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Kindergarten Entry Age and the Effect on Student Academic Achievement

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KINDERGARTEN ENTRY AGE AND THE EFFECT ON STUDENT ACADEMIC ACHIEVEMENT

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This study examined the impact of age at school entry on academic achievement in third grade as measured by the Pennsylvania System of School Assessments (PSSA). In addition, the relationship between kindergarten entry age and the need for special education services in third grade was investigated. The sample consisted of 1039 third grade students from five different suburban school districts who took the 2014 PSSA. A three-way analysis of variance (ANOVA) was used to analyze the data and determine relationships between the independent variables of kindergarten entry age, sex, and socioeconomic status and the dependent variables of PSSA math score and PSSA reading score. A logistical regression analysis was used to examine the relationship between the independent variables of kindergarten entry age, sex, and socioeconomic status and the dependent variable of special education status. A statistically significant relationship was found between kindergarten entry age and PSSA reading scores, with students entering kindergarten at a younger age performing poorer than their older counterparts. No statistically significant differences were found between age category and PSSA math scores. However, socioeconomic status was found to be predictive of PSSA math scores. Additionally, the data did not support a significant relationship between kindergarten entry age and special education status. However, both sex and socioeconomic status had a significant predictive relationship to the likelihood of students requiring special

education services by third grade, with a higher likelihood for males and students from a lower socioeconomic status.

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STATEMENT OF THE PROBLEM

Introduction

Kindergarten classrooms of today are much different places than most people experienced even in the recent past. The academic demands placed on children are real, and the youngest are struggling to maintain pace and knowledge. Research has revealed that giving these younger kindergarten students an extra year may make a substantial difference in their long-term success (Fantuzzo, Bultosky-Shearer, McDermott, McWayne, Frye, & Perlman, 2007; Datar, 2006; Malone, West, Flanagan, & Park, 2006; Zill & West, 2001). Some studies have even suggested that older students, for their grade level, are less likely to be retained or diagnosed with a learning disability (Stipek, 2002). As such, school readiness has been a topic of concern for parents and educators over many years as kindergarten curricula are becoming more advanced in terms of what children are required to know and learn. Many parents are faced with the reality of school readiness when they are given cut-off dates for kindergarten entrance based on birth date.

In Pennsylvania, it is permissible for entry age and birth date for kindergarten to be determined by individual school districts. Most Pennsylvania school districts utilize a September 1 cutoff date for kindergarten entry. Since the passing of the No Child Left Behind Act of 2002, pressure for proficiency has increased in all grades, including kindergarten (Painter, 2006). More recently, the adoption of the Common Core Curriculum has driven the implementation of rigorous instruction to bring our children to academic proficiency. Because of this, educators are beginning to realize that younger

students may start to struggle due to the increased academic demands being placed upon them (Painter, 2006).

It is of utmost importance that parents and educators alike understand the importance of school readiness and how it relates to academic success. To better comprehend the importance of school readiness, it is imperative to ascertain what kindergarten students must be able to do academically, socially, and behaviorally. Research in this area has been contradictory, at best. Some research has shown that age is a poor predictor of school readiness (Elder & Lubotsky, 2009; Stipek, 2003) while other research in this area indicates that the older the child is when they enter school, the better they will perform (Cannon & Lipscomb, 2008; Lin, Freeman, & Chu, 2009; Warder, 1999). It is expected that younger children entering kindergarten will have lower kindergarten readiness skills and will, therefore, experience lower academic functioning later in their academic careers.

Theoretical Framework

For years, scholars have been proposing theories regarding the development of children. As every human is expected to grow, it is no surprise that this is a topic of great interest to many. Theories have been proposed in an attempt to define when, how, and under what conditions learning takes place to determine an optimal timeframe for students to enter kindergarten. While there is not one single theory to predict a child's development and learning, some of the theories overlap in beliefs, while others offer a completely different perspective.

Competing Models of Learning

There are two models of learning that affect decisions to begin kindergarten. First is the experientialist model, which includes starting kindergarten when age appropriate. This model is based on the idea that children develop based on cognitive experiences (Lincove & Painter, 2006). Supporters of the experientialist model believe that the experiences students have at school should begin with early developmentally appropriate instruction. As these children are exposed to carefully constructed learning experiences, they obtain an early start on cognitive development (Lincove & Painter, 2006).

Behaviorists Watson and Skinner purport that the educational environment can and should be manipulated to produce a favorable response. Vygotsky, while supportive of stimuli and response, also believed in the mediating factors. Simply stated, the learner could modify the stimuli before providing a response. Nevertheless, experientialists such as Vygotsky, Watson, and Skinner could assert that because developmental levels do not matter, kindergarten entry age should not be considered since the environment can be manipulated to produce a desired result.

In contrast, the second model of learning is the maturationist model, which is based on the idea that children should reach a certain state of cognitive maturity before learning can occur (Deming & Dynarsky, 2008; Lincove & Painter, 2006; Snow, 2006). Supporters of this model of learning believe that instruction prior to the time that children reach cognitive maturity will not be successful (Deming & Dynarsky, 2008).

As it relates to school entry, Piaget suggests that sending a child to school before they are developmentally ready would not be beneficial. A child may not be able to achieve success if he or she has not reached the appropriate developmental level (Piaget,

1970). Developmentalists such as Gesell assert that entering school is not a simple process and the smoothness of that transition depends largely on emotional maturity (Gesell & Ilg, 1946). Children should enter school when they are developmentally ready, rather than by chronological age.

As is evident from the contrasting theories, it is important to investigate and explore studies that focus on chronological age and school entry. These examinations likely will help to determine which theoretical perspective is most reflective of and suggest the most beneficial age for children to begin school. As such, the next chapter will focus on the literature that is available as it relates to school entry age and academic success.

Significance of the Study

Parents, teachers, and administrators often search for guidance when determining an appropriate kindergarten entry age. While each state provides a birth date requirement for entry into kindergarten, that date can vary by state. Also, the final decision to enter a child into kindergarten or to wait a year to enroll a child is often left up to the parents. Often, these parents do not have the information necessary to make an informed decision as to when would be the optimal time to enroll their child in kindergarten.

This non-intrusive study is important to the field of education in that districts may be unnecessarily allocating financial resources to students through retention and/or special education services, when this may have been prevented by simply having them wait a year to begin kindergarten. School districts are expected to produce proficient students and if kindergarten students with a younger entry age are shown to have a higher probability of being retained or requiring special education services than their older

counterparts, this could cost the district money as well as produce lower proficiency rates. Kindergarten entry age may predict a student's chance of retention and/or requiring special education services, which can be costly to the district and can bring about social and emotional repercussions for these students.

This issue of kindergarten entry age is important for parents, educators, and community alike. The children in these schools are setting the stage for future achievement and success. If kindergarten entry age affects later educational performance, then all parties involved need to know the implications. If children are not prepared to enter into society at the end of their schooling and make a useful contribution, all could suffer the consequences. Children need to be prepared to enter the work force with solid skills and academic proficiency. This information could also be particularly beneficial for school psychologists when making eligibility decisions for special education. This study may provide useful information for parents, so they can make an informed decision about when to enroll their child in kindergarten; for educators so that they may make the transition into kindergarten easier for these students; and for schools, communities, and legislators, so that they may set appropriate kindergarten entry dates for students.

Purpose of the Study

The purpose of this study is to examine the impact of age at school entry on academic achievement in third grade. In the state of Pennsylvania, it is permissible for entry age and birth date for kindergarten to be determined by individual school districts with September 1 being the suggested cut off date. There also appears to be a nationwide trend to begin red-shirting students who just make the district cut off, or who have

birthdays a few months prior to the state's cutoff date. The purpose of this study would be to expand upon the current research related to kindergarten entry age, further examine the effects on academic achievement, and contribute to the research base. This study will be beneficial to districts specific to Pennsylvania and requirements within this state. It will also help to expand upon the research done in this area in other states.

Research Questions and Hypotheses

1. Does kindergarten entry age, sex, or socioeconomic status impact student reading achievement? It is hypothesized that younger students entering kindergarten between 60 and 63 months will perform lower as compared to their peers entering at 64 months or older on the 2014 reading portion of the Pennsylvania State System of Assessments (PSSAs). It was also hypothesized that male students performed lower than female students and that economically disadvantaged students performed lower than those who were not economically disadvantaged (Fantuzzo, Rouse, McDermott, Sekino, Childs, & Weiss, 2005).
2. Does kindergarten entry age, sex, or socioeconomic status impact student math achievement? It is hypothesized that younger students entering kindergarten between 60 and 63 months will perform lower as compared to their peers entering at 64 months or older on the 2014 math portion of the Pennsylvania State System of Assessments (PSSAs). It was also hypothesized that male students performed lower than female students and that economically disadvantaged students performed lower than those who were not economically disadvantaged (Fantuzzo, Rouse, McDermott, Sekino, Childs, & Weiss, 2005).

3. Does kindergarten entry age, sex, or socioeconomic status predict that that a student will receive special education services? It is hypothesized that younger students entering kindergarten between 60 and 63 months will be more likely to be identified as requiring special education services than their peers entering at 64 months or older. It was also hypothesized that male students required special education services more frequently than female students and that economically disadvantaged students required special education services more frequently than those who were not economically disadvantaged (Weiss, 2008).
4. Does kindergarten entry age, sex, or socioeconomic status predict that that a student will be retained? It is hypothesized that younger students entering kindergarten between 60 and 63 months will be more likely to be retained than their peers entering at 64 months or older. It was also hypothesized that male students would be retained more frequently than female students and that economically disadvantaged students would be retained more frequently than those who were not economically disadvantaged (Weiss, 2008).

Definition of Terms

The following definitions will be used for this study:

Age eligible. Age eligible is defined as a child entering the kindergarten school year based on the state cutoff date criterion. Currently, this cut off age is specified by individual districts with guidance from the state suggesting that the child turn five by September 1.

Middle-age at entry. Middle-age at entry birthday is defined as students who enter kindergarten when they are 64 to 67 months of age.

Older-age at entry. Older-age at entry is defined as students who enter kindergarten when they are 68 to 72 months of age.

Redshirting. Redshirting is defined as voluntarily delaying kindergarten entrance for a child who meets the age eligibility.

Retention. Retention is defined as requiring a student to repeat a grade due to lack of mastery of concepts and failing grades.

Special education status. Special education status is defined as whether or not a child has been evaluated and determined to require special education services due to an identified disability according to requirements set for by the Individuals with Disabilities Education Improvement Act (IDEIA) (US Department of Education, 2004).

Young-age at entry. Young-age at entry is defined as students who enter kindergarten when they are 60 to 63 months of age.

Limitations/Delimitations of the Study

Data analyzed in this study will be longitudinal in nature and will include academic achievement data, and demographic data, as well as retention and special education status, if applicable. The sample size will be large enough to enhance the credibility and generalizability of the study. This sample size of third grade students within five school districts across the state were chosen due to the close demographic area to the researcher. However, the study will not be able to control for factors that may influence normal development of children in their early years of childhood. These factors include household socioeconomic status, prior educational experience, family dynamics, or parent education levels. It should be noted that these outside factors may contribute to a child's academic and social growth, regardless of age of kindergarten entry. Additional

factors that will not be controlled for in this study include teacher effectiveness and quality of instruction. Additionally, due to the fact that the participants of this study were obtained through a convenience sample from school districts within Allegheny County in western Pennsylvania, the sample might be considered a threat to external validity and generalizing the results of this study to other populations and demographic areas should be considered with caution.

Assumptions

It is assumed that the kindergarten through third grade curriculum involves a similar exposure to academics for students because of the implementation of the common core curricula. Additionally, it is assumed that all school districts are working toward common core standards, so despite the specific curriculum they use, they are all working toward the same standards. It is also assumed that due to Pennsylvania teacher credentialing regulations, all teachers are highly qualified to deliver instruction. Lastly, it is assumed that all third grade students involved in the study will have taken the PSSA for both reading and mathematics and that the PSSA will have been administered according to standardization procedures.

CHAPTER II

REVIEW OF THE RELATED LITERATURE

Introduction

This chapter reviews the literature associated with school entrance age. The purpose of this literature review is to explore previous research associated with kindergarten entry age and subsequent academic achievement. In Pennsylvania, school readiness is often determined by the child's chronological age. Thus, it is imperative to investigate the current research available as it relates to academic success for the child. It is also important to look at the effects on the school system as well. Areas to investigate include developmental readiness, kindergarten readiness, academic red shirting, retention rate, and special education. Why do parents voluntarily withhold students from school? Why are students retained? These questions are undoubtedly related to a child's readiness to begin schooling and age at entrance.

Developmental Views of Child Development

As summarized in the previous chapter, there are two models of learning that affect decisions to begin kindergarten: the experientialist model, otherwise known as nurture, and the maturationist model, otherwise known as nature. First is the experientialist model, which includes starting kindergarten when age appropriate. This model is based on the idea that children develop based on cognitive experiences (Lincove & Painter, 2006). Supporters of the experientialist model believe that the experiences students have at school should begin with early developmentally appropriate instruction. As these children are exposed to carefully constructed learning experiences, they obtain an early start on cognitive development (Lincove & Painter, 2006). In contrast, the second model of learning is the maturationist model, which is based on the idea that

children should reach a certain state of cognitive maturity before learning can occur (Deming & Dynarsky, 2008; Lincove & Painter, 2006; Snow, 2006). Supporters of this model of learning believe that instruction prior to the time that children reach cognitive maturity will not be successful (Deming & Dynarsky, 2008).

Experientialist model.

This model of learning suggests that educational achievement will be improved in later grades by providing early developmentally appropriate instruction (Snow, 2008). The experientialist model of developmental psychology purports that students learn through being exposed to new experiences (Deming & Dynarsky, 2008).

Vygotsky. One theorist whose principles support that of the experientialist view is Lev Vygotsky (Graue & DiPerna, 2000). Vygotsky proposed that the education system develops a child's learning and behavior, and school systems should be centered around helping a child educate herself with the help of a more competent peer or adult (Vygotsky, 1997). Vygotsky (1997) stated that "behavior is composed of biological and social features (p. 47). Those who follow Vygotsky's teachings believe that teachers must interact with students to ensure that their experiences in education match their current needs (Graue & DiPerna, 2000).

