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THE SUSTAINED IMPACT OF PREKINDERGARTEN PARTICIPATION
ON THIRD GRADE ACADEMIC PERFORMANCE

by

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A dissertation submitted in partial fulfillment of the requirements
for the degree of Doctor of Education
in the Department of Educational Leadership and Higher Education
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ABSTRACT

In this study, the researcher investigated whether the impact of participating in a prekindergarten program on academic achievement persists through third grade. The study compared three groups of students: students who participated in voluntary prekindergarten, private prekindergarten, and students who did not participate in any prekindergarten program. Using a series of two-factor multivariate analyses of variance (MANOVAs), this investigation found no interaction effects among prekindergarten participation and race, gender, socioeconomic status, presence of a discipline referral, or chronic absenteeism on academic achievement in the third grade. However, there was a main effect for the type of prekindergarten program on academic achievement. Both participants of voluntary prekindergarten and private prekindergarten programs outperformed their peers on both third grade mathematics and third grade reading assessments. Thereby, indicating that prekindergarten participation had sustained effects on academic achievement through third grade regardless of student characteristics. Recommendations for future research include evaluating data collection practices, replicating the study annually to continue to evaluate the prekindergarten programs, and following the same cohort to determine the continued impact prekindergarten participation has on students.

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LIST OF ABBREVIATIONS AND ACRONYMS

ANOVA	Analysis of Variance
CPC	Chicago Child-Parent Center Program
ECLS	Early Childhood Longitudinal Study
FDOE	Florida Department of Education
FRL	Free and Reduced Lunch
FSA	Florida Standards Assessment
HSIS	Head Start Impact Study
MAF	More at Four Program
MANOVA	Multivariate Analysis of Variance
MSRP	Michigan School Readiness Program
NIEER	National Institute for Early Education Research
SEIE	Sustained and Emerging Impacts Evaluation
SPSS	Statistics Package for Social Sciences
TN-VPK	Tennessee Voluntary Prekindergarten
VPI	Virginia's Preschool Initiative
VPK	Voluntary Prekindergarten

CHAPTER 1 INTRODUCTION

Introduction

Early childhood education is a critical and growing field of research and practice in the educational landscape. In the 1950s and 1960s, new research emerged contending that underprivileged students were suffering from lower cognitive development and that enrolling low socioeconomic students in enrichment programs would counter that phenomenon (Phillips & Lowenstein, 2011). This research led to the creation of the Head Start program in 1965, which was specifically designed to target low-income students and still serves nearly one million low socioeconomic students and pregnant women a year (Head Start Program Facts, 2016). Early childhood programs intended to narrow the gap and help underprivileged students catch up to their peers.

Since the creation of the Head Start program, early childhood education has increased and expanded to include more students; all but six states have state-funded preschool programs in addition to Head Start and 10 states enroll more than half of four-year-olds (National Institute for Early Education Research [NIEER], 2018). In the last 15 years, states have enrolled nearly 800,000 additional students and last year spent \$8.65 billion dollars to fund early childhood education programs (NIEER, 2018). Florida has committed to early childhood education on an even greater scale. In 2002, Florida amended their constitution requiring access to prekindergarten for all four-year-olds through their Voluntary Prekindergarten (VPK) Education program. Florida has gone from enrolling 0% of four-year-olds in VPK to enrolling 77% of all four-year-olds in

VPK (NIEER, 2018). With this growing scope and commitment, understanding the impact of early childhood education is critical.

There is an abundance of research showing that participating in prekindergarten increases kindergarten readiness but the research showing sustaining effects is less conclusive. Some studies show effects of prekindergarten do linger, (Almarode, Bradburn, Downer, Ruzek, & Jonas, 2015; Andrews, Jargowsky, & Kuhne, 2012; Barnett et al., 2013; Cascio & Schanzenbach, 2013; Dodge, Bai, Ladd, & Muschkin, 2016; Gormley & Gayer, 2005; Haslip, 2018; Hill, Gormley, & Adelstein, 2015; Huang, Invernizzi, & Drake, 2012; Peisner-Feinberg & Schaaf, 2010; Phillips, Gormley, & Anderson, 2016; Smith, 2016), but others report that the gains students make on kindergarten readiness scores begin diminishing by the end of first grade (Lipsey, Farran, & Hofer, 2015; Magnuson, Ruhm, & Waldfogel, 2007; Puma et al., 2012). Given the substantial investment of resources into prekindergarten, research needs to clarify whether programs prepare students for kindergarten but also how participating in prekindergarten programs prepare students for their schooling career.

Problem Statement

Prekindergarten programs are an investment in children. They are intended to allow all students access to equitable educational opportunities. Researchers must conduct studies to better understand whether that investment is yielding sustainable academic and social results past kindergarten entry. Because the research on sustained

impact in education from prekindergarten is still inconclusive, this research will add to the knowledge base.

Purpose Statement

In this study, the researcher investigated the long-term effects of an early childhood education program on academic outcomes. Specifically, the study examined whether the benefits to academic achievement derived from attending a prekindergarten program persisted through third grade. To account for the possibility that the long-term impacts of voluntary prekindergarten on academic achievement could be influenced by student characteristics, the research design included race, gender, socioeconomic status, discipline referrals, and chronic absenteeism as moderator variables. Results were interpreted to reach conclusions about the *sustained impact* (SEIE, 2018) of prekindergarten on academic achievement among participating students.

Research Questions

1. Are the effects of prekindergarten programs on academic achievement moderated by demographic characteristics?
 - a. In what way, if any, does a student's race moderate the impact that prekindergarten has on reading and math achievement?
 - b. In what way, if any, does a student's gender moderate the impact that prekindergarten has on reading and math achievement?
 - c. In what way, if any, does a student's socioeconomic status moderate the impact that prekindergarten has on reading and math achievement?

- d. In what way, if any, does the presence of discipline referrals moderate the impact that prekindergarten has on reading and math achievement?
 - e. In what way, if any, does a student’s chronic absenteeism moderate the impact that prekindergarten has on reading and math achievement?
2. How do private prekindergarten and voluntary prekindergarten programs influence academic achievement in reading and mathematics among third grade students?

Operational Definitions

Chronic Absenteeism: measured using the school district’s definition of “habitual truancy” of 15 or more absences (Seminole County Public Schools Student Conduct and Discipline Code, 2018).

Discipline Referrals: measured by whether students received a discipline referral in the third grade (Phillips et al., 2016). Referrals are completed at the discretion of the teacher and administration for violations of the Student Conduct and Discipline Code (Seminole County Public Schools Student Conduct and Discipline Code, 2018).

Mathematics achievement: measured by the mathematics mean scale scores on the 2016 administration of the Florida State Assessment (FSA). FSA Mathematics assesses students in Grade 3 on their Operations, Algebraic Thinking, Numbers in Base Ten, Fractions as Numbers, Measurement, Data, and Geometry (FDOE, 2017).

