not the median, which in this case is 99, which is a better indicator of the middle (central) score. These cases were removed as outliers.



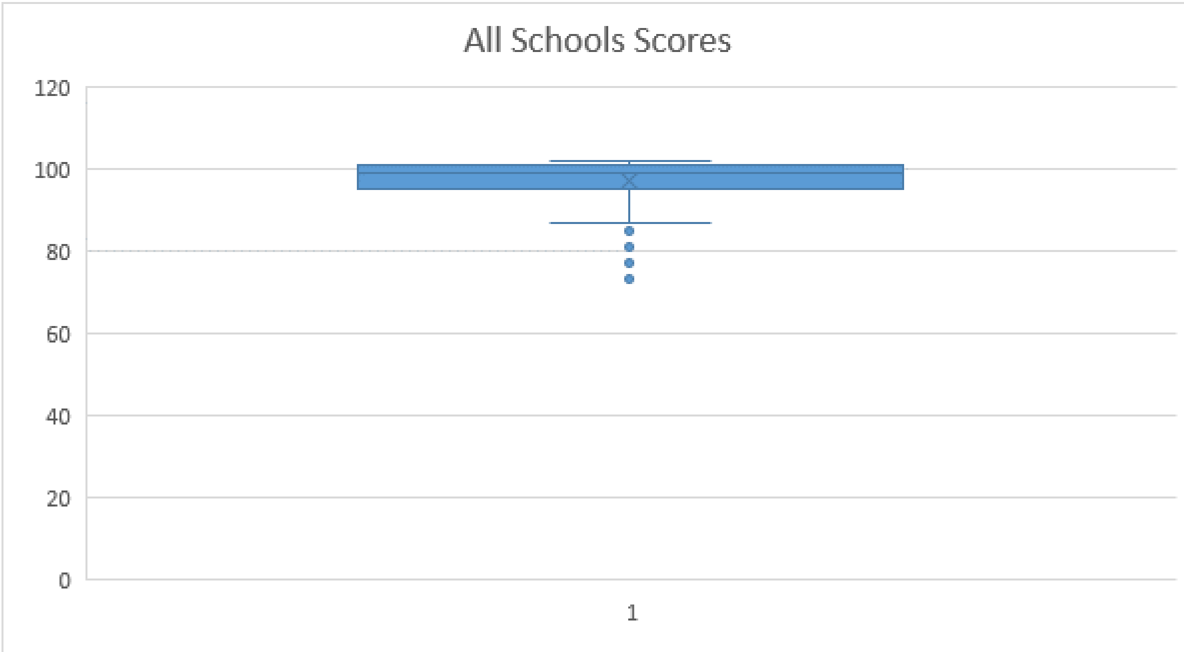


Figure 9. Boxplot of All Three Schools' Scores. A box plot was used to detect outliers in the data collected from scores from the Phonological Awareness Literacy Screening-Kindergarten (PALS-K) for all three schools.

Results for Null Hypothesis

Assumptions tests. Requirements for Pearson's *r* requires the data set to be screened for normality, bivariate outliers, linearity, and normal bivariate distribution (Warner, 2013) between the predictor variable, age, and criterion variable achievement in literacy skills in a rural school district. The assumption of bivariate normal distribution was examined using a scatterplot completed to ensure the presence of the classic "cigar-shape." The assumption of bivariate normal distribution was met. See Figure 10 for this information.