One of Vygotsky's most important points from his theory is what he called the "zone of proximal development" (Vygotsky, 1978). The zone of proximal development explores the relationship between learning and development. Vygotsky called the first level of development the "actual developmental level," which is the level of a child's cognitive functioning that is the result of completed developmental cycles (Vygotsky, 1978). The zone of proximal development can be defined as the distance between a

child's actual development and potential development that could be acquired through the experiences of learning with the assistance of adults. Vygotsky believed that properly organized learning through experiences will result in mental development (Vygotsky, 1978). Play is also considered an important role in development according to Vygotsky. It is believed that play enables children to satisfy a need while creating imaginary situations (Vygotsky, 1978). In other words, play provides experiences for children to act against an impulse, which is particularly important when children begin to engage in imaginary play.

According to Vygotsky (1978), the interaction between the social environment and the biology of behavior is particularly important. While following the same path, development is not the same for each child. Each function of development will occur both on the social, or interpsychological, level and the psychological, or intrapsychological, level (Vygotsky, 1978). As such, learning and instruction should occur before development through experiences with adults or older peers.

While Vygotsky examined the importance of play and experiences in the development of a child, he also investigated how children learn how to write (Vygotsky, 1978). The development of writing can lag behind the development of speech by as much as 6 to 8 years (Vygotsky, 1986). This lag is evident because written speech is a linguistic function; whereas, speech is an oral function. Because he believed writing to require a high level of abstraction, Vygotsky (1986) theorized that it was the higher level of abstraction, rather than underdevelopment of muscles, that caused problems for the learner. Because of this, Vygotsky (1986) believed that writing should be taught in preschool, but it must be taught with purpose rather than as a motor skill.

As it relates to school entry, Vygotsky's (1978) theories provide three important points that can possibly indicate his views on school entry age. First, the zone of proximal development purports that if a child is within the zone of proximal development for learning, a child could enter school and experience learning with the help of an adult or older peer. Second, his view of learning is that it should be in advance of development. This would support a child entering into kindergarten at a younger age. Third, his idea of writing is that if a child could read or write, he or she could enter school. According to experientialists, the role of the school is to provide these developmentally appropriate experiences to aid in the maturation and development of children from all paths of life (Lincove & Painter, 2013). As such, delaying school entry does not allow these students the types of interactions they need to develop academically (Deming & Dynarsky, 2008). Kindergarten provides academic growth for all children, regardless of age.

Watson. Additionally, John B. Watson was an influential theorist who believed that behavior must be observable rather than speculative. Watson purported that behaviors can be described in terms of stimuli and response (Watson 1930/1970). This led Watson to believe in the possibility of predicting and controlling behavior. In contrast to developmental theorists, Watson's behaviorism suggested that training is more influential than developmentalists believe.

Skinner. Similar to Watson, Skinner's theory was strongly based around behavior. According to Skinner (1953), behavior is affected by conditioning and reinforcement of response patterns. Reinforcers can either be positive or negative and will either strengthen the behavior that produces the response (positive reinforcement) or

strengthen the behavior that reduces or eliminates the response (Skinner, 1976). The use of positive reinforcements can be used across a variety of environments. In the home environment, positive reinforcement can be in the form of food, warmth, and approval or affection (Skinner, 1953). At school, positive reinforcement can be in the form of good grades, diplomas, medals, recognition for good attendance, or scholarships.

Behaviorists Watson and Skinner purport that the educational environment can and should be manipulated to produce a favorable response. Vygotsky, while supportive of stimuli and response, also believed in the mediating factors. Simply stated, the learner could modify the stimuli before providing a response. Nevertheless, experientialists such as Vygotsky, Watson, and Skinner could assert that because developmental levels do not matter, kindergarten entry age should not be considered since the environment can be manipulated to produce a desired result.

Maturationist model.

Conversely, the maturationist model purports that children cannot benefit from instruction until they have reached a specific developmental level. This developmental level includes milestones that are linked to chronological age (Deming & Dynarksy, 2008). Therefore, children who are more mature learn more efficiently (Deming & Dynarsky, 2008; Snow, 2006). It has been suggested that the optimal age of cognitive development is between the ages of 8 and 9 years and children should not be taught to read until their mental age and background allowed them to be mature (Witty & Kopel, 1939).

Piaget. According to Piaget (1977), intellectual development depends on the natural processes and maturation of the nervous system. Maturation is the physiological

development of nerve-muscle connections that aid in cognitive development (Piaget, 1977). Maturationists believe that the child's biological clock is what helps children to reach different levels of development and that older children will be more successful than younger students because of a higher developmental level (Lincove & Painter, 2013). It is assumed by maturationists that the benefits due to a child's maturity level continue throughout a school career and these children should begin kindergarten at a later age (Elder & Lubotsky, 2009). As reported by Lincove and Painter (2006), children who are identified as being too young or immature for kindergarten will not be ready for the curriculum and will struggle to keep up for the entirety of their academic career.

However, Piaget (1977) believed that while maturation is a factor in cognitive development, it is not the only factor. Piaget's stages of development do not follow a set age range; rather, one progresses through one stage before entering into another. These natural stages of development include sensorimotor (birth to two years of age), preoperational (two to eight years of age), concrete operations (seven to twelve years of age), and formal operations (twelve to roughly fifteen years of age) (Piaget, 1970).

A child's thinking develops from concrete to abstract (Piaget, 1970). As such, in preschool children engage in continuous investigation and learn primarily through interaction with the environment and playing. Entering into the next phase, ages 4-7 years, children have an increased social interest in the world. In this stage, thinking occurs in parts rather than the whole, they engage in self-conversation, and demonstrate obedience to adults. The next phase, ages 7-11 years, children start to understand relationships in a parts-to-whole mind frame. They can conceptualize and classify, and shift from inductive to deductive thinking. During this stage, children also rely on

thinking tied to real objects or events rather than thinking abstractly (Piaget, 1970). Due to the many skills that are acquired during this stage, it seems logical that this would be the prime time to enter into school. It is during the last stage, ages 12-15 years, that children are more likely to begin thinking hypothetically or abstractly (Piaget, 1970).

Piaget also believed that a child's intelligence developed through interactions with his or her social and physical environment, along with interactions with others (Piaget, 1977). Learning takes place through assimilation, accommodation, and adaption within a child's environment (Hergenhahn, 1982). Assimilation is the natural occurrence of an event; accommodation requires modifying thinking based on the environment; and adaption is a balance between self and the environment (Hergenhahn, 1982). All three of these processes involve the child and environment with little to no mention of adult role in the processes.

As it relates to school entry, Piaget suggests that sending a child to school before they are developmentally ready would not be beneficial. A child may not be able to achieve success if he or she has not reached the appropriate developmental level (Maier, 1969). Even once that child has entered into school, the developmental stage of that child should be considered when planning instruction (Maier, 1969). As such, a child in a preoperational stage of development would not benefit from lectures because he or she is lacking mental operations such as conservation and deductive logic (Piaget, 1970). Rather, that child would need to be exposed to concrete teaching methods that allow the child to interact with the environment, so that prior experiences would influence current experiences (Hergenhahn, 1982).

Gesell. Theorist Arnold Gesell's ideas were similar to that of Piaget. Gesell is best known for his observations of natural and sequential stages of development in children (Gesell & Ilg, 1936). Gesell purported that children develop in progressions, but the amount of time needed to grow and develop varies amongst children (Gesell, Ilg, & Ames, 1956). Developmental stages are further varied through Gesell's suggestion that child development may differ by gender as well. Growth should not be expected to follow a straight and level path.

In regards to school entry, developmentalists such as Gesell assert that entering school is not a simple process and the smoothness of that transition depends largely on emotional maturity (Gesell & Ilg, 1946). Children should enter school when they are developmentally ready, rather than by chronological age. Sending a child to school before they are developmentally ready could result in difficulties such as feelings of inadequacy, disappointments, confusion, and misdirected teaching (Gesell et al., 1940).

Historical Views of Kindergarten

The purpose of kindergarten has changed over the years. In Germany in the 1830s Friedrich Froebel's educational philosophies led to the development of kindergarten (Dombkowski, 2001; Froebel, 1886). When women began entering the workforce at an increasing number, children were often left unsupervised which led to the emergence of some negative behaviors (Shapiro, 1983). According to Froebel (1886), young children were inherently good, but they could evidence some outwardly evil behavior. From this, his views that early educational exposure could help bring out the inherent good in the children developed into the emergence of kindergarten (Shapiro,

1983). However, kindergarten at this point did not focus on stringent academics; rather, its primary emphasis was spiritual and character development (Dombkowski, 2001).

In the United States, the first kindergarten was opened by Margarethe Schurz, a former student of Froebel, in the town of Watertown located in Wisconsin (Graue, 2001). One of the most influential Froebelian kindergarten trainers from Germany, Maria Boelte, joined the kindergarten movement in the United States and adapted Froebel's kindergarten to better meet the needs of American students (Shapiro, 1983). Training sessions were held for parents to instruct them in ways to teach morality, hygiene, drawing, and music, as well as meet the physical needs of small children. According to Shapiro (1983), free kindergartens were created for poor urban children in order to provide a safe, supervised place for them to learn and grow.

It was not until the 1800s that reformers pushed to include kindergarten into the public school systems. At that time, public school systems were seen as places where rote academic drills and strict discipline were present. It was thought that kindergarten would be the solution to the strict perception of public schools. During this push, reformers felt that schools should be more child-centered, modeling that of kindergarten classrooms (Shapiro, 1983). According to Allen (1988), many school systems included kindergarten by the year 1914. However, in the 1930s and 1940s, educational thought had shifted towards students needing to be physiologically, psychologically, and intellectually ready for school (Dombkowski, 2001). As such, the idea that young students were not ready or mature enough to benefit from instruction was born. This readiness view was based largely on research done in the 1920s that suggested the optimal age for learning to read was 6.5 years (Gray, 1984).

Later, in the 1980s and 1990s, kindergarten was in nearly every American school. By this time, kindergartens were federally funded and it was often required by states that students attend. The 1997 National Center for Education Statistics showed that 17 states did not require kindergarten, evidencing that states were still conflicted about the role of kindergarten (Dombkowski, 2001). In the 1990s 98% of children attended kindergarten and many of these programs began to last a full day rather than the previous half-day due to the increase in the number of working parents (Dombkowski, 2001). It was at this time that kindergarten took a more academic focus and preschool was introduced to prepare students for kindergarten. The government put pressure for academic proficiency on schools through programs such as the Goals 2000 Act of 1994, which planned to ensure that children were ready to learn in first grade (Dombkowski, 2001). This pressure forced schools to seek ways to delay school entry for those children who were not deemed ready by convincing parents to retain them.

Presently, kindergarten requirements vary state by state across the country. Out of the 50 states in the nation, only 14 of them require mandatory attendance in kindergarten. Out of those 14, twelve of them have provisions for exemptions or waivers (Kauerz & McMaken, 2005).

School Accountability

"American educators feel anxiety about improving student achievement now more than ever." (Starmack, 2007, p.10). As school district accountability increases, socially promoting students decreases as a more rigorous curriculum and method of assessment is implemented. Schools are expected to make adequate yearly progress to show that they are meeting the educational needs of all of their students. Adequate yearly

progress, or AYP, is defined as the minimum cutoff, set by the state, of the percentage of children who should be scoring proficient on the Pennsylvania State System of Assessments (PSSAs) (Department of Education, 2014).

NCLB. In 2001, President George W. Bush proposed the No Child Left Behind Act to show school progress through standards, assessments, and proficiency levels for students' academic achievement (Wallender, 2014). However, it was left up to individual states in regards to how to define this progress, which created largely different methods of assessments across the states. Through the No Child Left Behind Act of 2001, school districts were held accountable to provide student performance data in the form of a district report card. In Pennsylvania, this district report card highlights the percentage of students who have scored proficient on the PSSAs. By 2014 school districts were expected to reach 100 percent of students scoring at least proficiently on the PSSAs. As of the time of this study, 100 percent proficiency has not been obtained.

Common Core. In order to address the diversity and range of standards set into place across the United States, the Council of Chief State School Officers and the National Governors Association teamed up to create standards that were consistent across the states (McLaughlin & Overturf, 2012). Professionals to assist in creating these standards were chosen from the areas of English, language arts, and mathematics because these disciplines include skills necessary for all other content areas. The Common Core State Standards Initiative (CCSSI, 2014) focuses on creating common educational standards, preparing students for college (or careers), stressing quality education for all students, and increasing rigor in schools. Out of the four focus areas, rigor has gained the most attention (Fisher, Frey, & Algraro, 2013) because the common core standards are

intended to be rigorous by mirroring the standards of top-performing countries. Currently, 43 states, the District of Columbia, four territories, and the Department of Defense Education Activity (DoDEA) have adopted the Common Core State Standards (CCSSI, 2015).

Specific to Pennsylvania, the standards were adopted in July of 2010 with full implementation during the 2013-2014 school year (CCSSI, 2015). Since the adoption of the Common Core Standards in 2010, the decision was made to craft a set of Pennsylvania (PA) Core Standards tailored to meet the state specific needs in English Language Arts and Mathematics, as well as for Language Arts and Literacy in History/Social Studies and Science/Technical Subjects (Pennsylvania Department of Education, 2015a).

The Pennsylvania Common Core was implemented in five phases. First, during the Exploration Phase, "information about the innovation was disseminated to increase awareness and build knowledge" (PA Department of Education, 2013). Next, during the Installation Phase, the decision to implement an innovation begins the phase and ends when administrators and educators are using the innovation (PA Department of Education, 2013). Third is the phase of Initial Implementation, where "administrators and educators involved in the innovation must learn how to perform and relate to this new way of doing things" (PA Department of Education, 2013). Fourth is the phase of Full Implementation where "administrators and educators simultaneously perform new functions acceptably. The innovation is part of the school culture and conscious efforts are made to help new staff master the innovation" (PA Department of Education, 2013). During the last phase of Innovation/Sustainability, "administrators and educators begin to

work on how to improve the innovation itself. Data plays an important role in determining which innovations are effective, add value, and deserve support. Sustainability anticipates the next set of changes and continually maintains high fidelity services, even in the midst of continual change" (PA Department of Education, 2013).