Reading achievement: measured by the reading mean scale scores on the 2016 administration of the Florida State Assessment (FSA). FSA Reading assesses students in

third grade on their ability to read and understand Key Ideas and Details, Craft Structure, Integration of Knowledge and Ideas, and Language and Editing (FDOE, 2017).

Voluntary Prekindergarten (VPK): a voluntary free kindergarten program for four- and five-year-olds who reside in Florida. Students must reside in Florida and be four years old on or before September 1st of the current school year to be eligible for VPK (Early Learning Coalition of Seminole County, 2018).

Conceptual Framework

Though prekindergarten programs have shown clear impact on kindergarten readiness, the research behind their long-term relationship with academic achievement is less conclusive. The conceptual framework of this study centered on the idea of *sustained impact* and was informed conceptually by the evaluation model of Sustained and Emerging Impacts Evaluation (SEIE). SEIE is an evaluation approach that addresses the impact of an intervention after the end of the intervention (SEIE, 2018). Though prekindergarten programs have demonstrated increased gains on kindergarten readiness assessments, these scores may not be predict future academic success. Attentive to the SEIE framework, this study analyzed the relationship between participation in prekindergarten and academic achievement in third grade to investigate the sustained impact of prekindergarten.

Literature Review

Prekindergarten Development

The first preschool programs had different objectives than modern programs. During World War II, the federal government funded childcare to facilitate the ability for mothers to work. Twenty years later, preschool programs began to shift when the federal government created the Head Start program in 1965. The Head Start program was spurred by the “war on poverty” and designed to counter the negative impacts of poverty on childhood development and “possibly even wipe out poverty itself” (Philips & Lowenstein, 2011, p. 490). In the last fifty years, preschool has continued to change dramatically. Now, though many states still address poverty by targeting low-income students, other states have begun to adopt universal prekindergarten programs.

Preschool may have begun with utilitarian aims of allowing women to work during wartime but it has its roots in providing equity to all students. Research and psychology have identified early childhood as a pivotal time in life that can impact the rest of childhood and adulthood. A central goal for preschool and prekindergarten initiatives has been closing the gap between privileged children and children who come from low-income families. Initiatives have altruistic goals of providing children with the tools they need to be successful in life but also aim to improve society by changing the trajectory of impoverished children.

The first federal prekindergarten program in the United States, Head Start, was designed to “break the cycle of poverty, providing preschool children of low-income families with a comprehensive program to meet their emotional, social, health, nutritional

needs” (History of Head Start, 2018, para. 2). In 1995, the program expanded to Early Head Start and has been reauthorized in 1998 and 2007. Many state prekindergarten programs have continued with a similar mission and target at-risk students through various factors and means.

Other states are now shifting towards a universal prekindergarten model. Unfortunately, there is not one clear definition of universal prekindergarten and different states qualify based on different criteria. Thirteen states offer some version of universal prekindergarten but only five states actually enrolled more than 70% of four-year-olds (NIEER, 2018). Universal prekindergarten is based on the belief that earlier intervention will improve academic and societal outcomes for all students. This has led to calls from various organizations and leaders, including President Obama who hoped to have “high quality preschool for all” (Office of the Press Secretary, 2013).

In 2002, Florida passed the Florida Pre-Kindergarten Amendment to their constitution providing voluntary prekindergarten (VPK) to all four-year-olds. Florida was the 4th state to pass a universal prekindergarten policy. Florida has rapidly become the 2nd largest prekindergarten program in the state enrolling nearly 80% of four-year-olds, yet it also ranks 42nd in prekindergarten spending and lacks many criteria of a high quality program (NIEER, 2018). Of the 10 benchmark standards set out by the NIEER (2018), Florida only meets two: maximum class size and developmentally appropriate standards. Florida notably lacks standards for prekindergarten educators, requiring only a high school diploma and a Child Care Professional Credential with some additional training on literacy and performance standards (Early Learning Coalition of Seminole

County, 2018). Florida regulations also do not require monitoring or professional development for instructors. Students in Florida can choose from public, private, or charter VPK providers. In Seminole County, there are currently 168 approved providers and only 37 elementary schools (Early Learning Coalition of Seminole County, 2018). Monitoring and professional development across so many distinct and varied providers would be challenging. Despite the lack of these quality measures, Florida does consistently see significant differences between students who participate in VPK programs and students who do not on their Florida Kindergarten Readiness Scores (FLKRS) (Office of Early Learning, 2018).

Prekindergarten Achievement

Preschool and early childhood education are believed to be pivotal interventions for students that can impact the whole course of their education. There are many challenges to inferring a national impact of preschool because of the variation among states, population differences between groups offered preschool and groups not offered services, and other critical factors such as parent involvement and engagement. Many studies, historical and current, have been conducted to study the impact preschool has on students and many are largely positive. As research shifts to investigate the sustained impact preschool has on students, the results become less conclusive.

Nearly all studies examined in this literature review showed that students who participate in prekindergarten programs achieve higher scores on kindergarten readiness assessments than their counterparts who do not participate in prekindergarten programs

(Gormley & Gayer, 2005; Hanshaw, 2016; Hustedt, Barnett, & Jung, 2010; Hustedt, Barnet, Jung & Friedman, 2010; Huang, 2017; Lipsey, Hofer, Dong, Farran, & Bilbrey, 2013; Lipsey, Farran, & Hofer, 2016; Magnuson et al., 2007). One meta-analysis of preschool programs across 13 states showed significant positive impacts in all states (Gormley, Gayer, Phillips, & Dawson, 2005). Prekindergarten, in most studies, has a positive relationship with school readiness.

In the previous five years, researchers have conducted very few studies in Florida analyzing the impact VPK has on academic achievement. One search yielded only four studies done in Florida in the past five years that analyzed the broad effects of VPK on achievement (Drummond, 2013; Hanshaw, 2016; Winsler et. al, 2012; Wright, 2012). Three of the studies investigated kindergarten readiness and all three revealed significant differences between VPK participants and non VPK participants (Drummond, 2013; Hanshaw, 2016; Winsler et. al, 2012; Wright, 2012). The research conducted on VPK has shown VPK participation has a positive relationship with kindergarten readiness. There has been research conducted nationally on the sustained impact of VPK participation but results are not conclusive. The historical preschool programs such as the High Scope Perry Preschool program, The Carolina Abecedarian Study in 1972, and the Chicago Longitudinal Study in 1985 all show significant academic and social benefits to participation in their programs even into adulthood (Armor & Cato, 2014; Barnett, 2008). Unfortunately, modern preschool programs vary significantly from these programs and often have higher teacher to student ratios, shorter intervention lengths, and less parental support. Some studies reported statistically significant gains through later

grades (Almarode et al., 2015; Andrews et al., 2012; Barnett et al., 2013; Cascio & Schanzenbach, 2013; Dodge et al., 2016; Gormley & Gayer, 2005; Haslip, 2018; Hill et al., 2015; Huang et al., 2012; Peisner-Feinberg & Schaaf, 2010; Phillips et al., 2016; Smith, 2016). While other studies reported gains “fading out” or find that students who did not participate in prekindergarten programs “catch up” (Lipsey et al., 2015; Magnuson et al., 2007; Puma et al., 2012). Some researchers saw this fade out as early as first grade with a loss of 70 to 80 percent of the gains associated with prekindergarten participation (Magnuson et al., 2007). The current study was conducted to add to the knowledge base on the sustained effects of prekindergarten participation.