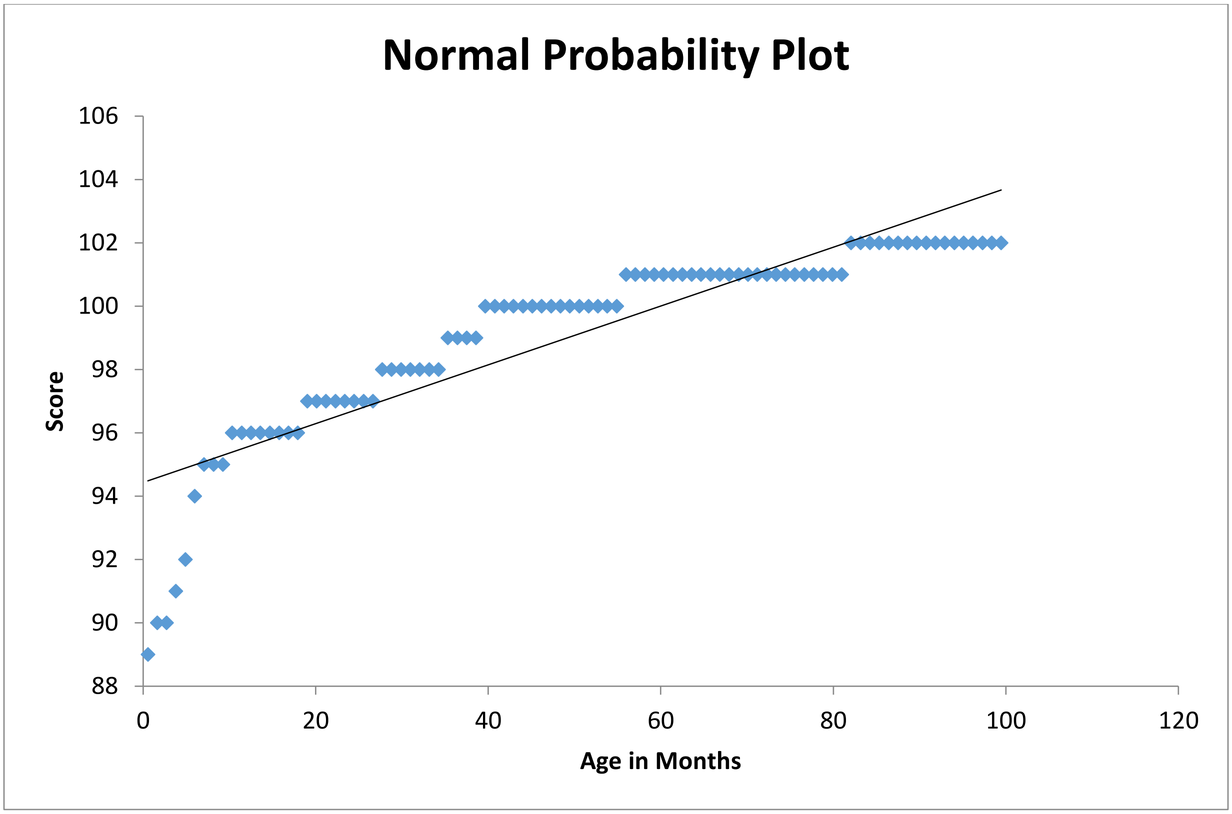


Figure 10. The Normal Probability Plot depicts the "cigar-shape."

The assumption that there is a linear relationship between the two variables, age and literacy skills, was examined; therefore, an assumptions of bivariate outlier was performed with a scatterplot and any extreme outliers were removed. The assumption of linearity was examined using a scatterplot, with a line of fit added to ensure the assumption of linearity was met (Figure 11). The Scatterplot between age and literacy skills (scores) for all three schools depicted a positive correlation between age in months and score on the Phonological Literacy Screening-Kindergarten (PALS-K).