The curriculum framework specifies what is to be taught for each subject in the curriculum. In Pennsylvania, curriculum frameworks include Big Ideas, Concepts, Competencies, and Essential Questions that are aligned with standards and assessment anchors defined in the Common Core Standards (PA Department of Education, 2015b). Big ideas are defined as "declarative statements that describe concepts that transcend grade levels. Big ideas are essential to provide focus on specific content for all students" (PA Department of Education, 2015b). Concepts "describe what students should know (key knowledge) as a result of this instruction specific to grade level" (PA Department of Education, 2015b). Competencies are defined as "what students should be able to do (key skills) as a result of this instruction, specific to grade level" (PA Department of Education, 2015b). Lastly, Essential Questions are "questions connected to the Standards Aligned System framework and are specifically linked to the Big Ideas. They should frame student inquiry, promote critical thinking, and assist in learning transfer" (PA Department of Education, 2015b).

Pennsylvania System of School Assessment (PSSA). According to the Pennsylvania Department of Education (2014), in 1999, Pennsylvania adopted academic standards for reading, writing, and mathematics. These standards indicate what a student should know and be able to do at their corresponding grade level. The PSSA is a standards-based, criterion-referenced assessment used to measure a student's attainment

of academic standards, while also determining the effectiveness of school programs to teach children this information they are expected to know. Every student in grades 3 through 8 and grade 11 is assessed in reading and math to determine proficiency. Students' scores on the PSSA are classified as advanced, proficient, basic, and below basic in terms of levels of performance and proficiency (Pennsylvania Department of Education, 2014). "Individual student scores, provided only to their respective schools, can be used to assist teachers in identifying students who may be in need of additional educational opportunities, and school scores provide information to schools and districts for curriculum and instruction improvement discussions and planning" (Pennsylvania Department of Education, 2015a). It is important to look at PSSA scores in the current study to determine if entry age influences scores on reading and math portions of the PSSA, which would in turn provide guidance for curriculum changes and/or instructional improvements.

School Readiness and Expectations

Due to children developing at different rates, defining an optimal entrance age to school is challenging. Children will evidence a large range of skills regardless of the age that they enter. Therefore, is entry age really an issue? To answer this, it is imperative to understand what kindergarten students must be able to do academically, socially, and behaviorally. Research in this area has been contradictory, at best. Some research has shown that age is a poor predictor of school readiness (Elder & Lubotsky, 2009; Stipek, 2003), while other research in this area indicates that the older the child is when they enter school, the better they will perform (Cannon & Lipscomb, 2008; Lin, Freeman, & Chu, 2009; Warder, 1999).

Emig (2000) proposed that in order to be ready to enter into kindergarten, children must possess the following five skills: health, cognition, language/literacy, social/emotional, and approaches to learning. In support of this, Dockett and Perry (2003) investigated which factors teachers, parents, and children considered to be the most important in regards to school readiness. The authors identified eight areas to be considered when getting ready to begin kindergarten, which include: (a) Knowledge of information, such as knowing the alphabet, colors, and numbers; (b) Social adjustment to school, such as interacting with other children and adults; (c) Skills such as tying shoes, coloring, or buttoning clothing; (d) Attitude towards school; (e) Rules and the ability to follow expectations of behavior; (f) Physical characteristics such as age and health; (g) Family issues such as family involvement and support in regards to schooling; and (h) Education environment, such as the overall atmosphere of the school, these are all important skill areas of knowledge for children to possess when it is time for kindergarten transition.

Dockett and Perry (2003) also found differences between the expectations of parents, teachers, and children regarding kindergarten readiness. Children believed the most important aspects of beginning school to be the ability to follow rules; their parents believed the most important factor to be their child's ability to adjust to school; and teachers felt the most important expectation was that of possession of knowledge and skills. According to Ackerman and Barnett (2005), teachers define kindergarten readiness as a child's ability to communicate, be healthy, and be curious and enthusiastic about learning. Teachers in urban schools felt more pressure to emphasize early academic skills in order to determine a child's readiness for kindergarten. Ackerman and

Barnett (2005) also report that parents define school readiness as children being socially ready for school and having a positive outlook about school.

As discussed previously, the maturationist and environmentalist views of learning create a developmental background for school readiness. However, the problems associated with school readiness could be more about the school system and the way they educate children rather than the child's individual development. According to Warder (1999), "schools need to work on their readiness for children, as opposed to the children's readiness for school" (p. 6).

The National Education Goals Panel (NEGP) (1997) has indicated that it should be the responsibility and commitment of the school to educate the students who arrive each year. The following factors were identified by the NEGP as being the most important characteristics of schools that were ready to educate the children who walked in their doors on the first day of kindergarten. According to the NEGP, schools should make a smooth transition between home and school; strive for continuity between daycare, preschool, and elementary schools; and help students learn about the world around them. Schools should make a commitment to the teacher's success and the child's success. The NEGP also purports that schools should be armed with proven methods to increase academic success and if children are not responding to a particular teaching method, then the school should be ready to change educational practices. Ready schools assume ownership and responsibility for the educational results of the children they serve.

Nelson (2004) suggests that ready schools maintain a clear partnership between early childhood centers, the home, and the community that provides a smooth transition

for children into kindergarten. Establishing a clear transition for each level can solidify this partnership; this means having clearly defined roles of parents, registration procedures, and locations of screenings. Next, ready schools will appoint a coordinator from the district who assists with transition procedures such as helping teachers contact parents. Lastly, Nelson (2004) suggests that ready schools establish a transition committee that would work with the community in regards to facilitating school communication and helping parents know what to expect during the transition process.

Curriculum exposure. As discussed previously, there is a need for schools to be ready for the children who enter their doors. Research suggests that there has also been an effort to academically prepare students for kindergarten through curricula presented during preschool and daycare (Cassidy, Mims, Rucker, & Boone, 2003). A study by Burke and Burke (2005) suggests that the emphasis on academics at such an early age could come at the expense of other developmental aspects. The authors suggest that most student performance standards are set in a way that they assume that all children start out at the same ability level. These expected standards do not take into account the interests of the students, their respective ability levels, or their diverse experiences prior to entering kindergarten.

However, the push for having more academically challenging preschools is driven by the increasing emphasis on teacher accountability and high stakes testing. Hyson (2003) found that children who were enrolled in academically challenging preschools showed no advantage in their cognitive abilities. While they did demonstrate a larger knowledge of numbers and the alphabet, these differences disappeared by the end of first grade. Hyson (2003) purports that a quality kindergarten can incorporate academics as

well as social-emotional learning. Additionally, if a playful and nurturing environment is excluded during a child's academic career, the child's motivation and involvement may be affected. A student-centered environment should seek a balance between academics and play. By combining these two, the kindergarten experience will allow for more learning and enhance future success (Hyson, 2003). It has been suggested that school psychologists work with parents and educators to teach them how to incorporate play into home and school activities (Boak & Lamb, 1999). Through mature play, kindergarten students can learn skills while playing (Bodrova & Leong, 2003). Characteristics of mature play include use of the imagination, role play, a broad range of play themes, clear rules or boundaries, language use, and varied lengths of time for play (Bodrova & Leong, 2003).

Readiness skills: Who knows what? Zill and West (2001) analyzed data from the Early Childhood Longitudinal Study of the Kindergarten class of 1998-1999 (ECLS-K), which assessed and measured reading, math, and general knowledge though cognitive testing and screenings. The ECLS-K data include 19000 children receiving their education within 940 public and private schools. The data gathered about the children were obtained through information provided by the following: interview with parents, teacher questionnaires to both teachers and school administrators, and abstract of school records. Specific to this study, the findings identified what a typical child knows or should know when he or she enters into kindergarten. The data show the average child entering kindergarten when he or she is already 5 years old. Ninety-four percent of these children could identify single digit numbers and simple shapes, while 66% could recognize the letters of the alphabet by name and have some pre-reading skills. The

average boy weighed 47 pounds and was 3'9" tall. The average girl weighed 46 pounds and was 3'8" tall. Data also found that 9% of the kindergarten children were not yet 5 years old, while 20% were almost 6 years old. Zill and West (2000) reported this variability to be due to the difference in state policies, qualifications for schools, and parental choice.

Additionally, Zill and West (2001) reported information from the ECLS-K study that was more specific to age-related differences in school readiness. Seventy-three percent of kindergarten students who are almost 6 years old at entry could identify letters of the alphabet by name. Only 56% of students who had not yet turned 5 years could identify letters by name. In relation to a child's number sense, 66% of children who are almost 6 years old at entry could read and count numbers beyond 10, while 42% of children who had not turned 5 were able to do this. Seventy-five percent of children who were almost 6 years old at entry were described by their teachers as being more ready for group activities and interacting appropriately with peers as compared to 69% of the children who were just turning 5 at entry.

Readiness assessments. In order to determine a child's readiness for kindergarten, readiness assessments are available in order to gain a clearer picture of a child's academic proficiency at the time of entrance to kindergarten. Assessments can be valuable resources to help determine skills and abilities of children, as well as helping to effectively design and provide quality services for those children (Emig, 2000). Kindergarten readiness assessments are also a way for school districts to find children who would potentially require special education services.

Shepard, Kagan, and Wurtz (1998) identify and describe five major purposes for assessing young children prior to entering kindergarten. These five purposes include (1) to improve student learning, (2) to identify children with special needs who may require additional support services, (3) to evaluate existing program effectiveness, (4) to be aware of readiness trends, and (5) to evaluate the use of the assessment for high-stakes accountability.

According to Scott-Little and Niemeyer (2001, p. 11), all kindergarten assessments should be used for the purpose they were designed, be appropriate for the age of the child, investigate a wide range of the child's abilities, be authentic, be sensitive to cultural and language differences, be adaptable for children with disabilities, include information from several sources, provide data about which schools can be confident, and have a realistic data collection process for districts.

Mantizicopoulos (1999) indicated that one of the most widely used kindergarten screening tools is the Brigance K & 1 Screen. This screener is a fifteen-minute assessment that consists of twelve subtests and is administered by a teacher. The subtests are able to provide data regarding a child's acquisition of number skills, motor skills, language skills, body knowledge, recognition of number and letter skills, and the ability to follow directions. The Brigance has a maximum score of 100 and any score of 65 or lower may indicate the need for further evaluation. Another widely used screening tool as reported by Costenbader et al (2000) is the Gesell School Readiness Test. This instrument is designed to assess a child's developmental maturity as it relates to skills, knowledge, and abilities. However, the researchers found that the Gesell contains

inadequate psychometrics and that the maturity-school readiness tie is unfounded (Costenbader et al., 2000).

Entrance Age and Cutoff Dates

Although there are many ways to determine whether a child is ready to begin kindergarten, age is most often used to determine eligibility. Marshall (2003) purports that "the only legally and ethically defensible criterion for determining school entry is whether the child has reached the legal chronological age of school entry" (p. 2). The age variance in today's kindergarten classrooms usually ranges between 4 years, 9 months to 6 years and older. Kindergarten classes also vary in class size and structure. Regardless of the cutoff date, it is expected there will always be younger and older children in any kindergarten class. However, if we know that children would likely be more successful if they entered at and older age range, we could set our cut-off dates and age requirements accordingly.

Across the Country. Entrance age, the chronological age of a child based on birth date, is not consistent across the United States (Narahara, 1998). The usual cutoff birth date is September 1. Thirty-five states have cutoff dates between August 31 and October 16. Four states have cutoff dates before August 15 and six states do not have established cutoff dates; rather the decision is left up to those individual states and the districts within them (Stipek, 2002; Kauerz, 2005). Compulsory school age is the age at which, by law, the child must enter school (Stipek, 2002). Table 1 depicts cutoff dates for kindergarten eligibility at age 5 and compulsory school age across these states.

Table 1

Cutoff Dates for Kindergarten Eligibility and Compulsory School Age

State	Minimum Kindergarten Entrance Age	Compulsory School Age
Alabama	Age 5 by September 1	Age 6
Alaska	Age 5 by September 1	Age 7
Arizona	Age 5 by September 1	Age 6
Arkansas	Age 5 by August 1	Age 5
California	Age 5 by September 1	Age 6
Colorado	Age 5 by October 1	Age 6 on or before Aug 1
Connecticut	Age 5 by January 1	Age 5
Delaware	Age 5 by August 31	Age 5
District of Columbia	Age 5 by September 30	Age 5
Florida	Age 5 by September 1	Age 6
Georgia	Age 5 by September 1	Age 6
Hawaii	Age 5 by July 31	Age 6 by Jan 1
Idaho	Age 5 by September 1	Age 7 by first day of school
Illinois	Age 5 by September 1	Age 7
Indiana	Age 5 by August 1	Age 7
Iowa	Age 5 by September 15	Age 6 by Sept 15
Kansas	Age 5 by August 31	Age 7
Kentucky	Age 5 by October 1 (current) Age 5 by August 1 (eff. 2017-2018)	Age 6 by October 1 (current) Age 6 by August 1 (eff. 2017-2018)
Louisiana	Age 5 by September 30	Age 7
Maine	Age 5 by October 15	Age 7
Maryland	Age 5 by September 1	Age 5
Massachusetts	LEA: each school may establish its own minimum permissible age for school attendance	Age 6
Michigan	Age 5 by September 1	Age 6 by Dec 1
Minnesota	Age 5 by September 1	Age 7
Mississippi	Age 5 by September 1	Age 6 by Sept 1
Missouri	Age 5 by August 1	Age 7
Montana	Age 5 by September 10	Age 7
Nebraska	Age 5 by July 31	Age 6 by Jan 1
Nevada	Age 5 by September 30	Age 7
New Hampshire	LEA decision	Age 6
New Jersey	LEA: May admit children aged 4-5, must admit children aged 5-6. The cutoff date must be after October 1.	Age 6
New Mexico	Age 5 by September 1	Age 5 by Sept 1
New York	LEA decision. Must be between ages of 4 and 6	Age 6

North Carolina	Age 5 by August 31	Age 7
North Dakota	Age 5 by August 1	Age 7
Ohio	LEA decision: Age 5 by Aug 1 or Sept 30, or beginning of term (if after Sept 30)	Age 6
Oklahoma	Age 5 by September 1	Age 5
Oregon	Age 5 by September 1	Age 7
Pennsylvania	Local option: not less than 4 for K-4, not less than 5 for K-5	Age 8
Rhode Island	Age 5 by September 1	Age 6
South Carolina	Age 5 by September 1	Age 6
South Dakota	Age 5 by September 1	Age 6
Tennessee	Age 5 by August 15	Age 6
Texas	Age 5 by September 1	Age 6
Utah	Age 5 by September 2	Age 6
Vermont	LEAs have the option to choose any date between August 31 and January 1.	Age 6
Virginia	Age 5 by September 30	Age 5
Washington	Age 5 by August 31	Age 8
West Virginia	Age 5 by September 1	Age 6
Wisconsin	Age 5 by September 1 Age 4 by September 1 for 4 year old kindergarten	Age 6
Wyoming	Age 5 by September 15	Age 7

Note. Adapted from Education Commission of the States website. Copyright 2014 by Education Commission of the States. Adapted with permission.