Methodology

Research Design

This study was a quasi-experiment using secondary data to investigate the possible influence of prekindergarten participation on third grade reading and mathematics achievement. The study design utilized a factorial multivariate analysis of variance (MANOVA) as its primary statistical test. The research design included race, gender, socioeconomic status, discipline referrals, and chronic absenteeism as moderator variables to account for the possibility that the impact of voluntary prekindergarten might be influenced by these student characteristics.

Participants

The participants for this study were the 2017-2018 third grade students in a large suburban school district in central Florida. The participants had the option of participating in prekindergarten in the 2013-2014 school year and were required to enroll in kindergarten in the 2014-2015 school year. Students were excluded if: (a) their prekindergarten participation was not identified as voluntary prekindergarten, private prekindergarten, or no prekindergarten, or (c) they did not receive scores on the third grade FSA Reading and Mathematics assessments.

Data Source

This study utilized data collected and maintained by the study district and was obtained from the study district's Assessment & Accountability department. The research was conducted using extant de-identified data obtained directly from the study district.

Variables

The study investigated differences in third grade academic achievement associated with participation in prekindergarten. The dependent variables were third grade FSA Reading and Mathematics assessment scores. The independent variable was prekindergarten participation (voluntary, private, none); and the moderator variables were race (White, Black or African American, Hispanic, Asian, Multiracial, Hawaiian or Other Pacific Islander, American Indian), gender (male, female), socioeconomic status (students eligible for free and reduced lunch, students ineligible for free and reduced

lunch), discipline referrals (students who received a discipline referral in third grade, students who received no discipline referrals in third grade), and chronic absenteeism (students who were absent 15 school days or more, students who were absent less than 15 school days).

Instrumentation

The third grade Florida State Assessment (FSA) measures reading and mathematics achievement. The FSA Mathematics assessment evaluated students in third grade on their Operations, Algebraic Thinking, Numbers in Base Ten, Fractions as Numbers, Measurement, Data, and Geometry skills and FSA Reading assessment evaluated students in third grade on their ability to read and understand Key Ideas and Details, Craft Structure, Integration of Knowledge and Ideas, and Language and Editing. All test items were field tested and, after operational testing, submitted to multiple statistical tests to establish validity and reliability (FLDOE, 2018).

Data Analysis

This study investigated differences in reading and mathematics achievement using a series of two-factor (condition x moderator) multivariate analyses of variance (MANOVAs) with prekindergarten participation as the independent variable. Five separate analyses were run in which one of five variables (race, gender, socioeconomic status, presence of a discipline referral, and chronic absenteeism) were included as a moderator variable. The results from each MANOVA indicated if any of those five variables moderated the effect that prekindergarten participation had on academic

achievement. If not, a MANOVA was conducted to examine the difference in academic performance among the three categories of prekindergarten participation. Post hoc tests were used to determine:

1. whether there was a difference in mathematics achievement among the three categories of VPK participation, if so, which programs were different; and
2. whether there was a difference in reading achievement among the three categories of VPK participation, if so, which programs were different.
3. the difference among the three categories of VPK participation for either math or reading achievement.

A MANOVA was the most appropriate test for this investigation for several reasons. The multivariate approach allowed the test to interpret data from multiple dependent variables at the same time, thus accounting for correlations among the dependent variables and increasing the statistical power of any statistically significant results. Also, the inclusion of moderator variables allowed the model to (1) account for the potential influence of variables such as race, gender, socioeconomic status, discipline referrals, and chronic absenteeism on the outcomes of interest, and (2) explore the possibility of interaction effects among these variables and the independent variable (i.e., whether the relationship between prekindergarten participation and third grade performance is moderated by any of these variables). In sum, the MANOVA better modelled the complexity of the relationships among variables and increased the precision of the study.

Delimitations

The study was delimited to one study district. Outcome measures are delimited to mathematics and reading achievement on the FSA in the third grade.

Limitations

Because the study was delimited to only one study district, the results were not immediately generalizable to other school districts; results yielded conclusions that were directly relevant for decision makers within the study district however, and some cautious generalizations beyond the district may be warranted. As prekindergarten programs vary considerably from state to state, the results have significantly less value in school districts outside of Florida.

Although the research design included moderator variables for student characteristics outside the control of prekindergarten programming that may have impacted student achievement (i.e., gender, race, and socioeconomic status), there are other variables for which the design could not account. Among these are parental involvement and variance in quality of prekindergarten instruction. Thus, results may have illuminated a distinction associated with these variables rather than with participation in a prekindergarten program.

A major limitation in this study was that it is a quasi-experiment and selection bias was a considerable threat to the validity of the study. As prekindergarten is voluntary, there is an identifiable difference between participating and non-participating families (i.e., the decision to participate); this may be an indication of other pre-existing

differences among families that choose to participate in VPK and families that choose not to participate.

Summary

Research results for the sustained impact of prekindergarten have been inconclusive. This study investigated the sustained impact of prekindergarten participation and analyzed the relationship between prekindergarten participation and third grade academic achievement. This study utilized several multivariate factorial analyses of variance (MANOVAs) to examine whether demographic and behavioral variables interact with treatments in their effects. By studying one study district, this research provided conclusive results on the relationship between prekindergarten participation and third grade academic achievement in that study district.

CHAPTER 2 LITERATURE REVIEW

Introduction

Prekindergarten education is a highly studied field and has large investments from federal, state, and local funding resources. Nearly every state has a prekindergarten program but each is designed and implemented differently. Florida is one of a few states that offers universal prekindergarten to all students under their voluntary prekindergarten (VPK) program.

Multiple Ebsco databases were used for the literature search for this dissertation. The initial search used the term “prekindergarten” or “preschool” or “pre-k” as various states use these different terms to describe their programs, “effects” or “impact,” and “academic achievement” and yielded 6,638 results. To narrow the search further, only scholarly journals or peer reviewed texts were selected that had been published since 2000. This search yielded 3,754 results. Finally, the results were further narrowed to focus on “research study or studies” and “united states or America or USA” and just a focus on “long term or “long-term” or “longitudinal.” This final search yielded 129 results. Abstracts were then reviewed and studies that focused only on behavioral effects, were conducted outside the US, or centered on health outcomes were eliminated to produce 39 final results.

In the course of reviewing the results from the final search, the researcher identified other studies cited within articles from the search that referenced long-term academic impacts of prekindergarten. The literature includes those studies from notable

researchers in the prekindergarten field who were consistently cited within articles from the search results: Barnett, Bassok, Cascio, Curenton, Gormley, Gayer, Lipsey, Phillips, and Puma. Finally, the Prekindergarten Task Force (2017), consisting of many of these notable researchers, published a Consensus Statement on the evidence of the impact of state-funded pre-kindergarten programs. Studies that examined whether prekindergarten participation had a long-term impact on academic achievement were also included (Prekindergarten Task Force, 2017).