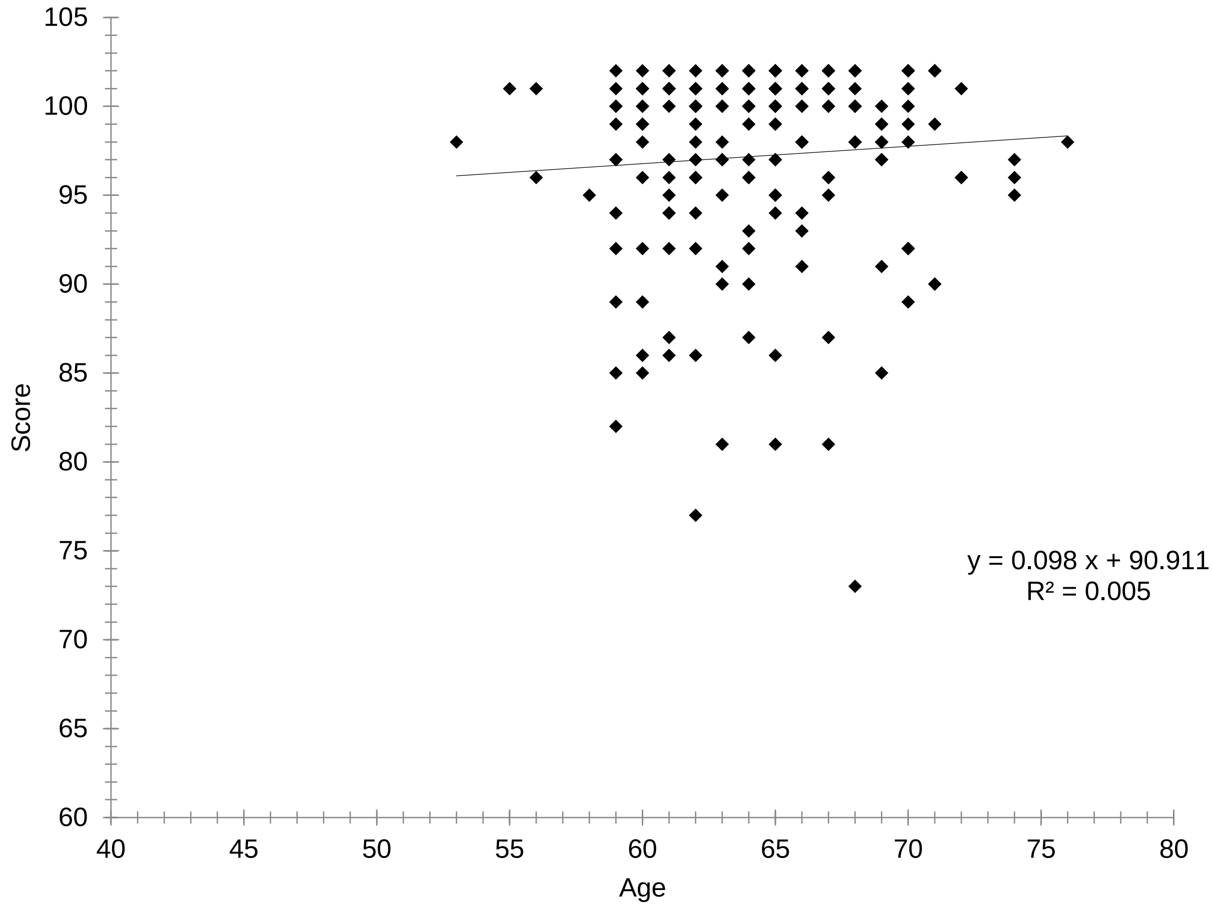


Figure 11. Scatterplot between age and literacy skills (scores) for all three schools depicting a positive correlation between age in months and score on the Phonological Literacy Screening-Kindergarten (PALS-K).

The assumption of normality was examined using Table 11 of skewness and kurtosis coefficients along with histograms. Skewness, or the measure of the lack of symmetry, was examined in Table 11. Table 11 shows a skewness value of .14 for ages in months, which indicates a positive (right) skew. The higher the absolute value, the greater the skew. To determine how extreme the skewness value was to indicate a problem for the assumption of normality, the skewness score for age in months (.14) was divided by the standard error (.17) which equaled .82. Since the result is within ±1.96, suggesting the departure from normality is not too extreme. Table 11 also shows a skewness value of -1.73 for scores indicating a negative (left) skew. The higher the absolute value, the greater the skew. In order to determine how extreme the skewness value is to indicate a problem for the assumption of normality, the skewness, score for score (-1.73), was divided by its standard error (.17) and equals -10.18. Since the result is outside ±1.96, it suggests that the departure from normality is too extreme.

Kurtosis is a measure of whether the data are heavy-tailed or light-tailed relative to a normal distribution. Table 11 reflects a kurtosis value of -.21 for ages in months, indicating a slightly plateaued (platykurtic); the higher the absolute value, the greater the kurtosis. To determine how extreme the kurtosis value was, the kurtosis score for ages in months (-.21) was divided by its standard error (.35) equally (-.60). Since the result is within ±1.96, the data suggested that the departure from normality is not too extreme.

Table 11 reflects a kurtosis value of 3.17 for scores, which indicates highly peaked (leptokurtic); the higher the absolute value, the greater the kurtosis. To determine how extreme the kurtosis value is to indicate a problem for the assumption of normality, the kurtosis, score for score (3.17), was divided by its standard error (.35) and equaled 9.06. Since the result is outside ±1.96, it suggests that the departure from normality is too extreme.