Specific to Pennsylvania. Kindergarten entry dates are determined on a local school district level within the state of Pennsylvania. According to the Pennsylvania Department of Education, the compulsory age of school attendance, or the age at which the child must be enrolled in school, is 8 years of age. In regards to kindergarten entry age, the state of Pennsylvania allows this cutoff to be determined on a local level. There are a total of 784 school districts within the state of Pennsylvania and 67 total counties in the state (NCES, 2012). The current study will include subjects from five school districts in Allegheny County, which is located in western Pennsylvania. When focusing on Allegheny County in western Pennsylvania, out of the 43 districts located there, 34

districts have a cutoff date of September 1, five have a cutoff date of August 31, two have a cutoff date of September 30, and one district each has a cutoff date of August 15 and August 30.

Academic Performance and Entry Age

Some research has found that children with "summer birthdays" often perform the poorest on reading and math measures during the spring of their kindergarten year (West, Denton, & Reaney, 2000). The authors obtained data through a nationally representative sample of 22,792 children in 1,277 kindergarten programs. The authors distributed questionnaires to obtained information regarding demographic data. The response rate for these questionnaires was 74%. Additional studies completed found that frequently the youngest kindergarteners score lowest on standardized tests at least up until first grade, and they are most likely to be retained in following years (Cryan et al., 1992). However, some research has indicated that the correlation between kindergarten entry age and academic achievement is low (Kilpatrick, 2002). This could be due to other factors, including experiences prior to kindergarten and exposure to the academic setting prior to beginning their kindergarten year (De Cos, 1997). Researchers have also found that kindergarten entry age ranges between 4.5 and 6.5 years, but the typical beginning kindergartener is 5.5 years old (Coley, 2002; Zill and West, 2001). While most research focuses on the initial effects of early kindergarten entrance age, it is important to realize that it may have lasting effects continuing into high school, such as poor performance and struggles throughout the academic career (Byrd et al., 1997).

Regardless of the cut-off dates used to determine kindergarten entry, there will always be a group of relatively younger and older students in the cohort for any school

year (Morrison, Smith, & Dow-Ehrensberger, 1995). However, there seems to be a connection between age, school readiness, and academic success in that the older the child is upon kindergarten entry, the more proficient he or she is expected to be. It is difficult to generalize this information, though, due to children within the samples studied, the definition of age categories, and what measures of achievement are used to assess academic functioning. Other factors that are also important to consider in relation to academic functioning in later grades are demographic characteristics of the community, socioeconomic status (Chatterji, 2006; Yesil-Dagli, 2006; Sirin, 2006; VanLaar & Sidannius, 2001), sex (Kleinfeld, 2009; Chhatterji, 2006; Yesil-Dagli, 2006; Chiu & McBride-Chang, 2006), ethnicity (Aldous, 2006; Chatterji, 2006; Yesil-Dagli, 2006; Reardon & Galindo, 2009; Koo, 1998), and preschool experiences available for children. These factors can lead to varying levels of support for academic skills and readiness when entering kindergarten regardless of the child's age.

Academic Performance and Socioeconomic Status

There are several differences seen between children of lower socioeconomic status and those of higher socioeconomic status. Lee and Burkham (2002) found that children from higher socioeconomic status families are more likely to have higher cognitive scores than those from lower socioeconomic families. Additionally, children from lower socioeconomic status backgrounds are more likely to attend lower performing elementary schools as compared to their higher socioeconomic status counterparts. A risk of attending a lower quality elementary school could mean less school resources and poorer school conditions, resulting in poorer academic performance (Lee & Burkham, 2002).

Even as early as the 1990's, researchers were asserting the risk of academic failure as it is associated with socioeconomic status. Jones and Mandeville (1990) found that the likelihood of academic failure was nearly 13 times higher for a younger student coming from a lower socioeconomic background as compared to an average age student coming from a socioeconomic background.

Academic Performance and Sex

There is a common thought that boys mature later than girls. The National Center for Education Statistics (NCES, 2000) reported that early academic skills were very similar between girls and boys, with boys demonstrating only slightly less advanced reading skills. Past research has indicated that girls are more likely to start school early and boys are more likely to delay (Graue & DiPerna, 2000). The NCES (2000) reported that the main differences between boys and girls in the early academic years are that of developmental and behavioral skills. Boys have more trouble paying attention, are more active, and have fewer communication skills.

Gurian and Stevens (2005) investigated different studies involving brain development and functioning in boys and girls. It was found that boys brains are often larger than girls', but certain areas, such as those contributing to language, are more densely packed with neurons in female brains (Marano, 2003). Additionally, girls demonstrated more brain activity while at rest than boys and the brain activity levels are different for both girls and boys, even when performing the same task. Colom and Lynn (2004) found than academically, girls tend to perform better than boys at younger ages but this difference levels out by age 16.

Entry Age and Special Education

As school districts are being held under strict accountability for student success, socially promoting a student onto the next grade has decreased, in turn, increasing the number of students who may qualify for special education services. The federal regulations, Individuals with Disabilities Education Improvement Act 20 U.S.C. § 1400 (IDEIA) (2004) govern how a child becomes eligible for special education services as federally mandated. After completion of assessments and other evaluation measures, a group of qualified professionals determine whether the child is a child with a disability and evidences an academic need. A child must not be determined to be a child with a disability if the determining factor for determination is a lack of appropriate instruction in reading and/or math, or if they are limited English proficient.

Rabinowitz (1989) examined kindergarten entry age and the corresponding effects on academic achievement through data obtained from Iowa Achievement Tests, report cards, Brigance K-1 Screening test, and the Scott Foresman Test of Early Reading Skills. The sample of the study included 83 boys and girls, ages 5 though 12 who were white, middle class, and Jewish. Rabinowitz hypothesized that there would be a significant relationship between school entry age and special education referral rates. The results indicated that 38% of early entry students as compared to 18% of late entry students had received special education services or had been referred for an evaluation.

In 2008, Weiss examined kindergarten factors that may be predictive of a learning disability in reading. These factors include age on the first day of kindergarten, social and academic classroom behaviors, reading skills, and reading instructions. Results of the study indicated that students who were significantly older on the first day of kindergarten

had a 76% chance of being identified with a learning disability by grade three. These results contradict previous research regarding age at school entry and special education.

A study authored by Hayes (2005) investigated predictors of grade retention and special education status. These predicting factors included mother's demographics, government assistance recipient, gender, birth weight, early services, age at kindergarten entrance, and English language learner status. While all of these factors were found to have a significant impact on grade retention and special education status, the age at kindergarten entry was one of most powerful predictors for grade retention, but slightly weaker in its prediction of special education status.

Socioeconomic Status and Special Education

Mann, McCartney, and Park (2007) examined child, family, and early childcare predictors for referral for special education services. The authors found that the strongest three factors to predict a need for special education services were those of socioeconomic factors, child cognitive ability, and child behavior. Demeris, Childs, and Jordan (2007) researched the effect that socioeconomic status has on academic achievement of both special education students and regular education students in grades kindergarten through third grade. The authors found that both students with disabilities and those without, scored lower on math assessments if they were from a lower socioeconomic background. Similarly, Cawley, Parmar, Foley, Salmon, and Roy (2001) studied the effect of socioeconomic status on the math performance of students with and without disabilities. They found that socioeconomic status might have a stronger effect on math performance than even disability status.

Another study investigating the effects of socioeconomic status on the need for special education services is that of Temple, Reynolds, and Arteaga (2010). Following a cohort of more than 1300 low-income students, the authors investigated whether family socioeconomic risk predicted placement into special education classes in grade school. Results indicated that students from a lower socioeconomic background were three times more likely to require special education services than those who were not from a disadvantaged background. Additionally, the authors found that high quality preschool programs had the possibility to reduce the negative effects of low socioeconomic status on the need for special education services.

Sex and Special Education

It is common belief that boys mature later than girls. Research supports the notion that boys are a higher represented population who require special education services. One study found that boys whose mothers were never partnered were more than three times as likely as children whose mothers were always partnered to be referred for special education services (Mann, McCartney, & Park, 2007). As is consistent with much of the available literature, May, Kundert, and Brent (1995) found that boys were more likely to require special education services and were more likely to be held out an extra year by their parents. The authors studied a sample size of 3,238 students who were enrolled in grades 1 through 12 to investigate sex and the relationship with a need for special education.

Advantages of Entering Early

Conversely, when examining census data from Texas and California, Dobkin and Ferreira (2009) found advantages for adults who entered school at a younger age. One

long-term advantage was completion of high school at higher rates than older peers. On the other hand, they found no differences in employment, wages, or home ownership for the students who entered school in the youngest group as compared to the older group.

Delayed Entry

Even with state guidelines mentioned previously, there are a wide range of abilities present in kindergarten classrooms (Carlton & Winsler, 1999). Much of the research found concerning delayed entry has been inconclusive at best. According to the National Center for Education Statistics, older kindergarten children are closer to being able to read independently, perform math tasks, know more about science and nature, have more advanced motor skills, be more socially adaptable with fewer demonstrated behavior problems, and be more eager to learn (NCES, 2000). According to Stipek (2002), even though some studies have shown that older children fare better academically in the younger grades, this advantage usually disappears and achievement levels out as students progress to higher grades.

Academic Redshirting and Retention. Academic redshirting is an increasing trend where parents are choosing to keep their age eligible child out of kindergarten until the next year under the assumption that the extra year of growth will allow them to be ahead academically and socially. According to Frey (2005), this term is most often used for boys and those who come from more affluent homes where the parents are more likely to be able to afford an extra year of day care. Through a meta-analysis of 14 studies completed on retention, Frey found that most low-income families do not have this financial luxury and must enroll their children as soon as they are able. Narahara

(1998) indicates that this is changing the way kindergarten classrooms look today in regards to varying skills levels, maturity, and ages within the classroom.

Academic redshirting can have its disadvantages too. Children who are held out of school may miss opportunities for social interactions with their same age peers and holding children out also implies that the children have failed at school even before they start (Diamond et al., 2000). Potentially, the practice of delaying entry may cause policy makers to expect more academically out of kindergarteners due to the rise in the age of the average student, which may in turn put too much emphasis on the academic achievements of kindergarteners. (Diamond et al., 2000).

Contrastingly, Graue and DiPerna (2000) asserted that most redshirted children tend to be younger boys who are more likely to be children of color and come from a background of poverty. The authors reviewed school records of more than 8,000 children to depict patterns of school entry, promotion, special services, and student achievement. The results indicated that 7% of the sample had delayed entry and were younger boys who were children of color coming from a background of poverty. This is inconsistent with the findings of Frey (2005), who indicated that these children were more likely to come from affluent homes with college-educated parents. If children have met requirements for entrance into kindergarten and completed a year of kindergarten, but may not be ready to move to first grade, retention is often presented as the next step. Frey (2005) posits that retained students are most often boys who are poor and African American. Long-term effects that may be related to retention include substance abuse, lower paying jobs, higher drop out rate, and possible jail time (Frey, 2005).

The history of grade retention in the United States is characterized by a fluctuation in the use of retention as a consistent academic practice. This fluctuation can be attributed to the shift in policies and educator beliefs over the years. The United States National Center for Education Statistics (NAECS) (2006) compared retention rates between the years of 1995 and 2006. In 2004, 9.6% of children ages 16 to 19 had been retained in a grade. This is a decrease from the 1995 statistic of 16.1% of students being retained at least a grade. Gay (2002) contributed to the research base regarding retention by indicating that retention should not be considered a viable option when children have not been successful in kindergarten. Retaining students does not help them catch up academically. Through a study of 415 students in grades one and two, Gay found that at the end of their first grade year, those children who were retained in kindergarten did not perform differently than their counterparts who were promoted onto first grade after one year in kindergarten (Gay, 2002). Additionally, Wallingford and Prout (2000) investigated the correlation between kindergarten entry age and special education referral rates among 1,277 children in grades kindergarten through five. The subjects were classified by three age groups (5-7 years, 8-9 years, and 10 years and up), season of birth month (6-9, 10-1, and 2-5), and gender. The authors found that students who were older for their grade due to delayed entry or retention were more likely to be referred for special education services.

A meta-analysis of 207 achievement effects within 22 different studies ranging between the years of 1990 to 2007 was recently completed. Allen, Chen, Willson, and Hughes (2009) found that the studies that used stringent quality controls for selection effects (i.e. what achievement prior to retention looked like for retained children versus

promoted peers) resulted in less negative effects from retention. The researchers also found that effect sizes were different depending on whether the retained and promoted students being compared were done so when they were in the same grade or the same age. It was found that retention effects were more positive when same grade comparisons were made. The study also found that children who were retained showed a sharp improvement as compared to promoted peers, in meeting grade level standards during the repeat year. Unfortunately, these noted improvement often disappeared within 2 to 3 years after retention (Alexander, Entwisle, & Dauber, 2003).