The literature search yielded a large number of studies showing the immediate effectiveness of prekindergarten programs on kindergarten readiness. Many of the studies also addressed the longitudinal or sustained impact of prekindergarten participation. Yet research in Florida on the VPK program is still limited. One search only yielded three studies analyzing Florida's VPK program that had a focus on academic achievement.

This chapter reviews the existing literature on prekindergarten including the history and originations of prekindergarten then continues to discuss the development of these historical programs into the modern prekindergarten programs that exist today. Three seminal studies are reviewed in detail: The Abecedarian Program, The Perry Preschool Program, and the Chicago Child-Parent Program, as they provide both justification and models for today's prekindergarten initiatives. Prekindergarten achievement is then examined through state level studies. The variation in results are discussed as study results range from broad positive long-term effects to no positive

sustained effects. Next, the chapter discusses national studies that have used large national databases to examine the impact of prekindergarten participation on a larger scale, including literature on the Federal Head Start Program. Finally, the review focuses specifically on Florida's voluntary prekindergarten program (VPK). To conclude the chapter, literature on the impact of VPK participation in Florida is reviewed.

Prekindergarten Development

History of Prekindergarten

Before the rapid expansion of prekindergarten, the United States went through a similar expansion of kindergarten. States slowly began implementing public kindergarten in the 1960s funded largely from local taxes (Cascio, 2010). By the end of the 1970s though, only two states did not fund kindergarten programs (Cascio, 2010). Kindergarten initiatives were largely to help prepare children for elementary school, reduce retention and special education services, and ultimately reduce individuals who needed public assistance or incarceration (Cascio, 2010). These objectives are remarkably similar to today's prekindergarten objectives.

Preschools originated, though, without today's modern objectives. The federal government, in order to facilitate mothers to work during World War II, funded government childcare. Childcare was a means for mothers to work, rather than a way to help educate or prepare children. Then, in the 1960s, the federal government created the Head Start Program in order to address the "war on poverty" and to mitigate some of the negative impacts poverty has on childhood development. They also intended

prekindergarten programs, such as the Head Start program, to greatly diminish poverty itself by providing students with the education and intervention needed to escape generational poverty. The Head Start program, unlike some state-funded programs, specifically targets students based on their socioeconomic status. Since the 1960s, prekindergarten programs have evolved and enrollment in public preschool has significantly increased. In one five-year period in the 1980s, 11 states started preschool programs and enrollment in prekindergarten increased by nearly 25% from 1980 to 2011 (Cascio & Schanzenbach, 2013).

Modern Prekindergarten Programs

Now, according to the National Institute for Early Education Research (NIEER) in their annual *State of Preschool: State Preschool Yearbook*, over 1.3 million 4-year-olds or 33% of all four-year-olds in the country are enrolled in state-funded preschool programs (2018). As enrollment in these programs has increased, so has the financial investment by the states. The NIEER (2018) reported total state funding for preschool programs exceeded 7.6 billion in 2017. With increases in enrollment and spending, prekindergarten has become a critical field for researchers to examine and understand. As Armor and Cato (2014) explained, "Any program that could cost state and federal taxpayers 50 billion per year warrants a closer look at the evidence on its effectiveness" (p. 1).

Modern prekindergarten programs seem to want to do it all. They still exist as a means to enable parents to work but also strive to provide quality education to

students. Some programs focus on target intervention populations while others attempt to serve all four-year-olds. Other states have expanded their prekindergarten programs to include three-year-olds as well. Barnett (2008) argued that public policy makers must decide how much support and what kind of preschool programs should be funded. With so much variation in prekindergarten programs across the nation, there has not been a consensus on which programs are most effective and should be prioritized. A recent study conducted by Cascio (2010) attempted to draw correlations between the effects of universal kindergarten enrollment to potential impacts of universal prekindergarten programs. Cascio (2010) tracked sustained effects after spikes in kindergarten enrollment and found no sustained effects for Black students and only limited small effects for white students. As Cascio (2010) argued this may show that universal programs may not have significant long-term benefits for certain populations.

There have been many studies that have found prekindergarten effectively prepares students for kindergarten (Gormley & Gayer, 2005; Hanshaw, 2016; Hustedt, Barnett, & Jung, 2010; Hustedt, Barnett, Jung & Friedman, 2010; Huang, 2017; Lipsey et al., 2013; Lipsey et al., 2016; Magnuson et al., 2007). Students who attend prekindergarten consistently outperform their peers who do not. As Barnett (2008) described, “multiple meta-analysis conducted over the past 25 years have found preschool education to produce on average immediate effect of about half a standard deviation on cognitive development” (p. 5). These types of gains help ensure all students arrive in kindergarten ready to learn and significantly reduce the school readiness gap for students in poverty (Barnett, 2008). Studies have reliably affirmed that attending

prekindergarten programs, in a variety of formats, helps prepare students to enter kindergarten.

But, with such a significant investment of resources, there is an “associated implied expectation that [positive effects of prekindergarten] would be sustained to some degree” (Lipsey et al., 2015, p. 39). One of prekindergarten program’s objectives was to help prepare students for kindergarten but also prekindergarten was proposed as an intervention to help students escape generational poverty. By intervening at a critical point in children’s development, prekindergarten was intended to change their trajectory in schooling and the future. The research on these sustained effects is less clear than the research on the immediate effects.

There are, as Hill et al. (2015) summarized, a few factors that may explain why the effects of high quality prekindergarten programs may be sustained: critical importance of the brain’s “early wiring,” the effect of having some or many students begin kindergarten at a higher level on the classroom as a whole, and finally the positive social-emotional outcomes that some researchers have found from participation in a prekindergarten programs. Each theory attempts to explain why participation in prekindergarten may have sustained effects but rather than focus on these theories, most of our modern investment in prekindergarten hinges on a few seminal studies of high quality and high impact prekindergarten programs.

Seminal Studies

There are a few critical studies that have become seminal studies for many modern prekindergarten programs and policies. As Lipsey et al. (2015), explained, “Much of the expectation for long-term positive pre-k effects comes from the small experimental studies of model programs conducted 40 to 50 years ago” (p. 39). These programs are cited in almost every modern day investigation of prekindergarten and, though the studies showed extraordinary results, they are not necessarily representative of modern prekindergarten programs.

The Abecedarian Program

The Abecedarian program was conducted at the University of North Carolina in Chapel Hill in the 1970s. The study followed 111 low income infants and randomly assigned 57 of these infants to receive intensive care and education (Armor & Cato, 2014). The students who received the intervention were provided with full-day, full-year day care from birth to kindergarten (Schweinhart, 2013). The study followed participants through age 21 (Barnett, 2008).