Table 11

Descriptives of Ages and Scores for All Schools

Variable	*N*	Mean	*SE* Mean	*SD*	Kurtosis	SE Kurt	Maximum
Age (Months)	196	64.63	0.29	4.01	-0.21	0.35	76
Literacy Score	196	97.23	0.39	5.4	3.17	0.35	102

Histograms for each variable were inspected for symmetric distribution. Figure 12 shows a slightly positively (right) skew for ages in months. Figure 12 also shows a slightly plateaued (platykurtic) distribution for ages in months, including two modes, which indicates bimodality. Figure 13 shows an extreme negatively (left) skew for scores. Figure 13 also shows a highly peaked (leptokurtic) distribution for scores, including one mode, which indicates unimodal modality.

One-Sample Kolmogorov-Smirnov Tests were employed to test for normality on Age (Table 12) and Test Scores (Table 13) for All Schools. Of these two variables of interest, only one, Test Scores for All Schools, yielded a *p*-value greater than alpha = .05 indicating normality. Of the two remaining variables of interest, Age (Table 12) for All Schools yielded a *p*-value at or lesser than alpha = .05, indicating extreme skewness or non-normality. Thus, the statistical test designed for instances of non-normal distributions is Spearman's rank-order correlation (Table 14). Kumar and Abirami (2018) stated "Sperman *r* is a nonparametric measure and can be utilized when data is not normally distributed between given two variables" (p. 28). Warner (2013) further stated that Spearman *r* is an appropriate analysis when the predictor and criterion variables "consist of ranks, or are converted to ranks, to get rid of problems such as extreme outliers" (p. 62).

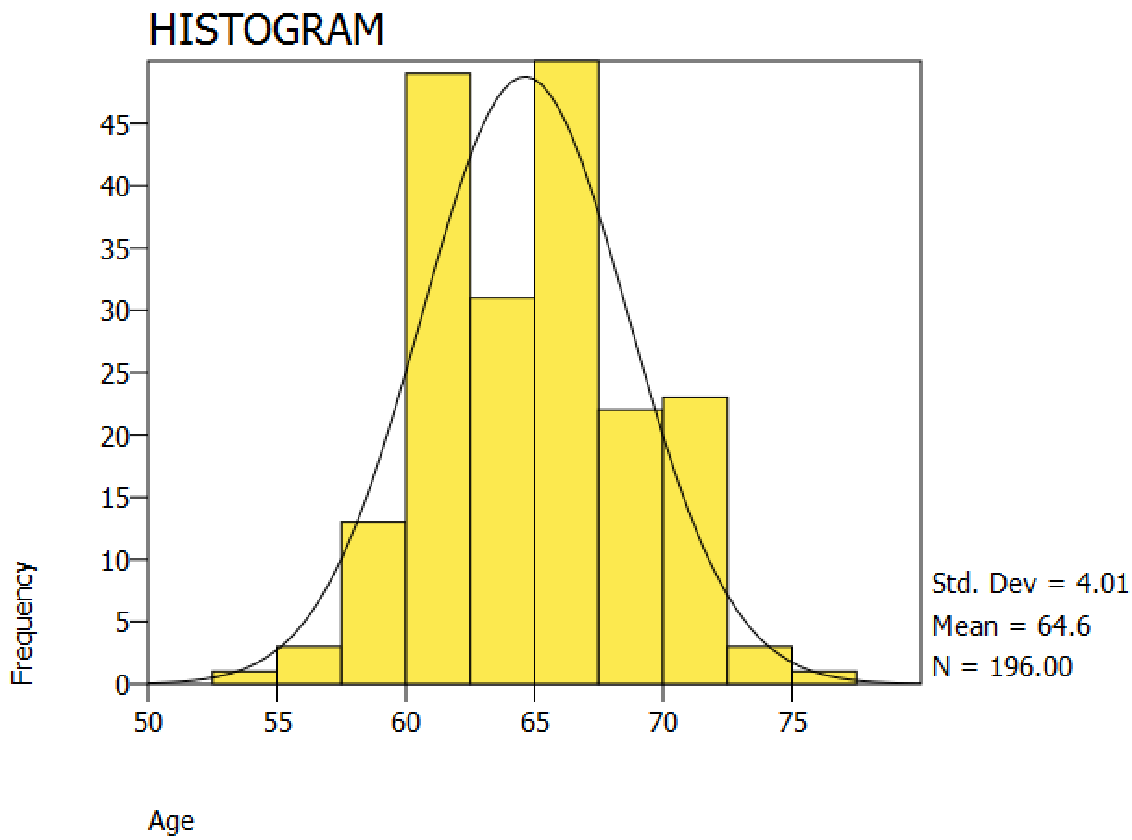


Figure 12. Histogram of ages in months for all three Schools. The histogram shows a slightly positive (right) skew for ages in months.