In regards to retaining children due to behavior problems, Mantizicoupoulos (1999), through a study completed with a sample of 134 children from Midwestern school districts, found that children retained due to inattention continued to experience the same inattention through first and second grades. Zill, Loomis, and West (1997) found that students who were retained had more trouble concentrating in class, performed below their abilities, and had more behavior problems. Retained students also received more negative feedback from educators as compared to students who had not been retained. The National Association of Early Childhood Specialists (NAECS, 2000) reports that immaturity and behavior problem are often cited as reasons for retention in the lower grades, but retention can have lasting effects on these children. For example, children retained in the early grades will display more problems in their later academic years. These children may struggle with social adjustments, behavior problems, increased stress, and ultimately leaving high school without graduating.

A study completed by Bergin, Osburn, and Cryan (1996) investigated retention rates amongst kindergarten students whose birthdates were in August and February. The

authors distributed questionnaires and student profiles to 600 teachers to collect data regarding their recommendations for struggling students. Out of the 600 questionnaires sent, 252 responded. Results indicated that retention was more often recommended for the younger students due to independence and immaturity. In support of this, Painter (2006) found that younger students were more likely to be retained and reported that parent and administrators may be tempted to redshirt a child who could possibly be retained in the future.

Overall, retaining students has not been shown to be an effective strategy to bolster academic achievement. One study found that retention in the early grades did not result in reading advantages in the early grades (Silberglitt, et al., 2006). Specifically, the findings of this study failed to support the efficacy of retaining students in earlier grades. Reading growth trajectories were investigated for a sample of 49 students split into two groups: student retained in grades kindergarten through two or student retained in grades 3-5. Results indicated that the reading growth trajectories were comparable in both groups. The authors reported that although retention is often considered the only logical alternative, the child would benefit more from individual interventions based on his or her needs. According to Jimerson (2001), most of the studies completed on retention over the past four decades fail to support the efficacy of remediating academic deficits.

Much of the research on grade retention is missing information regarding how the retention is implemented. Usually, retention simply means repeating the experiences in the grade being repeated (Picklo & Christienson, 2005). States such as Texas and Florida have implemented policies regarding the requirement of additional accelerated

instructions to students who are at-risk for retention and students who have been retained (Florida Department of Education, 2002; Texas Education Agency, 2009).

The National Association of School Psychologists (NASP) (2011) asserts that unless a child has missed an exorbitant amount of school, grade retention and social promotion are not recommended. NASP urges school districts to maximize students' opportunities to learn inside and outside of school through extended day or year school programs. Additionally, NASP suggests that students who are at risk for retention should be provided with intensive individualized intervention and progress monitoring of said interventions to ensure the maximum benefit possible for the student.

Why Would Parents Delay Entry into Kindergarten?

The research available on delayed entry is scarce, at best. Most research focuses on comparing age eligible students to delayed entry students, academic outcomes of those children, and delayed children with the children of the same age in different grades. According to Stipek (2002), studies comparing age eligible students to delayed entry students are limited due to the inability to control for the reason that parents delay entry.

Delayed Entry and Academic Achievement. Datar (2006) analyzed data collected through the Early Childhood Longitudinal Study – Kindergarten Class (ECLS-K). It was found that students whose entry was delayed had greater overall reading achievement for the first two years of school. African American and European American students' reading achievement scores were also compared using the ECLS-K data. Easton-Brooks and Brown (2010) investigated whether delaying entry had an effect on reading achievement between these two groups. Data show that age of entry explained

96% of the variance between these two groups, with European Americans scoring higher on assessments.

Oshima and Domaleski (2006) also utilized the ECLS-K data to compare reading achievement among students within the same grade. The authors divided students with summer birthdays (June, July, and August) from students with fall birthdays (September, October, November). They found a statistically significant difference in reading achievement between the two groups. Children with fall birthdays had a greater reading knowledge than those with summer birthdays. Oshima and Domaleski (2006) reported that this gap did begin to narrow by the spring of kindergarten and continued to decrease thereafter.

Kilpatrick (2002) studied the academic achievement of kindergarten students in later grades. Kilpatrick divided the students into two groups: early entry group (students less than 66 months old) and the regular-entry group (students 66 months and older). The researcher found that the academic achievement of these students in middle school was not affected by their kindergarten entry age.

Problems with Delaying Kindergarten Entry. By delaying entrance into kindergarten for age eligible children, Elder and Lubotsky (2009) indicate that it may increase the likelihood that a child would repeat a grade or be diagnosed with a learning disability. An undiagnosed learning disability may be the reason a child was suspected of not being ready for school. By delaying entry for a year longer, it may be an additional year before the learning disability is diagnosed.

Additionally, delaying entry may contribute to added day care costs for families, the possibility of students dropping out of school at an earlier grade, and delay of these

children entering the workforce for an extra year (Edler & Lubotksy, 2009). Also, students who are from more affluent families are more likely to delay entry to school than those children from lower economic groups. This, in turn, can increase the age gap between higher and lower economic groups, resulting in an even larger achievement gap. Lastly, Elder and Lubotsky (2009) note that teachers may alter their instruction to meet the needs of the older students rather than those who are age appropriate.

Marshall (2003) and Martin (2009) present another problem that comes about from delaying school entry, which is the increase in academic rigor to meet the academic needs of the older kids in the classroom. This raises the curriculum requirements and therefore, affects the academic requirements to enter into kindergarten; which has the potential to cause difficulties for the age appropriate or younger students entering kindergarten (Marshall, 2003; Martin, 2009).

Advantages of Delaying Entry. Most of the information available concerning the effect of kindergarten entry age upon later academic achievement is inconclusive at best. Current research suggests that regardless of their eligibility to begin kindergarten according to state law, some children are recommended to delay entry, otherwise known as redshirting (Graue & DiPerna, 2000). Other studies show that more boys than girls are held out for an extra year (Graue & DiPerna, 2000; Brent, May, & Kundert, 1996). Children who are born closer to the district cut-off date and would be the youngest in the grade are more likely to wait a year before entering kindergarten (Brent, May & Kundert, 1996). Research in this area indicates that older kindergarten students perform at a higher academic level than their younger peers (Datar, 2006; Fantuzzo, Bultosky-Shearer, McDermott, McWayne, Frye, & Perlman, 2007; Malone, West, Flanagan, & Park, 2006;

Zill & West, 2001). However, there are studies that have not found any advantages to delaying kindergarten entry. Morrison, Smith, & Dow-Ehrensberger (1995) found that age did not have an effect on memory skills or early reading skills measured in kindergarten and first grades. According to the aforementioned researchers, older and younger students performed comparably on picture recall, phonemic awareness, and reading tasks as assessed on the Wide Range Achievement Tests for those children in first grade. One study by Lincove and Painter (2006) examined the long-range outcomes of delaying kindergarten entry. Specifically, the authors used data from the National Education Longitudinal Survey (NELS) to examine long-term effects of age at school entry on both educational and social outcomes. The NELS included a cohort of 8th graders and followed them through high school and young adulthood. The sample included 25,000 8th graders from 1000 schools. The students were interviewed with questions centered on individual characteristics, school experiences, and family environments in 8th grade with a follow up interview at 10th grade, 12th grade, two years after that, and 6 years after that. The study found no long-term advantages educationally or economically of delaying school entry. The only consistent advantage shown in this study for older kindergarteners is that they were less likely to repeat a grade in school.

Summary

Chapter 2 has presented relevant literature in regards to delayed kindergarten entry and its effects on achievement, retention, and special education services. A background of kindergarten was introduced and discussed. School readiness skills and readiness assessments were discussed; along with the laws specific to Pennsylvania regarding kindergarten entry. Two opposing views and their corresponding theorists,

maturationist and experientialist, were also discussed. Maturationists believe that delaying entrance to kindergarten for younger children gives them the advantage of more time to mature and be more prepared to learn. Students must be ready before they can be expected to learn. Experientialists believe that students learn based on what they are exposed to in their environments and their environments should be built around student need. A review of the literature looked into many factors related to delaying entry to kindergarten versus not delaying entry to kindergarten. These factors included academic redshirting, retention in kindergarten, age at entry and academic achievement, and age at entry and special education.

CHAPTER III

METHODOLOGY

Introduction

The purpose of this study is to examine the relationship between kindergarten entry age of students and their scores on the third grade Pennsylvania System of School Assessments (PSSAs). Because the ages of entry into kindergarten vary greatly, parents, educators, and administrators are often confused by the conflicting data regarding optimal age of entry. Data are needed to help parents make informed decisions, teachers provide useful advice and input, and administrators create appropriate district policies regarding kindergarten entrance.

Design

This study will be quantitative in nature and utilize a causal-comparative design to examine kindergarten entry age of students and their scores on the third grade PSSAs. A three-way Analysis of Variance (ANOVA) will be used to estimate the relationship between the independent variables of kindergarten entry age, socioeconomic status, and gender with the dependent variables of PSSA reading score and PSSA math score. The three-way analysis of variance (ANOVA) is used to determine if there is an interaction between three or more independent variables on a continuous dependent variable. The assumptions that needed to be met in order to use the three-way ANOVA are the homogeneity of variance, normal distribution of subjects, and independent values. These assumptions were tested once the data were collected. A logistical regression analysis was used to investigate the predictive relationship between the independent variables of kindergarten entry age, socioeconomic status, and sex with the independent variable of special education status. A logistical regression analysis was also used to

investigate the predictive relationship between the independent variables of kindergarten entry age, socioeconomic status, and sex with the independent variable of retention status. The assumptions that needed to be met in order to perform a logistical regression analysis are the assumption of linearity, that there are no significant outliers, and that the data must not show multicolinearity. These assumptions were tested once the data were collected. This study investigated how early kindergarten entry age affects educational performance.

Independent Variables. The primary independent variable was birth date (MM,YY). By using the student's birth date, the study sample was divided into three age groups upon entrance to kindergarten: older group (68-72 months of age), middle group (64-67 months of age), and young group (60-63 months of age). These age ranges were used in order to most evenly separate the groups of subjects involved, assuming a normal distribution of subjects. Reliability and validity for birth date are excellent as this information was obtained from the student's permanent record. Weiss (2008) and Datar (2006) have also utilized a separation of age categories as listed above in similar research studies and the current study used the same.

The independent variables of sex and socioeconomic status were also investigated in this study. Sex was defined as whether the student is male or female, with reliability and validity reported as excellent supported by student's sex listed on kindergarten registration records. Socioeconomic status was defined as whether the student received free/reduced school lunches. Reliability and validity for socioeconomic status are excellent as this information is part of the student's permanent record. See Table 2 for Independent Variable information.

Table 2

Independent Variables

Independent Variable	How will the independent variable be measured?	Reliability and validity of independent variable.
Age at kindergarten entrance: 60-63 Months (5 years 0 months to 5 years 3 months) (Young-age)	Date of Birth is reported on birth certificate provided at registration. This group will be coded as 0) young age.	Excellent/Excellent. Date of Birth as reported on birth certificate provided at registration.
Age at kindergarten entrance: 64-67 Months (5 years 4 months to 5 years 7 months) (Middle-age)	Date of Birth is reported on birth certificate provided at registration. This group will be coded as 1) middle age.	Excellent/Excellent. Date of Birth as reported on birth certificate provided at registration.
Age at kindergarten entrance: 68-72 Months (5 years 8 months to 6 years 0 months) (Older-age)	Date of Birth is reported on birth certificate provided at registration. This group will be coded as 3) older age.	Excellent/Excellent. Date of Birth as reported on birth certificate provided at registration.
Socioeconomic Status	SES is reported as whether a student 1) receives a free/reduced lunch or 2) does not receive a free/reduced lunch.	Reliability and validity are excellent for SES. This information is part of the student's permanent academic record.
Sex	Sex is reported as 1) Male or 2) Female on birth certificate provided at registration.	Reliability and validity are excellent for sex. This information is part of the student's permanent academic record.

Dependent Variables. Four dependent variables were utilized in this study; Pennsylvania State System of Assessment Reading scores, PSSA Math scores, special education status, and retention status. PSSAs are Pennsylvania's standards-based, criterion referenced assessment used to measure a student's attainment of academic standards, while also determining the effectiveness of school programs to teach children the information they are expected to know. The first two dependent variables discussed

are the 2013-2014 PSSA reading scores and the 2013-2014 PSSA math scores. The scores for the reading and math portions of the PSSA are categorized into four levels of proficiency (Pennsylvania Department of Education, 2011): Below Basic, Basic, Proficient, and Advanced. Specific level cut off scores for 3rd grade reading are as follows: Below Basic (1000-1167), Basic (1168-1234), Proficient (1235-1441), and Advanced (1142 and higher). Specific level cut off scores for 3rd grade math are as follows: Below Basic (750-1043), Basic (1044-1179), Proficient (1180-1369), and Advanced (1370 and higher).

According to the Human Resources Research Organization (HumRRO), the PSSA exhibits strong convergent validity coefficients (2004). Correlations are very high between the PSSA and SAT (.90). The PSSA is positively correlated with other measures of student achievement including grades and GPA.

The Technical Report for the 2014 Pennsylvania System of School Assessments published by the Data Recognition Corporation (2014) reports that a strong link can be established between each PSSA item and its associated content. Strand score intercorrelations revealed that within subject area strands (i.e., Mathematics) correlate more highly with themselves than they do with other subject area strands (i.e., Reading). These high correlations provide favorable evidence regarding the internal and external relationships between the tests' components. The Technical Report for the 2014 Pennsylvania System of School Assessments reports the reliability and standard errors of measurement for each grade. Specific to the data to be used in this study, the third grade reading reliability coefficient was reported at .92 with 2.7 SEM. The third grade math reliability coefficient was reported at .95 with 3.3 SEM (Data Recognition Corporation,

2014). Reliability and validity coefficients for the PSSA as reported above are considered to be excellent.

"Individual student scores, provided only to their respective schools, can be used to assist teachers in identifying students who may be in need of additional educational opportunities, and school scores provide information to schools and districts for curriculum and instruction improvement discussions and planning" (Department of Education, 2015).