The study yielded impressive results with students in the program group having significantly higher IQ scores, though the effect sizes decreased from .75 at age 4 to .33 at age 21 (Barnett, 2008). The study found participants made gains in other academic areas such as higher achievement test scores, less repeated grades, more high school graduates, and more college attendees (Schweinhart, 2013). Finally, as young adults, participants were “more likely to have a skilled job, less likely to have become teen

parents, and less likely to smoke marijuana” (Barnett, 2008, p. 14). These broad positive effects show the impact a high quality, long-term program can have on children but are difficult to generalize to the small scale one or two year programs most states implement.

The Perry Preschool Program

Another seminal prekindergarten study was the Perry Preschool program in Ypsilanti Michigan in the 1960s. Like the Abecedarian program, the study analyzed a small cohort of 128 economically disadvantaged Black students, with 58 students randomly assigned to attend a half-day preschool program (Schweinhart, 2013). Students were randomly assigned to participate but efforts were made to ensure that the program group and no-program group did not differ statistically in their demographics (Schweinhart, 2013). The program served students for two school years and notably had incredibly small teacher-student ratios (6-1) (Armor & Cato, 2014). The small teacher-student ratios allowed for weekly 1 ½ hour home visits and individualized teaching and learning (Schweinhart, 2013).

Participants in the Perry Preschool program showed initial intellectual gains but they did not persist beyond first grade, leading to the “notorious idea of fadeout” (Schweinhart, 2013). However, because of the longevity of the study, researchers found significant long-term effects on crime rates, special education placements, rates of graduation and increased employment rates and salaries through age 40 (Barnett, 2008). These long-term effects are, as Schweinhart (2013) described, “lifetime effects” (p. 407). Again, the features of the Perry Preschool program are not replicated in most

modern prekindergarten programs, and therefore the program may be a model, but the results are challenging to generalize to current programs.

Chicago Child-Parent Center Program

The third study often cited is the Chicago Child-Parent Center Program (CPC). It also began in the 1960s and centers were located in the poorest neighborhoods in Chicago (Reynolds & Ou, 2011). The study followed a much larger cohort than the Abecedarian and Perry Preschool studies with over 24 centers serving over 1,500 students (Reynolds & Ou, 2011). The program required parent involvement with parenting education, certified educators, and extended intervention through third grade (Armor & Cato, 2014). Instead of a random design, the study used paired students from other low-income schools to create equivalence (Armor & Cato, 2014).

Researchers found prekindergarten participants had significantly higher graduation rates and completed more years of education (Reynolds & Ou, 2011). Prekindergarten participants also had lower rates of juvenile arrests overall, multiple arrests, and violent arrests (Reynolds & Ou, 2011). Finally, they were less likely to be retained or need special education services (Reynolds & Ou, 2011). Though participation in prekindergarten showed multiple statistically significant impacts, participation in extended services through elementary school only showed decreased rates of special education (Reynolds & Ou, 2011). Students who continued to receive services did not continue to have an advantage over students who only participated in the prekindergarten program, not the extended services.

Though all three studies showed significant long-term results of prekindergarten participation, all three programs do not necessarily mirror modern prekindergarten programs. These programs, if replicated today, have been estimated to cost anywhere from \$15,000 to \$40,000 per child (Lipsey et al., 2015). This is higher than the national average of \$5,000 currently spent per child and much higher than the \$2,282 Florida currently invests per child (NIEER, 2018). These seminal programs also provided longer interventions and much more intensive support than modern prekindergarten programs. Though the three seminal studies have “motivated policymakers to invest in preschool programs,” they have not “met the reasonable similarity standard” (Schweinhart, 2013, p. 407). These programs show the significant effects high quality prekindergarten can have, not just on academics, but on the entire lives of low income students. In the current prekindergarten landscape, the question remains, as Lipsey et al. (2016), explained “whether programs with weaker components and constrained budgets implemented at scale can approximate the same effects produced by these widely cited model programs” (p. 7).

Prekindergarten Achievement State Level Studies

Prekindergarten programs today vary greatly across the United States. As Phillips and Lowenstein (2011) described, the United States, “consists of a haphazard array of formal and informal arrangements, programs, and funding streams” (p. 484). There are six states that have no prekindergarten programs, while five states enroll more than 70% of four-year-olds in their states (NIEER, 2018). The programs also differ in

spending. New Jersey spends more than \$12,000 per child, while other states spend less than \$3,000 (NIEER, 2018). These programs have various levels of quality with twenty states meeting nine to ten of NIEER's (2018) quality benchmarks and nine states meeting less than five. Florida, though enrolling 77% of four-year-olds, spends less than \$3,000 per child and only meets two of the NIEER's (2018) current benchmarks. Finally, who is allowed to attend prekindergarten programs is different around the country. Some states offer prekindergarten to their most at-risk populations, while other offer universal prekindergarten.

With these stark contrasts, “widely varied effects on children are to be expected” (Barnett, 2008. p. 4). As Haskins and Brooks-Gunn (2016) explained, it is hard to “even define a pre-k program, because the versions being implemented across the nation differ widely” and there is “nothing like a national pre-k model” (p. 4). And though researchers have begun to evaluate the effectiveness of these programs, the programs “have been rolled out on the basis of little more than faith that they will benefit the participating children” (Lipsey et al., 2015, p. 8). Without any national model or clear effective program choices, each state makes their own decision regarding what kind of program, who to target, and how to implement, making each state's prekindergarten program unique.

Even with wide variation and little research into what types of programs should exist, most states have seen positive impacts from prekindergarten participation at kindergarten entry (Gormley & Gayer, 2005; Hanshaw, 2016; Hustedt, Barnett, & Jung,

2010; Hustedt, Barnett, Jung & Friedman, 2010; Huang, 2017; Lipsey et al., 2013; Lipsey et al., 2016; Magnuson et al., 2007). As Barnett (2008) explained, “multiple meta-analysis conducted over the past 25 years have found preschool education to produce an average immediate effect of about half a standard deviation on cognitive development” (p. 5). The research on the immediate impact of prekindergarten definitively shows most programs adequately prepare students for kindergarten. Unfortunately, the investment and promise of prekindergarten is not only on the immediate effects but on the sustained impact this intervention can have and this research is less definitive.

The results of research examining the sustained effects vary greatly across study and state. Some studies have shown broad positive long-term effects similar to the seminal studies described above, other researchers have seen more limited gains in certain areas or for certain subgroups, and still other studies have shown no long-term impacts. In order to contextualize the studies and due to the variation in prekindergarten programs across states, each study is preceded with a brief description of that state’s program purpose, enrollment, spending, and quality, as determined by NIEER’s (2018) quality benchmarks.

Broad Positive Long-Term Effects

Two states that have studies showing significant and broad positive long-term academic gains are North Carolina and New Jersey. North Carolina’s prekindergarten program, originally the More at Four (MAF) program and now renamed the North Carolina Pre-Kindergarten (NC Pre-K) program, is a targeted prekindergarten

program. Students are eligible if they either come from a household with income at or below 75% of the state median income or have one of five risk factors such as “developmental delay or identified disability, a chronic health condition, or limited English proficiency” (NIEER, 2018, p. 130). The state spends \$7,748 per child, serves 22% of four-year-olds in the state, and meets eight of the ten NIEER (2018) quality benchmarks including low student-teacher ratios, high education levels for teachers, and comprehensive, aligned, supported, and culturally sensitive standards.