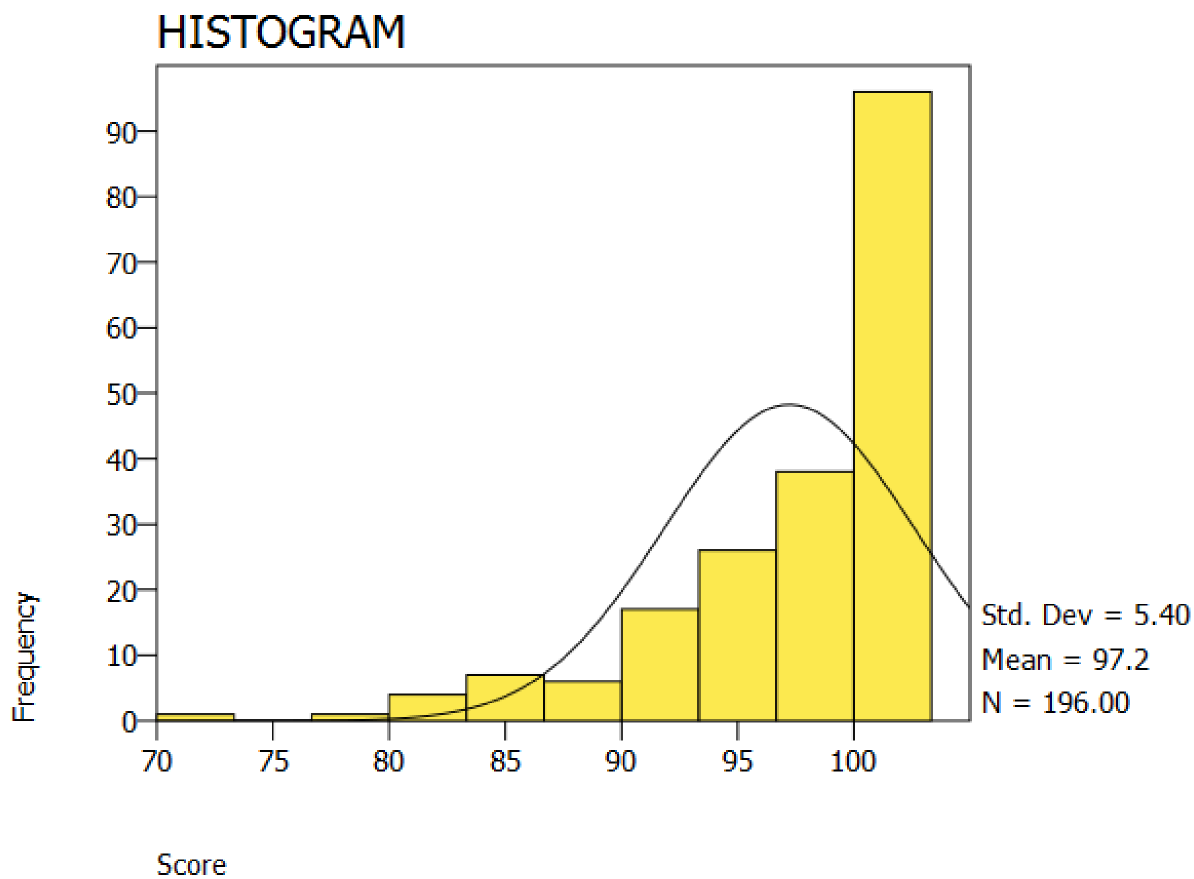


Figure 13. Histogram of scores for all three schools. This histogram shows an extreme negative skew for scores with a highly peaked distribution for scores.

Table 12

Kolmogorov-Smirnov test of Normality: Test Scores for All Schools

		Score
N		196
Normal Parameters	*M*	97.23
	SD	5.4
Most Extreme Differences	Absolute	0.19
	Positive	0.19
	Negative	-0.19
Kolmogorov-Smirnov Z		2.64
Asymp. Sig. (2-tailed)		0.000

Table 13

Kolmogorov-Smirnov test of Normality: Age for All Schools

		Age
N		196
	M	
Normal Parameters	*SD*	64.63
	Absolute	4.01
Most Extreme Differences	Positive	0.08
	Negative	0.08
		-0.05
Kolmogorov-Smirnov Z		1.13
Asymp. Sig. (2-tailed)		0.137
	M	

Table 14

Spearman's Correlation between Entrance Age and Academic Achievement in Literacy Skills Scores for All Schools (n = 196)[a]

			Entrance Age	Academic Achievement
Spearman's rho	Entrance Age	Correlation Coefficient	1.000	0.102
		Sig. (2-tailed)	.	0.153
		N	196	196
	Academic Achievement	Correlation Coefficient	0.102	1.000
		Sig. (2-tailed)	0.153	.
		N	196	196

Note. [a]Analysis does not reflect n = 25 cases after their removal as outliers.