The third dependent variable was that of special education status. This was dichotomized into two categories; special education student or regular education student. The reliability and validity for this variable are excellent as this information is part of the students' permanent academic record. A special education student is defined as any student who has been identified as having a disability by a school psychologist with the subsequent development of an Individualized Education Program (IEP). A regular education student is defined as any student who does not currently have an IEP. The federal regulations, Individuals with Disabilities Education Improvement Act 20 U.S.C. § 1400 (IDEIA) (2004), govern how a child becomes eligible for special education services as federally mandated. After completion of assessments and other evaluation measures, a group of qualified professionals determine whether the child is a child with a disability and evidences an academic need. A child must not be classified as a child with a disability if the determining factor is a lack of appropriate instruction in reading and/or math, or if they are limited English proficient.

The fourth and final dependent variable is that of retention status. This is defined as whether or not the child has been retained at least once between kindergarten and third grade. See Table 3 for Dependent Variable information.

Table 3

Dependent Variables

Dependent Variable	How measured	Reliability and Validity
PSSA Reading Score	PSSA reading scores are reported as numerical scores that fall into one of the four categories of proficiency; Advanced, Proficient, Basic, Below Basic (categories detailed below in Table 3).	The PSSA reading has excellent reliability and validity. A .92 reliability coefficient and a .90 validity coefficient were reported.
PSSA Math Score	PSSA math scores are reported as numerical scores that fall into one of the four categories of proficiency; Advanced, Proficient, Basic, Below Basic (categories detailed below in Table 3).	The PSSA math has excellent reliability and validity. A .95 reliability coefficient and a .90 validity coefficient were reported.
Special education status	Special education status will be measured as 1) student has been found to exhibit a disability and has an individualized education program (IEP) or 2) student does not have an IEP.	Reliability and validity are excellent for special education status. This information is part of the students' permanent academic record.
Retention Status	Retention status will be measured as 1) student has been retained at least once in grades K-3 or 2) student has never been retained.	Reliability and validity are excellent for retention status. This information is part of the students' permanent academic record.

Population

This study utilized convenience sampling from five mid-sized suburban school districts located in Allegheny County in Western Pennsylvania. The five districts together service 16,224 students; 7,843 female (48%), and 8,381 male (52%). The

student population within the five districts is 64% white, 31% black, 2.6% multi-racial, 1.5% Asian, 1% Hispanic, and less than 1% American Indian. On average among the five districts, approximately 47% of students received free and reduced lunches. See Table 4 for District demographic information.

Table 4

Demographic Information for Five Participating Districts

School District	Student Population	Ethnicity	Percentage Receiving Free or Reduced Lunch	Total Number of Third Graders
School District 1	3,908 students	34% white 60% black 4% multi racial 1% Asian <1% Hispanic <1% American Indian	73%	259
School District 2	991 students	96% white 2% black 2% multi racial	52%	65
School District 3	4,452 students	95% black 2% white 1% multi racial 1% Asian	19%	320
School District 4	3,027 students	93% white 1% black 2% multi racial 3% Asian <1% Hispanic	11%	201
School District 5	3,846 students	28% white 65% black 4% multi racial <1% Asian <1% American Indian 2% Hispanic	82%	255

Sample

For the purpose of this study, all third graders who took the most recent PSSAs (2013-2014) within the five districts were used for data collection and analysis. This resulted in a sample size of approximately 1100 students from the five school districts and the population previously described. The results of the data analysis were generalized to the population.

Data Collection Procedures

Prior to beginning the current study, IRB approval was sought. The completed IRB contained information regarding the process of the study, methods, data collection, and a human subjects review to ensure minimal risk. To obtain IRB approval prior to data collection, permission was secured from the superintendents from the five participating districts. An email requesting district participation was sent directly to the Superintendents of districts in western Pennsylvania who utilize OnHand Schools as their data management system. OnHand Schools was chosen due to the fact that the company houses data for many districts within the area that the study was completed. Prior to contacting any districts to request participation, approval and commitment to provide data was obtained from OnHand Schools. As a result, five school districts agreed to allow their anonymous data to be used in this study. Permission was obtained from the superintendent of each school system for OnHand Schools to provide the researcher with an anonymous extraction of the requested data. Specific data to be provided to the researcher included birthdate (MM,DD,YY), sex (M/F), socioeconomic status (free/reduced lunch Y/N), 2014 PSSA reading score (numerical score), 2014 PSSA math score (numerical score), and special education status (IEP, yes or no) from 2013-2014

third grade students. Additionally, retention status (has the student been retained, yes or no) was requested as part of the data extraction. However, OnHand Schools did not have data regarding whether a student had been retained at any grade between kindergarten and third grade so this variable was not included in this study. Data from the 2013-2014 school year was utilized because this was the most recent year of available PSSA results at the time of data collection for the current study. Anonymity of each district was ensured and due to the use of archival data for analysis, there was minimal to no risk to the students.

Instrumentation

In this study, kindergarten entry age was investigated to determine the impact on reading and math Pennsylvania System of School Assessments (PSSA) scores, possibility of retention, and special education status of third grade students. The PSSA is a standards-based, criterion-referenced assessment used to measure a student's attainment of academic standards, while also determining the effectiveness of school programs to teach children this information they are expected to know. Every student in grades 3 through 8 and grade 11 is assessed in reading and math to determine proficiency. Students' scores on the PSSA are classified as Advanced, Proficient, Basic, and Below Basic in terms of levels of performance and proficiency (Department of Education, 2014). The cut off scores for the aforementioned levels are detailed below in Table 5.

Table 5

Level Cutoff Scores for Performance Levels on the PSSA Reading and Math Assessments

Grade	Below Basic	Basic	Proficient	Advanced
		READING		
3	1000-1167	1168-1234	1235-1441	1442 and up
4	700-1111	1112-1254	1255-1468	1469 and up
5	700-1136	1137-1274	1274-1496	1497 and up
6	700-1120	1121-1277	1278-1455	1456 and up
7	700-1130	1131-1278	1279-1469	1470 and up
8	700-1145	1146-1279	1280-1472	1473 and up
11	700-1111	1112-1256	1257-1491	1492 and up
		MATH		
3	750-1043	1044-1179	1180-1369	1370 and up
4	700-1155	1156-1245	1246-1444	1445 and up
5	700-1157	1158-1311	1312-1482	1483 and up
6	700-1173	1174-1297	1298-1475	1476 and up
7	700-1182	1183-1297	1298-1471	1472 and up
8	700-1170	1171-1283	1284-1445	1446 and up
11	700-1166	1167-1303	1304-1508	1509 and up

Source: Table is adapted from the Department of Education website.

Statistical Analysis

The anonymous and de-identified data provided to the researcher were compiled, categorized, and analyzed. Data were entered into SPSS statistical software and statistical procedures were performed. A multifactorial three-way Analysis of Variance (ANOVA) was used to examine the impact of kindergarten entry age, sex, and socioeconomic status on educational performance, both in reading and mathematics. The assumptions that needed to be met in order to use the three-way ANOVA are the homogeneity of variance, normal distribution of subjects, and independent values. Logistic regression was used to examine whether kindergarten entry age, sex, and socioeconomic status predicted that a student would be identified as requiring special education services. Logistic regression was also used to examine whether kindergarten entry age, sex, and socioeconomic status predicted that a student would be retained at

least once between grades kindergarten and third. The assumptions that needed to be met in order to perform a logistical regression analysis are that there are no significant outliers and that the data must not show multicolinearity. All tests of statistical significance used an alpha level of .05.

Research Questions

The following research questions and related hypotheses guided this study: Please see Table 6 Research Questions:

1. Does kindergarten entry age, sex, or socioeconomic status impact student reading achievement? It was hypothesized that younger students entering kindergarten between 60 and 63 months will perform lower as compared to their peers entering at 64 months or older on the 2014 reading portion of the Pennsylvania System of School Assessments (PSSAs). It was also hypothesized that male students performed lower than female students and that economically disadvantaged students performed lower than those who were not economically disadvantaged (Fantuzzo, Rouse, McDermott, Sekino, Childs, & Weiss, 2005).
2. Does kindergarten entry age, sex, or socioeconomic status impact student math achievement? It was hypothesized that younger students entering kindergarten between 60 and 63 months will perform lower as compared to their peers entering at 64 months or older on the 2014 math portion of the Pennsylvania System of School Assessments (PSSAs). It was also hypothesized that male students performed lower than female students and that economically disadvantaged students performed lower than those who

were not economically disadvantaged (Fantuzzo, Rouse, McDermott, Sekino, Childs, & Weiss, 2005).

3. Does kindergarten entry age, sex, or socioeconomic status predict that that a student will receive special education services? It was hypothesized that younger students entering kindergarten between 60 and 63 months will be more likely to be identified as requiring special education services than their peers entering at 64 months or older. It was also hypothesized that male students required special education services more frequently than female students and that economically disadvantaged students required special education services more frequently than those who were not economically disadvantaged (Weiss, 2008).
4. Does kindergarten entry age, sex, or socioeconomic status predict that that a student will be retained? It was hypothesized that younger students entering kindergarten between 60 and 63 months will be more likely to be retained than their peers entering at 64 months or older. It was also hypothesized that male students would be retained more frequently than female students and that economically disadvantaged students would be retained more frequently than those who were not economically disadvantaged (Weiss, 2008).

Table 6

Research Questions

Independent Variables	Dependent Variable	Statistical Analysis	Assumptions
Research Question #1			
Birthdate at kindergarten entrance (DD/MM/YY) Sex (M/F) Socioeconomic status (Free or reduced lunch Y/N)	PSSA Reading Score (numerical)	Three-way Analysis of Variance (ANOVA)	homogeneity of variance, normal distribution of subjects, and independent values
Research Question #2			
Birthdate at kindergarten entrance (DD/MM/YY) Sex (M/F) Socioeconomic status (Free or reduced lunch Y/N)	PSSA Math Score (numerical)	Three-way Analysis of Variance (ANOVA)	homogeneity of variance, normal distribution of subjects, and independent values
Research Question #3			
Birthdate at kindergarten entrance (DD/MM/YY) Sex (M/F) Socioeconomic status (Free or reduced lunch Y/N)	Special education status – coded as 1) student has an IEP and 2) student does not have an IEP	Logistic Regression	No significant outliers, no multicollinearity
Research Question #4			
Birthdate at kindergarten entrance (DD/MM/YY) Sex (M/F) Socioeconomic status (Free or reduced lunch Y/N)	Retention status – coded as 1) student has been retained at least once in grades k-3 and 2) student has not been retained.	Logistic Regression	No significant outliers, no multicollinearity

Summary

This study contributes to the research base of the optimal age for a child to begin kindergarten. More specifically, this study investigated how kindergarten entry age affects academic achievement in third grade. Data to be utilized was provided for 2013-2014 third grade students from a sample of approximately 1100 students. Specific data that was used included birthdate, PSSA reading score, PSSA math score, special education status, and retention status for each subject in the sample. It was hypothesized that children with an early birthday, who are between 60 and 63 months of age, will perform lower on the PSSA reading and PSSA math, will be more likely to require special education services, and will be more likely to be retained than their on-time peers who are 64 to 72 months of age. Additionally, gender and socioeconomic status were investigated to determine if a relationship existed in predicting PSSA Reading scores, PSSA Math scores, special education status and/or retention status. It was hypothesized that male students would require special education services and be retained more frequently then their female counterparts. It was additionally hypothesized that economically disadvantaged students would require special education services and be retained more frequently than their not economically disadvantaged counterparts. Data were analyzed using a three-way analysis of variance (ANOVA) and Logistic Regression.

CHAPTER IV

RESULTS

Overview

The current study sought to determine the relationship between kindergarten entry age and latter academic achievement as measured by the Pennsylvania System of School Assessments (PSSA) administered in third grade. Other factors that were explored included that of gender, socioeconomic status, special education status, and retention status to determine if any relationships exist amongst these variables as well. Permission was obtained from five school districts in western Pennsylvania to examine their school district data housed within the OnHand Schools Data Management System. Permission was also obtained from the Institutional Review Board at Indiana University of Pennsylvania to conduct the study. Data were analyzed using SPSS statistical software at a .05 level of significance.

Independent Variables

Independent variables present in the study included kindergarten entry age, socioeconomic status, and sex. Kindergarten entry age was separated into three categories: young-age at entry, middle-age at entry, and older-age at entry. Young-age at entry included students whose birthdate fell between August 2005 and May 2005, or who were between 5 years 0 months (60 months) and 5 years 3 months (63 months) of age at entry. Middle-age at entry included students whose birthdate fell between April 2005 and Jan 2005, or who were between 5 years 4 months (64 months) and 5 years 7 months (67 months) of age at entry. Older-age at entry included students whose birthdate fell between December 2004 and September 2004, or who were between 5 years 8 months

(68 months) and 6 years 0 months (72 months) of age at entry. Socioeconomic status was separated into two groups and defined as economically disadvantaged (those students receiving free or reduced lunch) or not economically disadvantaged (those students receiving neither free nor reduced lunch). Sex was separated into two categories, male or female. The data were provided to the examiner by OnHand Schools in a de-identified, anonymous excel file and included the independent variables of student birthdate, socioeconomic status, and sex.

Dependent Variables

Dependent variables present in the study included PSSA reading score, PSSA math score, special education status, and retention status. The PSSA reading score was from the 3rd grade class during the 2013-2014 administration and was reported as the raw-numerical scores. The PSSA math score was from the 3rd grade class during the 2013-2014 administration and was reported in numerical scores. Special education status was reported as whether a student has an Individualized Education Program and receives special education services. The data were provided to the examiner by OnHand Schools in a de-identified, anonymous excel file and included the dependent variables of PSSA reading score, PSSA math score, and special education status for each student. During the data collection, it was revealed that retention status of each student could not be obtained and provided by OnHand Schools. Due to this, the dependent variable of retention status was omitted from this study.

Population

The population of interest in this study includes mid-sized suburban school districts in Western Pennsylvania. Particularly this study included a sampling from five

mid-sized suburban school districts located in Allegheny County in Western Pennsylvania. The five districts together serviced 16,224 students. The student population within the five districts was 64% white, 31% black, 2.6% multi-racial, 1.5% Asian, 1% Hispanic, and less than 1% American Indian. On average between the five districts, approximately 47% received free and reduced lunches.

Sample

Participants in this study included all third graders who took the most recent PSSAs (2013-2014) within the five districts. This resulted in a sample size of 1039 students from the five school districts and the aforementioned population. The results of the data analysis were generalized to the population.