Two long-term studies have shown significant gains for students who participated in the MAF program. Peisner-Feinberg and Schaaf (2010) found that when compared to other low socioeconomic students, those that participated in the MAF program performed significantly better on both third grade reading and math achievement levels. Their findings “may indicate that participation in the MAF program has an ameliorating effect on the negative effects of poverty related to children’s academic achievement” (Peisner-Feinberg & Schaaf, 2010, p 10). Though they did not see gains for high socioeconomic students who participated in the MAF program (Peisner-Feinberg & Schaaf, 2010).

Another study conducted in 2017 also found positive impacts for state investments in both the MAF program and also their birth to kindergarten community program, Smart Start (SS). These investments were “associated with higher math and reading standardized test scores, reductions in special education placement rates, and reductions in being grade retained in Grades 3, 4, and 5” (Dodge et al., 2016, p. 1011). The impacts were positive for all subgroups and there was no fade-out throughout

elementary years (Dodge et al., 2016). The study analyzed achievement at the community level and found participants of the programs and non-participants both benefited from higher investment levels, indicating there may have been a spillover effect for non-participants (Dodge et al., 2016). Though both studies showed higher effects for low socioeconomic students, the MAF program targets these students, therefore the higher effects on the targeted population may be expected.

Like North Carolina, New Jersey's Abbott Preschool Program has shown broad positive long-term academic impacts. The Abbott Preschool Program targets the 35 poorest school districts but provides the program to all 3- and 4-year-olds who live in those districts (NIEER, 2018). The Abbot Preschool Program reported spending \$13,439 per student, making it the second highest allocation per child in the United States (NIEER, 2018). The program also serves 23% of 4-year-olds and 20% of 3-year-olds in the state and meets eight of the ten NIEER (2018) quality benchmarks including low student-teacher ratios, high education levels for teachers, and comprehensive, aligned, supported, and culturally sensitive standards. Including wrap-around services, The Abbot Preschool Program provides a full-day and full-year program to participants (Barnett, Jung, Youn, & Frede, 2013).

Previous studies have found that Abbott Preschool Program showed substantial impacts not only at kindergarten entry but also in second grade (Barnett et al., 2013). The current study showed significant impacts for students in the 4th and 5th grade who participated in one or two years of the Abbott Preschool Program. Participants, who

had both one year and two years of prekindergarten, had decreased grade retention and special education rates (Barnett et al., 2013). Participants who completed one year had test year gains in Language Arts and Literacy, Math, and Science in the 4th and 5th grade of 10 to 20 percent, while students who completed two years had gains of 20 to 40 percent (Barnett et al., 2013). These results indicated, “strong evidence that the Abbott Preschool program has produced persistent, meaningful gains in achievement for children in the state’s most disadvantaged communities” (Barnett et al., 2013, p. 17). Both North Carolina and New Jersey’s targeted programs have yielded sustained academic gains. In both states, though effects were more pronounced for low socioeconomic students, the programs design also benefited all students.

Limited Positive Sustained Effects

Some states have seen only limited sustained impacts on specific sub groups. Both Texas and Oklahoma’s prekindergarten programs have had positive effects but not the same broad effects North Carolina and New Jersey’s programs have achieved. Texas’ program is not universal but enrolls 49% of 4-year-olds in the state (NIEER, 2018). Students are eligible if they qualify for free or reduced lunch, are homeless or in foster care, have a parent on active military duty or was injured or killed on duty, cannot speak English, or have a parent who is eligible for the Star of Texas Award (NIEER, 2018). They spend \$3,901 per child and only meet four of the ten quality benchmarks set by the NIEER (2018), notably having no class size limits or requirements

for staff-child ratios. Though the program is “large and well-established” it is not considered “high quality” (Barnett et al., 2013).

Unlike the programs in North Carolina and New Jersey, Texas’ program is limited to only students of need and therefore studies can only draw conclusions about those subgroups. Andrews et al. (2012) analyzed the impact prekindergarten attendance had on third grade achievement. The study was limited to an analysis of students eligible for free and reduced lunch and students with limited English proficiency. The study found sustained impact for both populations on reading and mathematics (Andrews et al., 2012). Andrews et al. (2012) also found attendance in public prekindergarten significantly reduced retention rates and assignment to special education in third grade. Again, their results were limited to drawing conclusions about students who were eligible for free and reduced lunch and students with limited English proficiency as these were the only groups offered the intervention of prekindergarten.

Another state that drew limited conclusions on the impact of prekindergarten was Oklahoma. Unlike Texas’ program, Oklahoma offers prekindergarten to all four-year-olds. Their program enrolls nearly 73% of four-year-olds and, for a universal program, still maintains high per child spending of \$7,428. It fulfills seven of the ten NIEER (2018) quality benchmarks. Notably, prekindergarten teachers must have certification and degrees equivalent to public elementary schools and have equal compensation (Gormley & Gayer, 2005).

Oklahoma's robust, high quality program has attracted many research studies. One study on kindergarten entry which examined Tulsa Public Schools (TPS) prekindergarten program showed clear effects on child development (Gormley & Gayer, 2005). Gormley and Gayer (2005) found increased cognitive/knowledge, language, and motor skills scores in students who attended the prekindergarten program. Their study showed the largest gains for Hispanics, then black students, with the least gains for white children (Gormley & Gayer, 2005). They also found higher gains for students who qualified for free and reduced lunch (Gormley & Gayer, 2005). These results align with other studies on the impact of prekindergarten on kindergarten entry or readiness.

Other studies that have examined the sustained effects of prekindergarten in Oklahoma found limited gains for limited populations. Smith (2016) focused on the impact prekindergarten has on later criminal activity. Smith (2016) found that black children are more likely to be charged with misdemeanors and felonies at the age of 18 or 19 if they did not attend prekindergarten. Similar to Gormley and Gayer (2005), Smith (2016) did not find the same impact on white students.

In another study, looking at the sustained academic impact of prekindergarten, Hill et al. (2015) examined two separate cohorts of students who were eligible to participate in prekindergarten in Tulsa Public Schools. Their early cohort had no evidence of sustained impacts and the later cohort only saw sustained effects for boys on mathematics achievement (Hill et al., 2015). Though these studies focusing on Tulsa Public Schools, showed limited impacts, another study on the Oklahoma Head Start

program showed positive impacts on math achievement scores through middle school, less retention, and students who participated in Head Start were less likely to be chronically absent (Phillips et al., 2016). In this same study, there were no sustained impacts from prekindergarten participation on reading scores (Phillips et al., 2016).

In a study examining both Oklahoma and Georgia, researchers found similar limited sustained effects (Cascio & Schanzenbach, 2013). Georgia's prekindergarten program is similar to Oklahoma as it is universal, enrolls 60% of all four-year-olds, and meets eight of the ten quality benchmarks set by the NIEER (2018). Cascio and Schanzenbach (2013) studied students who enrolled in both of these universal high quality programs and like Phillips et al. (2016) found, sustained positive impacts in mathematics through middle school but only for low socioeconomic students. Students from high socioeconomic families had no sustained effects from prekindergarten participation (Cascio & Schanzenbach, 2013). These studies showed that universal prekindergarten programs can have limited positive sustained effects for students.