A Spearman's rank-order correlation (r_s) was performed to determine whether a relationship was present between age as the predictor variable and the achievement in reading in literacy skills in a rural school district as the criterion variable. A relationship was not present between age as the predictor variable and the achievement in reading in literacy skills in a rural school district as the criterion variable, r_s = .102, N = 196, p = .153 (Table 14).

The analysis suggests that there is not a relationship between entrance age measured in months and academic achievement in literacy skills scores for School A, School B, School C, and All Schools. Therefore, the researcher failed to reject the null hypothesis indicating the relationship between entrance age and academic achievement in literacy skills for kindergarten students in a rural school is not significant.

CHAPTER FIVE: CONCLUSIONS

Overview

The purpose of this study was to determine the relationship between entrance age and academic achievement in literacy skills for kindergarten students in a rural school. Chapter Five will begin with a synopsis of the study conducted. Discussion regarding the research question and the findings coincide with the research that is reviewed. Information related to the implications of the study, limitations of the study, and recommendations for future research finalize this chapter.

Discussion

The purpose of this correlational study was to determine the relationship between entrance age and academic achievement in literacy skills for kindergarten students in a rural school. The predictor variable (age) and the criterion variable (achievement in reading in literacy skills in a rural school district) were developed to determine if age predicts the outcome of literacy skills, as measured by the Phonological Awareness Literacy Assessment-Kindergarten (PALS-K) in kindergarten students. The null hypothesis was also considered.

The instrument utilized for this study, Phonological Awareness Literacy Assessment-Kindergarten (PALS-K) in kindergarten students, was developed by The University of Virginia and the Curry School of Education. This instrument was developed as a diagnostic tool "to identify students who perform below grade-level expectations in several important literacy fundamentals, and thus are at risk of reading difficulties and delays" (Invernizzi et al., 2015, p. 5). This instrument was developed following the Early Intervention Reading Initiative established by the 1997 Virginia Acts of Assembly when funding was created to help school divisions identify children in need of additional instruction and early intervention services (Invernizzi et al., 2015). The assessment has two domains (Phonological Awareness and Literacy Skills) with seven subtests. Rhyme Awareness, Beginning Sound Awareness, Alphabet Knowledge, Letter Sounds, Spelling, Concept of Word, and Word Recognition in Isolation are included within the screener.

Pearson product-moment correlations (*r*) were used in this study with the predictor variable, chronological age or the time elapsed since birth (Age, 2004), and literacy skills or early reading skills (including alphabet knowledge, letter sounds, spelling, concept of word, and word recognition in isolation) (Invernizzi et al., 2015) as the criterion variable. A correlation design is appropriate for this study due to the relationship between two variables; the strength and direction of the relationship (Gall et al., 2007).

Research Question

The research question of this study was to determine the relationship between entrance age and academic achievement in literacy skills for kindergarten students in a rural school. The chronological age, or the time elapsed since birth (Age, 2004), was used as the predictor variable and literacy skills or early reading skills (including alphabet knowledge, letter sounds, spelling, concept of word, and word recognition in isolation) (Invernizzi et al., 2015) as the criterion variable.

There was not a significant relationship found between entrance age and academic achievement in literacy skills for kindergarten students in a rural school. Research relating to age and literacy skills is limited and contradicting. Research pertaining to kindergarten students show younger students may not be cognitively prepared for the academic challenges of reading (Miller, 2011). This is due to underdeveloped mental capacities such as working memory skills (Stamovlasis & Tsaparlis, 2012), cognitive control (Coldren, 2013), and executive functioning skills (Shanmugan & Satterthwaite, 2016). Additionally, Lloyd (2015) researched and discovered that students who entered kindergarten later, or were delayed one year or more, compared to peers in the same classroom had an overall academic advantage.