Descriptive Statistics

The sample size of 1039 subjects included all students who entered kindergarten between the ages of 5 years, 0 months and 6 years, 0 months. Students younger than 5 years, 0 months and older than 6 years, 0 months at entry were not utilized in the study because information regarding the circumstances why they were below or over the age limit was not available to the researcher. The data contained missing socioeconomic status for 417 students, resulting in a sample size of 622 for that variable. Sex, birth date, and special education status information were available for all 1039 participants. PSSA Math scores were available for 883 participants and PSSA reading scores were available for 882 participants. Out of the 1039 total participants, 556 students were female and 483 were male. For socioeconomic statuses, 253 students were economically disadvantaged, 369 were not economically disadvantaged, and 417 participants had missing data for this variable. Birthdate was reported for all 1039 participants. Of these, 291 students were

younger-age at entry, 343 were middle-age at entry, and 405 were older-age at entry. A total of 162 students received special education services through an IEP and 877 students did not receive special education services. The following table depicts the number of males and females, socioeconomic status, chronological age at entry, age categories for birth dates, and the number of students receiving special education services (Table 7).

Table 7

Summary of Demographic Characteristics

Variable	Frequency	Percent
Sex (n=1039)		
Female	556	53.5
Male	483	46.5
Economically Disadvantaged (n=622; missing=417)		
Yes	253	24.4
No	369	35.5
Age Categories (n=1039)		
Young at entry (60-63 months)	291	28.0
Mid at entry (64-67 months)	343	33.0
Older at entry (68-72 months)	405	39.0
IEP (n=1039)		
Yes	162	15.6
No	877	84.4

Student birth dates were separated into the aforementioned three age categories (younger-age at entry, middle-age at entry, and older-age at entry). The younger-age category consisted of students between 60 and 63 months of age at entry, the middle-age category consisted of students between 64 and 67 months of age at entry, and the older-age category consisted of students between 68 and 72 months of age at entry. The specific number of participants falling within each age month revealed that the highest frequency of students were 70 months of age at entry and the lowest frequency were 72 months of age, with 60 months of age being the next to lowest. The following Table 8

depicts the frequencies of chronological ages in months and the age categories they were assigned to.

Table 8

Chronological Age at Kindergarten Entry

	Frequency	Percent	Age Category from Table 7
60 Months	57	5.5	Young
61 Months	70	6.7	Young
62 Months	83	8.0	Young
63 Months	81	7.8	Young
64 Months	89	8.6	Middle
65 Months	93	9.0	Middle
66 Months	73	7.0	Middle
67 Months	88	8.5	Middle
68 Months	83	8.0	Older
69 Months	94	9.0	Older
70 Months	95	9.1	Older
71 Months	85	8.2	Older
72 Months	48	4.6	Older

Findings

The results obtained from the data analysis completed as a part of this study are provided in the order of the research questions that were proposed.

Research Question 1. The first research question sought to determine if kindergarten entry age, sex, and/or socioeconomic status impact student reading achievement. It was hypothesized that younger students entering kindergarten between 60 and 63 months would perform lower as compared to their peers entering at 64 months or older on the 2014 reading portions of the Pennsylvania System of School Assessments. It was also hypothesized that male students performed lower than female students and that economically disadvantaged students performed lower than those who were not economically disadvantaged. A three-way analysis of variance was used to analyze the relationship between the independent variables of birth date, sex, and socioeconomic

status, and the dependent variable of PSSA reading score. The assumptions that needed to be met in order to use the three-way ANOVA are the homogeneity of variance, normal distribution of subjects, and independent values. There was homogeneity of variances, as assessed by Levene's test for equality of variances, p = .163. A histogram of the standardized residuals for PSSA reading scores is shown in Figure 1. Inspection of the histogram indicates that the data are normally distributed. There were no outliers in the data, as assessed by inspection of a boxplot.

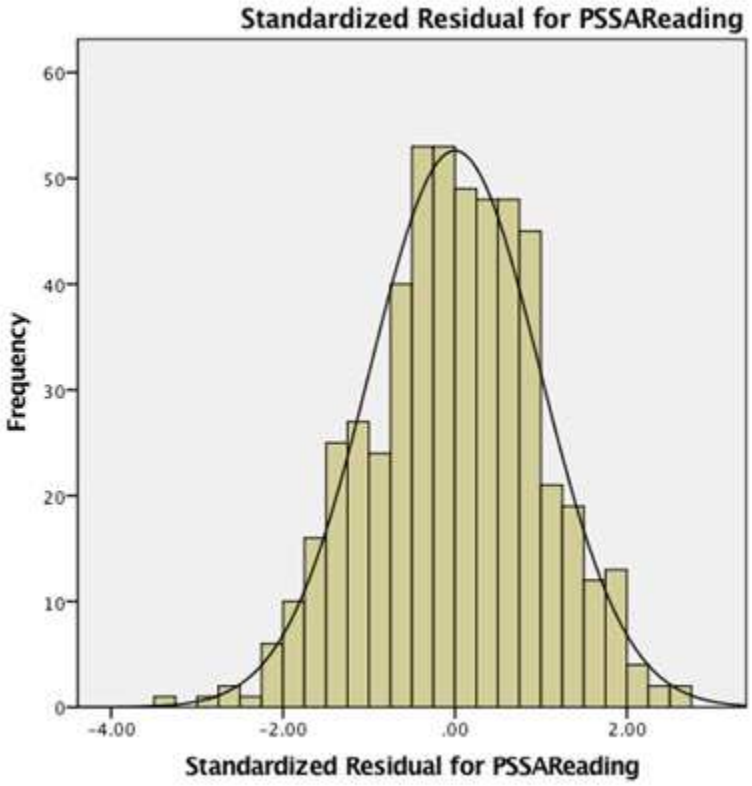

Figure 1. Histogram of standardized residuals for PSSA reading scores

Table 9 shows the number of students, the mean PSSA reading score, and standard deviations of PSSA reading scores for each level of the three main factors of age group, sex, and socioeconomic status.

Table 9

Number of Students, Mean PSSA Reading Score, and Standard Deviation

	N	Mean	Standard Deviation
PSSA Reading (n=882, missing=157)			
Age Group (n=1039)			
Young K	152	1348	149
Middle K	164	1355	150
Older K	206	1387	160
Sex (n=1039)			
Female	260	1389	150
Male	262	1342	155
Socioeconomic Status (n=622, missing=417)			
Econ Disadvantaged	210	1295	144
Not Econ Disadvantaged	312	1413	143

A 3 (age category) x 2 (sex of participant) x 2 (socioeconomic) analysis of variance (ANOVA) was calculated on participants' PSSA reading scores. A summary of this statistical analysis is presented in Table 10. The three-way interaction of AgeCategory*Sex*SES was not statistically significant ($F(2,510) = .231$, $p=.794$). This indicates that the effect of age group on the PSSA reading scores does not differ significantly across the four sex/SES groups.

None of the two-way interactions examined were significant. However, all of the three main effects are significant at the 5% level of significance. These results indicate that when all other variables are controlled for, the main effects of sex, SES, and age each contribute a significant percentage of the variability of the dependent variable PSSA

reading. In regards to the dependent variable of sex, female students scored an average of 47 points higher than male students on the PSSA reading test. Students who were not economically disadvantaged scored on average 118 points higher than those who came from economically disadvantaged backgrounds. A post-hoc test analysis revealed that between the three age groups, the only significant difference was between the younger students and the older students. Younger students scored an average of 7 points lower on the PSSA reading test than their middle age counterparts, but this difference was not statistically significant. Similarly, the younger students scored an average of 39 points lower on the PSSA reading test than their older counterparts.

Table 10

3-Way Analysis of Variance: Relationships Between Kindergarten Entry Age, Socioeconomic Status, Sex, and PSSA Reading Scores

Source	df	F	p-value
Main Effects			
Sex	1	14.729	.000
Socioeconomic Status (SES)	1	83.233	.000
Age Category (AGE)	2	3.340	.036
Interaction Effects			
Sex*SES	1	1.946	.164
Sex*AGE	2	.608	.545
SES*AGE	2	.441	.643
Sex*SES*AGE	2	.231	.794

Note. F(11,510)= 10.238, p<.001, R Squared = .181 (Adjusted R Squared = .163).

Research Question 2. The second research question sought to determine if kindergarten entry age, sex, and/or socioeconomic status impact student math achievement. It was hypothesized that younger students entering kindergarten between 60 and 63 months would perform lower as compared to their peers entering at 64 months or older on the 2014 math portions of the Pennsylvania System of School Assessments.

It was also hypothesized that male students performed lower than female students and that economically disadvantaged students performed lower than those who were not economically disadvantaged. A three-way analysis of variance was used to analyze the relationship between the independent variables of birth date, sex, and socioeconomic status, and the dependent variable of PSSA math score. There was homogeneity of variances, as assessed by Levene's test for equality of variances, p = .128. A histogram of the standardized residuals for PSSA math scores is shown in Figure 2. Inspection of the histogram indicates that the data are normally distributed. There were no outliers in the data, as assessed by inspection of a boxplot.

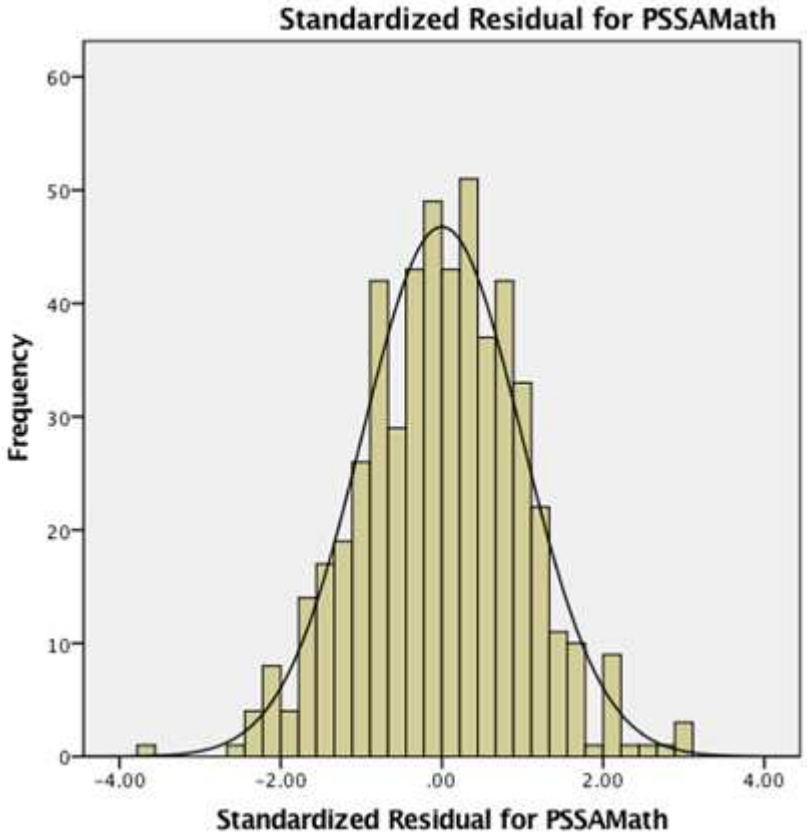

Figure 2. Histogram of standardized residuals for PSSA math scores

The number of students, the mean PSSA math score, and standard deviations of PSSA math scores for each level of the three main factors of age group, sex, and socioeconomic status are outlined below in Table 11.

Table 11

Number of Students, Mean PSSA Math Score, and Standard Deviation

	N	Mean	Standard Deviation
PSSA Math (n=883, missing=156)			
Age Group (n=1039)			
Young-age K	152	1329	178
Middle-age K	164	1334	162
Older-age K	206	1365	182
Sex (n=1039)			
Female	260	1346	173
Male	262	1342	177
Socioeconomic Status (n=622, missing=417)			
Econ Disadvantaged	210	1267	164
Not Econ Disadvantaged	312	1397	163

A 3 (age category) x 2 (sex of participant) x 2 (socioeconomic) analysis of variance (ANOVA) was calculated on participants' PSSA math scores. A summary of this statistical analysis is presented in Table 12. The three-way interaction of AgeCategory*Sex*SES was not statistically significant ($F(2,510) = .793$, $p=.453$). This indicates that the effect of age group on the PSSA math scores does not differ significantly across the four sex/SES groups. None of the two-way interactions examined were significant. However, the main effect of socioeconomic status is significant at the $p=.05$ level. Specifically, economically disadvantaged students scored 130 points lower, on average, than their not economically disadvantaged peers on the PSSA math test. These results indicate that when all other variables are controlled for, the main effect of

SES contributes a significant percentage of the variability of the dependent variable PSSA math. In regards to age, younger-age at entry students scored 36 points lower, on average than their older-age at entry peers.

Table 12

3-Way Analysis of Variance: Relationships Between Kindergarten Entry Age, Socioeconomic Status, Sex, and PSSA Math Scores

Source	df	F	p-value
Main Effects			
Sex	1	.052	.820
Socioeconomic Status (SES)	1	78.424	.000
Age Category (AGE)	2	2.158	.117
Interaction Effects			
Sex*SES	1	1.161	.282
Sex*AGE	2	.731	.484
SES*AGE	2	.150	.861
Sex*SES*AGE	2	.793	.453

Note. $F(11,510)= 7.98$, $p<.001$, R Squared = .147 (Adjusted R Squared = .128).

Research Question 3. The third research question sought to determine if kindergarten entry age, sex, and/or socioeconomic status predict whether a child will require special education services through an Individualized Education Program. The number of students eligible for special education services through an IEP from the three main effects of sex, age category, and socioeconomic status are outlined below in Table 13.