Virginia and Michigan are also states where studies have shown limited sustained impacts but instead of achievement scores, their studies focused on grade retention. Virginia's Preschool Initiative (VPI) and the Michigan School Readiness Program (MSRP) target at risk four-year-olds with most students coming from low socioeconomic families (NIEER, 2018). VPI meets six of NIEER's (2018) ten benchmarks while MSRP meets ten. Both programs spend just over \$6000 per child (NIEER, 2018).

As seen in other studies, a study that examined the impact of VPI on kindergarten entry found that students who attended VPI were more prepared for kindergarten (Huang, 2017). In this study, they specifically examined letter name knowledge and found that students who attended VPI could name 9 more letters than students who did not (Huang, 2017).

Another study examined not only kindergarten readiness but also grade retention and literacy competencies in first grade found similar effects (Huang et al., 2012). Huang et al. (2012) found lower retention rates in kindergarten, with Black students having the highest impact. The study also found that VPI attendees were more likely to meet minimum literacy competencies at the end of kindergarten and at the end of first grade with the greatest benefits for Hispanic students (Huang et al., 2012). These findings are consistent with other studies on the impact of prekindergarten on kindergarten entry scores but also show the sustained impact of VPI through 1st grade.

In another study, Haslip (2018) found sustained effect on literacy measures through the middle of first grade. Though Virginia has a targeted prekindergarten program, Haslip (2018) studied one large urban school district that has essentially created a universal program. The district prekindergarten program is a full-day program for all four-year-olds and accommodates 99% of children who apply based on academic need following a prescreening (Haslip, 2018). The results suggested that “universal Pre-K, and not just criteria-selective Pre-K, can sustain literacy gains well into first grade” (Haslip, 2018, p. 14).

Though the impacts on kindergarten entry and through first grade have been positive, a study conducted by the Virginia University Research Consortium on early childhood found mixed results (Almarode et al., 2015). The study, which was the first to follow VPI students into middle school, showed that students who attended VPI were 3.9 percent more likely to be promoted to eighth grade on time but they found no significant performance differences on either reading or writing assessments in 8th grade (Almarode et al., 2015). In a similar study, Malofeeva, Daniel-Echols, and Xiang (2007) found attendees of MSRP were also less likely to be retained but showed no statistically significant differences on achievement scores. This lack of sustained academic achievement results has been seen in other studies as well.

No Positive Sustained Effects

Though many states have seen sustained positive impacts from prekindergarten participation either across participants, for specific sub groups, or specific measurements, there have been studies that have seen no impact or even negative effects from prekindergarten participation. A recent state-level study in Tennessee saw no positive sustained effects.

Tennessee's voluntary prekindergarten (TN-VPK) program targets low-income, homeless, or foster care children (NIEER, 2018). Though the program was considered high quality and fulfilled nine of the ten past benchmarks, under NIEER's (2018) new standards, the TN-VPK program only meets five. Tennessee also reports spending just over \$6000 per child on their TN-VPK program and serves 22% of four-year-olds.

Notably, the TN-VPK program still only serves about half the students eligible for the program allowing for researchers to use students admitted to the program as an experimental group and those on the waitlist as a control group (Lipsey et al., 2013). The first study conducted by Lipsey et al. (2013) examined the impact TN-VPK had on kindergarten readiness. All students in both the experimental and control group qualified for the free and reduced lunch program but students who participated in TN-VPK showed academic gains 45% greater than those who did not participate at the beginning of kindergarten (Lipsey et al., 2013). The results, as in previously mentioned studies, showed definitively prekindergarten prepared students for kindergarten. This same study, analyzed the same two groups of students to examine whether the academic gains sustained through kindergarten and first grade. By the end of kindergarten the TN-VPK showed only higher scores on Passage Comprehension than non-participants (Lipsey et al., 2013). At the end of first grade, there were no statistically significant gains and, in fact, the non-participant group scored higher on the Quantitative Concepts subscale (Lipsey et al., 2013). These results, from such a robust study design, unfortunately illustrate not all prekindergarten programs are producing sustained positive impacts.

Lipsey et al. (2015), continued to analyze the impacts of these two groups of participants in TN-VPK and non-participants as they advanced into their third grade year. By the end of second grade, non-participants scored higher on most measures and were statistically significantly higher on achievement composite measures and math tests (Lipsey et al., 2015). Second and third grade teachers also rated participants of TN-VPK and non-participants the same for behaviors and feelings though TN-VPK participants

had slightly more positive peer relations (Lipsey et al., 2015). These results show how even in high-quality prekindergarten programs, “it is uncertain whether [large scale] programs can deliver the benefits expected of them” (Lipsey et al., 2015, p. 6).

National Student Achievement Studies

Even with such variation in implementation across states, some studies have attempted to analyze the national impact of prekindergarten programs. Researchers have used data from large nationally representative data sets such as the National Longitudinal Survey of Youth (NLSY) or the Early Childhood Longitudinal Study (ECLS) to analyze the impact of prekindergarten participation. These data sets not only include academic assessments, but parent, teacher, and administrator surveys and school environment ratings. Looking at different aspects of these data sets and different cohorts, researchers have found both positive and negative effects of prekindergarten participation.

Magnuson et al. (2007) analyzed the kindergarten class of 1998-1999 using the ECLS data set. They found that students performed higher on math and reading assessments at kindergarten entry were less likely to be retained in kindergarten, if they participated in a prekindergarten program in the year prior to kindergarten (Magnuson et al., 2007). Magnuson et al. (2007) found these effects higher for disadvantaged groups and for individuals who attended public preschool rather than center-based care. They also found that the effects of prekindergarten participation largely dissipated by the end of first grade (Magnuson et al., 2007).

Following that same cohort and using the same data set, Ansari and Winsler (2018) expanded the study analyzing academic assessments through eighth grade and including social-emotional and behavioral problems from teacher surveys. Ansari and Winsler (2018) found sustained, though diminishing effects of prekindergarten participation on academic achievement through eighth grade but also found that students who attended prekindergarten had some negative behavioral effects, though these were not sustained through eighth grade. Bassok, Gibbs, and Latham (2015), used the same ECLS 1998 cohort but compared them to the ECLS 2010 cohort to examine how the impact of prekindergarten participation has changed over time. Bassok et al. (2015) found similar patterns between both cohorts with sustained academic effects through first grade but like Ansari and Winsler, (2018), some negative behavioral outcomes. These studies use data from across states and aggregate results from varying programs nationwide.

The only nationwide prekindergarten program is the Head Start program. Head Start is a federal program that was initiated by Lyndon B. Johnson when he declared The War on Poverty in order to “help communities meet the needs of disadvantaged preschool children (History of Head Start, 2018). It has been reauthorized multiple times, most recently in 2007 with bipartisan support (History of Head Start, 2018). In addition to providing low socioeconomic families with preschool education, Head Start also provides medical, dental, and mental health care along with education for parents (Deming, 2010).