Implications

Despite the study not indicating a significant relationship between entrance age and academic achievement in literacy skills for kindergarten students in a rural school, this study aids in information to all stakeholders within an educational community. Parents and guardians frequently question when to enroll their student into the education system. Kindergarten entrance ages vary by state further confusing stakeholders. Di Santo and Berman (2011) researched and verified younger children (ages three to four) viewed kindergarten as a place to play, while older students (ages five to six) viewed kindergarten as a place to learn or follow the rules.

Kindergarten students who are defined as “rural” are faced with graver challenges. One in four children who reside in a rural community live in poverty and have the highest rate of child-poverty (Fisherman, 2015, p. 9). Students who reside in rural communities have lower reading scores (Durham & Smith, 2006) and perform at lower academic levels (Schaefer et al., 2016). This information suggests the instrument used for this study may reflect critical scores for literacy skills but does not paint the full picture of the impacts of age and literacy skills.

Limitations

There were limitations to this study. The sample size of this study consisted of 221 (N=221) kindergarten students. These students were from three separate schools in the same rural school division. Of the study, 126 students were male (57.0%), with only 94 (42.5%) students being female. The participants were primarily Caucasian (69.7%), with African-Americans as the second highest (19.0%). The average age of all kindergarten students was five years, four months (64 months). This study was limited to only kindergarten students within the three invited schools. Other elementary schools from within the same division were not invited to participate in the study.

The limitations to a greater diversity of male to female ratio, ethnicity, and sample size limited this study.

Recommendations for Future Research

The following list indicates recommendations for future research:

(a) Additional research relating to this study would include a larger sample size to include a broader range in age of kindergarten students. The larger sample size would permit a researcher to re-test the study to determine if a correlation is present among rural kindergarten students and age.

(b) It is further recommended to conduct the research to include urban and rural students. Increasing the demographics of students would permit a researcher to effectively determine if age impacts literacy skills regardless of demographic location.

(c) A further recommendation would be to conduct the study using a different literacy instrument as a replacement to Phonological Awareness Literacy Screening-Kindergarten (PALS-K). This would permit the researcher to further examine a relationship between literacy skills and age.

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APPENDICES

Appendix A

Instrument: Phonological Assessment for Literacy Screening-Kindergarten

pals™ Phonological Awareness Literacy Screening

K

20__ Student Summary Sheet

Student (first & last): ______________________________

Teacher: ______________________ Assessment Date: ______________

Section I

Part A: Group Rhyme Awareness

					+/-
1.	**shell**	tire	rope	**bell**	____
2.	**ring**	two	**swing**	box	____
3.	**pie**	**tie**	dog	shoe	____
4.	**snail**	bike	tent	**whale**	____
5.	**bone**	fish	**cone**	tree	____
6.	**toes**	**rose**	cow	flag	____
7.	**car**	**star**	house	watch	____
8.	**spoon**	tape	belt	**moon**	____
9.	**sock**	leaf	**rock**	web	____
10.	**train**	**rain**	wheel	book	____

Score: ____/10

Group items must be administered prior to individual items.

Section I

Part C: Individual Rhyme Awareness

					+/-
1.	**rock**	tree	**sock**	fish	____
2.	**hat**	dog	shoe	**bat**	____
3.	**snail**	**whale**	rope	tent	____
4.	**bell**	**shell**	train	foot	____
5.	**swing**	doll	**ring**	van	____
6.	**bone**	lips	**cone**	tape	____
7.	**eye**	pen	whale	**fly**	____
8.	**key**	five	**bee**	road	____
9.	**car**	box	lips	**star**	____
10.	**rose**	duck	**toes**	leaf	____

Score: ____/10

Section I

Part B: Group Beginning Sound Awareness

					+/-
1.	**bone**	fire	sink	**bird**	____
2.	**door**	**dog**	leaf	spoon	____
3.	**rose**	bee	**ring**	kite	____
4.	**shell**	comb	fly	**shirt**	____
5.	**watch**	hand	**web**	doll	____
6.	**lock**	fruit	**lips**	game	____
7.	**key**	belt	star	**kite**	____
8.	**pen**	car	**paint**	six	____
9.	**mouse**	**mop**	shark	five	____
10.	**hay**	sheep	**house**	book	____

Score: ____/10

Group items must be administered prior to individual items.