Table 13

Number of Students and Percentage of Students with an IEP

	Socioeconomic Status			
	Not Disadvantaged		Disadvantaged	
Sex and Age Group	N	% Requiring Service	N	% Requiring Service
Females				
Young K	64	12.5	40	22.5
Middle K	64	6.3	38	10.5
Old K	67	9.0	52	17.3
All age groups	195	9.2	130	16.9
Males				
Young K	52	5.8	29	31.0
Middle K	44	20.5	49	32.7
Old K	78	20.5	45	24.4
All age groups	174	16.1	123	29.3
Both Genders				
Young K	116	9.5	69	26.1
Middle K	108	12.0	87	23.0
Old K	145	15.2	97	20.6
All age groups	369	12.5	253	22.9

It was hypothesized that younger students entering kindergarten between 60 and 63 months would be more likely identified as requiring special education services as compared to their peers entering at 64 months or older. It was also hypothesized that male students required special education services more frequently than female students and that economically disadvantaged students required special education services more frequently than those who were not economically disadvantaged. Binary logistic regression was performed to determine the likelihood of accurately classifying participants as eligible for special education services using the variables of sex, socioeconomic status, and kindergarten entry age. The assumptions of a logistical

regression were tested. There were no standardized residuals with values over 2.5 standard deviations that would need omitted from the analysis.

Although age group, sex, and socioeconomic status significantly improve our ability to predict the likelihood of receiving special education services, Nagelerke's R-squared (.056) for the model indicates that these variables still do not do a great job at predicting which students will receiving special education services. Table 14 indicates that the current model predicts that all of these students do not require special education services through an IEP, even though 16.7% of these students do receive special education services through an IEP. The model correctly classified the other 83.3% of these students. As evidenced in Table 13, the percentages of students receiving services through an IEP in each of the twelve sex/age/socioeconomic classifications ranges from 5.8% to 32.7%.

Table 14

Logistical Regression Classification Table

Observed		Predicted		
		IEP		Percentage Correct
		Yes	No	
IEP	Yes	0	104	0
	No	0	518	100.0
Overall Percentage				83.3

Regression coefficients, standard errors, and significance levels for predictor items (sex, SES, age category) included in the model are shown in Table 15. Results indicate that the variables of socioeconomic status (p=.001) and sex (p=.003) affected the likelihood that a student would require special education services by third grade. Kindergarten entry age did not affect the likelihood that a student would require special education services by third grade (p=.962). The odds ratios generated by this model

indicate that being female decreases the odds of requiring special education services through an IEP by 49%[1]. The 95% confidence interval suggests that being female decreases the odds of requiring special education services through an IEP by between 21%[2] and 67%[3]. Additionally, the results indicate being an economically disadvantaged student almost doubles the odds of requiring special education services through an IEP, with the confidence interval indicating that the odds might increase from between 36%[4] and 223%[5].

Table 15

Logistic Regression Predicting the Need for Special Education Services

	B	SE	Wald	df	p-value	OR (95% CI)
Age (ref=older group)			.077	2	.962	
Young group	.003	.284	.000	1	.991	1.00 (0.58, 1.75)
Middle group	-.060	.269	.051	1	.822	.94 (0.56, 1.59)
Sex (ref=male)						
Female	-.672	.222	9.115	1	.003	.51 (0.33, 0.79)
Economically Disadvantaged (ref=no)						
Yes	.740	.220	11.347	1	.001	2.10 (1.36, 3.23)

Note. B=estimated unstandardized regression coefficient. OR=Odds Ratio. CI=Confidence Interval.

Summary

The data collected and analyzed in the current study sought to determine the relationship, if any, between kindergarten entry age and academic achievement. Results indicated no statistically significant relationship between the interaction terms of kindergarten entry age, socioeconomic status, gender and PSSA reading scores in third

[1] (.51-1) 100% = -49%
[2] (.33-1) 100% = -67%
[3] (.79-1) 100% = -21%
[4] (1.36-1) 100% = 36%
[5] (3.23-1) 100% = 223%

grade. However, a statistically significant relationship did exist between age category and PSSA Reading scores. A post-hoc analysis revealed that the older K group scored higher than the young K group at a statistically significant level. Results also indicated that a statistically significant relationship between the interaction terms of kindergarten entry age, socioeconomic status, gender and PSSA math scores in third grade was not found. However, the main effect of socioeconomic status was found to be predictive of PSSA math scores, while neither age category or sex significantly affected PSSA Math scores. Additionally, the data did not support a significant relationship between kindergarten entry age and special education status. However, sex and socioeconomic status both had a significant predictive relationship to the likelihood of students requiring special education services in the third grade, with a higher likelihood of requiring special education services for males and for students in the lower socioeconomic group. Chapter 5 provides a discussion and conclusion related to the data obtained in the current chapter. Additionally, suggestions for future research will be provided.

CHAPTER V

DISCUSSION

The purpose of this study was to determine if sex, socioeconomic status, and/or kindergarten entry age have an affect on reading achievement, math achievement, and whether or not a child would require special education services in third grade. This study sought to provide more information to parents, teachers, and administrators for determining an appropriate age for kindergarten entry. Many school districts follow state guidelines regarding kindergarten entry age cutoff dates, which usually fall around September 1st. However, often times, when children do meet the age requirements, some parents struggle with the decision to delay their child from starting school until he or she is more mature/older. The following chapter discusses the current study and findings. Additionally, conclusions, limitations, and recommendations for further research are discussed.

Overview

This study utilized a sample drawn from 1039 students from five suburban school districts in Allegheny County in western Pennsylvania. Permission to extract district data was obtained from superintendents from each of the five school districts. University IRB approval was obtained. The sample included 556 females and 483 males who were in the third grade for the 2013-2014 school year and took the 2014 Pennsylvania System of School Assessments (PSSA).

In Pennsylvania, the most common cutoff date for kindergarten entry is that children must be 5 by September 1st. The participants in this study were divided into three separate groups. Children who entered kindergarten between 60 and 63 months of age were categorized into the young at entry group (n=291). The middle age at entry

group contained children who were 64 and 67 months of age (n=343). Lastly, the older age at entry group contained children who were 68 to 72 months of age (n=622). The mean age at entry was 66 months of age.

The additional variable of socioeconomic status was also investigated. This variable was defined as whether the student received a free or reduced lunch. Out of the total sample of 1039 participants, 253 were categorized as economically disadvantaged, 369 were not economically disadvantaged, and 417 contained missing information regarding socioeconomic status. Special education status of students was also investigated. This was determined by whether a child had an IEP by third grade. Out of the 1039 participants, 162 students were receiving special education services and 877 were not.

Pennsylvania System of School Assessment scores were recorded for both the reading and math portions of the 2014 administration. On the reading portion, the mean score was 1362 with a minimum score of 1000 and a maximum score of 1932. On the math portion, the mean score was 1335 with a minimum score of 829 and a maximum score of 1914. Eight hundred and eighty three students took the math PSSA and 882 students took the reading PSSA.

A three-way analysis of variance was used to determine the relationships between the three groups of sex, SES, and kindergarten entry age and how each related to PSSA reading scores in third grade. A three-way analysis of variance was also used to determine the relationship between the three groups of sex, SES, and kindergarten entry age and how each related to PSSA math scores in third grade. Lastly, a logistic regression was used to determine the relationship between sex, SES, and kindergarten

entry age and how each predicted the likelihood that a child would require special education services by third grade. This study tested three hypotheses at the .05 level of significance and all data were analyzed using SPSS statistical software.

Once the hypotheses were tested, it was revealed that there was not a significant interaction among kindergarten entry age, sex, socioeconomic status and PSSA reading scores in third grade. However, the main effect of age was statically significant in relation to PSSA reading scores. A post-hoc analysis revealed that the Older K group scored higher than the Young K group at a statistically significant level. Additionally, there was not a significant interaction among kindergarten entry age, sex, socioeconomic status and PSSA math scores in third grade. However, the main effect of socioeconomic status was significant, indicating that economically disadvantaged students scored lower on the PSSA math.

The current study's findings regarding academic achievement are supported by West, Denton, and Reaney (2000), who found that children with summer birthdays perform the poorest on reading and math measures during the spring of their kindergarten year. In comparison to the current study, which found that younger students performed poorer only on reading assessments but not math assessments, West, Denton, and Reaney found that younger students performed poorer in both areas. Additionally, West, Denton, and Reaney utilized a large nationally represented sample of approximately 22,000 children from a range of racial/ethnic backgrounds and socioeconomic statuses. These children attended both public and private kindergartens during both full day and half-day programs. The sample also included both language minority students and special education students. The Early Childhood Longitudinal Study Assessment (ECLS-K)

battery was used to assess student achievement in reading and math during both the fall and the spring of the 1998-1999 school year.

In comparison to the current study, West, Denton, and Reaney's study utilized a much larger sample size of 22,000 students, while the current study contained a sample size of 1039 students. The demographic characteristics were similar with the exception that the current study did not utilize any language minority students. Additionally, West Denton and Reaney utilized the ECLS-K battery that was designed specifically for their study to measure exact reading and mathematics skills required by kindergarteners. The current study utilized the PSSA, which was designed to measure student achievement across a variety of skills based on national requirements of skills that students should possess at certain grades levels in their academic careers. Contrastingly with the ECLS-K, the PSSA does not assess students in kindergarten, but rather begins assessing students in the third grade. Both assessments do provide an overall reading achievement score, but the reading skills assessed in kindergarten are much different than those assessed in third grade. This could provide areas for future research in terms of how the particular sample of students in West Denton, and Reaney's study performed on reading and math assessments administered in the third grade to further relate it to the current study.

Conflictingly, Kilpatrick (2002) found that there is a low correlation between kindergarten entry age and academic achievement at the middle school level. Kilpatrick utilized a sample size of 389 students in one suburban middle school. The author examined the students' Terra Nova reading and math test scores to determine if any relationships existed between age at kindergarten entry and academic achievement in middle school. Through data analysis using an unpaired t-test, results indicated that no

statistically significant differences were present. In comparison to Kilpatrick's study that found no significant relationship between age and reading or math achievement, the current study did find a statistically significant relationship between kindergarten entry age and reading achievement. Unlike Kilpatrick's study utilizing a sample size of 389 students from a single school, the current study gathered data from a larger sample size of 1039 participants across five different school districts.

Lastly, logistic regression indicated that kindergarten entry age did not predict whether a child would require special education services by third grade. However, the analysis revealed that sex and socioeconomic status did predict whether a child would require special education services by third grade (Weiss, 2008). Male students coming from economically disadvantaged backgrounds demonstrated a higher likelihood of requiring special education services by third grade.

Weiss (2008) found that students who were significantly older on the first day of kindergarten had a higher chance of being identified as requiring special education services by grade 3 than their younger counterparts. Weiss utilized the same data set as West, Denton, and Reaney (2000). The ECLS-K data were specifically examined to determine if age, socioeconomic status and reading scores on the ECLS-K assessment battery were predictive of the need for special education services. While Weiss found a significant relationship between kindergarten entry age and the need for special education services, the current study did not find a significant relationship between kindergarten entry age and a later need for special education services.

Conclusions

The purpose of this study was to determine if a significant relationship existed between academic achievement scores on the PSSA reading and math tests and the possible need for special education services based on kindergarten entry age, sex, and socioeconomic status.

There appear to be many different schools of thought in regards to when a child is ready to enter kindergarten. Parents and teachers sometimes possess conflicting ideas about optimal entry age due to many different considerations. Aside from the chronological age requirement, some other important factors to take into account when determining whether a child is ready to enter kindergarten include social maturity, academic skills, previous preschool experience, family support, and environment.

School districts have also taken an active role to ensure a successful kindergarten transition by fostering community/school relationships, offering in school day care programs, offering early intervention programs, and reaching out to community members regarding readiness programs offered in the district, as well as through kindergarten readiness testing.

However, common practice seems to be centered on chronological age as the most important determining factor regarding whether a child is ready to begin kindergarten. Parents sometimes decide to hold children out of school an extra year if they are close to the cutoff date or seem immature for their age for fear that their child will not be able to keep up, or will lack some of the advantages to which the older children may have access to.

Research conducted as part of this study suggests that age of kindergarten entry has a significant effect on reading academic achievement in third grade but not math. While parents and educators may express concern regarding the long-term effects of being a young kindergartener, this does not appear to have a significant impact on academic performance. In this study, age at kindergarten entry did have a significant impact on PSSA reading but not on PSSA math scores in third grade. Additionally, this study revealed that age at kindergarten entry did not predict the likelihood that a child would require special education services by third grade. However, data analysis did reveal that sex and socioeconomic status predicted a higher likelihood of requiring special education services by third grade. Male students and those who were economically disadvantaged were more likely to require special education services by third grade.

Limitations

While this study involved children between 5 years 0 months and 6 years 0 months, it did not include those children younger than 5 or older than 6. This did not take into account children who entered kindergarten early or those who were possibly redshirted by their parents. Additionally, other extraneous factors that could have the possibility to influence academic achievement were not investigated in this study. Parent education level, preschool experience, or exposures to academic materials prior to starting school were not investigated.

Recommendations for Future Research

Based upon the findings from this study, there are recommendations for future study that may be beneficial additions to the research base regarding kindergarten entry

age. A follow up study would be beneficial to determine if kindergarten entry age, sex, and SES could have an effect on academic achievement and possible need for special education services in later grades, such as middle school and high school. Additionally, the current study was completed in a suburban setting. It is recommended that a similar study be conducted in both rural and urban areas. Possible preschool experience was not considered in the current study. Studying this factor may add additional information about another important factor when determining kindergarten readiness and the appropriate time to start school.

Parent education levels were not taken into consideration in the current study. This may be an important factor to investigate because this may result in a different amount of academic exposure and/or experience that a child is exposed to prior to beginning kindergarten. Additionally, the current study only involved students between the ages of 5 years, 0 months and 6 years, 0 months. Future research could include those children who are younger than 5 years, 0 months and older than 6 years, 0 months at entry age. Reasons why younger children enter and why children are older may be beneficial to know, as well as impacts on their educational performance. Lastly, information regarding retention was not included in the current study. It may be beneficial to include children who have been retained in grades kindergarten through third to see if kindergarten entry age has an effect on retention.

Summary

In conclusion, kindergarten readiness is a complex issue with many factors to consider. The current study reveals that age alone is not sufficient enough to determine whether a child is ready for kindergarten. These decisions must be made based upon

individual child need through parents who were equipped to make an educated decision. Additionally, schools and communities must contribute equally to ensure that children are ready to begin kindergarten. With all factors taken into consideration, and support from all parties involved, children can enter into kindergarten and begin a successful, healthy academic career, no matter their age.

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