Section I

Part D: Individual Beginning Sound Awareness

Score: ____/10

Section II: Alphabet Knowledge

Lower-Case Alphabet Recognition

m	g	i	z	r
v	h	b	w	c
x	l	s	d	n
e	j	u	t	q
f	a	k	p	o
y				

Score: _____/26

Section III: Letter-Sound Knowledge

A: Letter Sounds

B	S	R	F	W
T	O	J	A	H
K	Sh	V	I	P
Z	L	C	Th	U
E	D	Y	G	N
Ch				

Score: _____/26

Section III: Letter-Sound Knowledge

B: Spelling

Word					
1. top	t	o	p	_____ # Checked	_____ Bonus Point
	d	i	b		
2. lid	l	i	d	_____ # Checked	_____ Bonus Point
		e	t		
3. wag	w	a	g	_____ # Checked	_____ Bonus Point
	r	e	k		
	y		c		
4. bet	b	e	t	_____ # Checked	_____ Bonus Point
	p	a	d		
5. run	r	u	n	_____ # Checked	_____ Bonus Point
	w	o			
	y				

Score: _____/20

Section IV: Concept of Word

	Pointing	Word ID	COW Word List
Rain, rain **go** away.	(1)	(2)	go
Come **again** another **day**.	(1)	(2)	day
Little Johnny **wants** to play.	(1)	(2)	rain
Rain, **rain** go **away**.	(1)	(2)	to
Score:	/4	/8	come
			away
Pointing _____ +			little
Word ID _____ +			play
COW Word List _____ =			wants
COW Total Score _____ /22			another
			/10

Section V: Word Recognition in Isolation (optional)

Preprimer	Primer	First Grade
big	jump	long
can	this	eyes
to	old	sitting
not	have	heat
in	was	going
play	one	moved
and	need	pony
we	into	began
get	sun	off
he	hid	boy
with	too	clouds
run	rain	goldfish
dog	that	then
will	house	colors
you	blue	started
for	look	barn
is	feet	taste
by	live	wet
at	said	time
see	now	cake
Score:_____/20	Score:_____/20	Score:_____/20

Appendix B

Verification of use of Instrument

From: PALS K-3
Sent: Thursday, June 14, 2018 11:14:44 AM
To: Brower, Rebecca
Subject: Re: Dissertation

I double checked with Dr. Invernizzi. As I thought, approval by the PALS Office is not needed as the data is not ours; data are owned by the school division. Please send your *request* to the County PALS Division Representative,

Dr. Invernizzi asked that I send you an article relative to your research topic (see attached).

Please let me know if I can further assist.

Kind regards,
Ellen

Phonological Awareness Literacy Screening (PALS), Project Manager
Curry School of Education
University of Virginia

Phone.
Email: pals@virginia.edu
Website: https://pals.virginia.edu

Appendix C

IBR Approval

LIBERTY UNIVERSITY
INSTITUTIONAL REVIEW BOARD

October 11, 2019

Rebecca A. Brower
IRB Application 4030: The Relationship Between Entrance Age and Academic Achievement in Literacy Skills for Kindergarten Students in a Rural School

Dear Rebecca A. Brower,

The Liberty University Institutional Review Board has reviewed your application in accordance with the Office for Human Research Protections (OHRP) and Food and Drug Administration (FDA) regulations and finds your study does not classify as human subjects research. This means you may begin your research with the data safeguarding methods mentioned in your IRB application.

Your study does not classify as human subjects research because it will not involve the collection of identifiable, private information.

Please note that this decision only applies to your current research application, and any changes to your protocol must be reported to the Liberty IRB for verification of continued non-human subjects research status. You may report these changes by submitting a new application to the IRB and referencing the above IRB Application number.

If you have any questions about this determination or need assistance in identifying whether possible changes to your protocol would change your application's status, please email us at irb@liberty.edu.

Sincerelv.

Administrative Chair of Institutional Research
Research Ethics Office

Appendix D

Approval from Schools A, B, and C for use of Data

October 10, 2019

Ms. Rebecca Brower

Dear Ms. Brower:

The purpose of this letter is to provide written approval to conduct the research study entitled "The Relationship Between Entrance Age and Academic Achievement of Literacy Skills for Kindergarten Students in Rural Schools." This approval grants permission to use PALS data from Students from [illegible] Schools. The District will strip the data of all identifying information prior to Mrs. Bower receiving the data.

Best of luck to you as you begin this research project.

Sincerely,

Supervisor of Assessment and Planning