The Head Start Impact Study (HSIS) was a congressionally mandated study to “determine if access to Head Start caused better developmental and parenting outcomes for participating children and families” (Puma et al., 2012). The study analyzed two groups of students, one who were eligible and allowed to enroll in Head Start and a control group who was not (Puma et al., 2012). The study analyzed two cohorts of students who attended Head Start, one who entered Head Start at age 3 and one who entered Head Start at age 4. The control group was allowed to enroll in other preschool programs, and therefore did not necessarily stay home (Puma et al., 2012). As seen in individual state studies, Head Start participation had a positive impact on every measure of children’s preschool experience for both cohorts at kindergarten entry (Puma et al., 2012). This result mirrors the results seen in individual state studies.

When analyzing the results from third grade, Puma et al., (2012) found little to no positive impacts. For the four-year-old cohort there was evidence of a positive impact for participants on the reading assessment but no significant impacts were found for math skills, prewriting, promotion, or teacher indicators (Puma et al., 2012). Additionally for the three-year-old cohort there was no positive effects at all and only one statistically negative impact. Children who participated in Head Start as three-year-olds had a lower grade promotion rate, as reported by parents, than non-participants (Puma et al., 2012).

Though the HSIS found no sustained academic effects, other studies have used data from the National Educational Longitudinal Study to look at adult impacts of Head Start participation. In their studies they found higher graduations rates and college

attendance (Deming, 2010; Phillips et al., 2016). It may be that Head Start is not having a sustained impact on achievement assessments but is providing students with skills needed for success in adulthood.

Voluntary Prekindergarten in Florida

Program Overview

Florida's VPK program originated from a state constitutional amendment in 2002 requiring that all four-year-olds have access to prekindergarten. Florida enrolls 77% of four-year-olds making it second in access in the nation. Although Florida has high enrollment rates, it is not considered a high quality program meeting only two of NIEER's (2018) quality benchmark and ranking 42nd in the nation on per child spending, only allocating \$2,282. The two quality benchmarks that Florida's VPK program meets are class sizes of 20 or less and comprehensive, aligned, supported, and culturally sensitive standards. Florida VPK program standards address eight domains: physical development, approaches to learning, social & emotional development, language & literacy, mathematical thinking, scientific inquiry, social studies, and creative expression through the arts (Office of Early Learning, 2018). Florida does not have curriculum supports in place, require bachelor's degrees, specialized training, or professional development for VPK educators, and does not require low staff-child ratios, vision, hearing & health screenings, or program improvement plans (NIEER, 2018).

VPK Student Achievement Studies

The Office of Early Learning (2018) publishes an annual report outlining progress, initiatives, and results of the VPK program. In 2017, 54% of all kindergartners were evaluated as ready for kindergarten, compared to 63% of kindergartners who attended a VPK program (Office of Early Learning, 2018). The Office of Early Learning (2018) also published results on the prekindergarten providers' readiness rates. Over 6,000 providers received a readiness rate, but only 57% of those providers had over 60% of their students ready for kindergarten (Office of Early Learning, 2018). Though students who attend prekindergarten have higher rates of readiness, there are still many programs that are not preparing all students for kindergarten.

A search for studies researching the impact of VPK participation on academic achievement yielded only a few results. Though the subject of teacher educational level or the type of VPK program has been studied, this researcher only located three studies from a search with the search terms "VPK" and "Florida" that focused on the effects of participation in prekindergarten.

The few studies completed in Florida analyzing the impacts of VPK participation have had mixed results. Drummond (2013) studied the immediate impact of VPK participation and found that students who attend public school VPK programs were more prepared for kindergarten than those who attended private. Another study examined the immediate and sustained impact of VPK participation and found no statistical difference in either kindergarten readiness or third grade academic achievement between students who attended prekindergarten and students who did not (Rodriguez, 2013). Finally,

Hanshaw (2016), found similar findings to other research studies that students who participated in VPK began prekindergarten with better letter naming and phonemic awareness than students who did not attend prekindergarten but the study did not investigate sustained effects.

Summary

Prekindergarten has been rapidly expanding in recent years yet much of the policy and practices have been based on a few seminal experimental studies. Though programs like the Abecedarian Program, Perry Preschool Program, and the Chicago Child-Parent Program all showed remarkable long-term gains for participants, these small-scale, high quality interventions do not resemble today's prekindergarten programs.

Today's prekindergarten programs are vastly different from state to state. Many states, such as North Carolina and Tennessee, have targeted programs that focus on providing prekindergarten opportunities to students in poverty. Other states like Oklahoma and Florida have implemented universal prekindergarten programs and accept all four-year-olds. State spending can range from a few thousand dollars per child in Florida to over \$12,000 per child in New Jersey. Each program is also run differently, with some programs being implemented through the public school systems with highly qualified instructors and others implemented in a variety of settings such as daycare facilities, private prekindergarten centers, and religious institutions (NIEER, 2018).

Even with such variation, states have seen consistent benefits to prekindergarten participation on kindergarten readiness (Gormley & Gayer, 2005; Hanshaw, 2016;

Hustedt, Barnett, & Jung, 2010; Hustedt, Barnet, Jung & Friedman, 2010; Huang, 2017; Lipsey et al., 2013; Lipsey et al. 2016; Magnuson et al., 2007). Prekindergarten is fulfilling one of its goals to get students who otherwise wouldn't be, prepared to enter kindergarten. In this way, it has become an equalizer, providing the opportunity for all students to start kindergarten at the same level. Though prekindergarten prepares children for kindergarten, at its root, it also aims to improve society by changing the trajectory of impoverished children. With this goal the research is less conclusive.

Deming (2010), highlighted one of the critical issues with evaluating programs ability to provide sustained impacts, "researchers must wait at least 15 to 20 years to evaluate the effect of an early childhood program" (p. 87). This is one of the reasons the three seminal programs are cited so often, in order to conduct research on the long-term impact of a program that research must be done years after implementation. In the past decade, more researchers have begun to analyze the sustained effects of prekindergarten participation and have seen mixed results.

In North Carolina and New Jersey, studies have shown prekindergarten participation results in broad positive sustained effects on academic achievement and grade retention through third, fourth, and fifth grade (Dodge et al., 2016; Peisner-Feinberg & Schaaf, 2010). Other states, like Texas, Oklahoma, and Georgia have seen limited success either with certain sub groups such as low socioeconomic students, Hispanic students, or boys (Andrews et al., 2012; Cascio & Schanzenbach, 2013; Gormley & Gayer, 2005; Hill et al., 2015; Phillips et al., 2016; Smith, 2016). Michigan

and Virginia have seen sustained impacts only on grade retention but not academic achievement (Almarode et al., 2015; Huang et al., 2012; Malofeeva et al., 2007). Finally, Tennessee and the Head Start program have studied the long-term effects of prekindergarten and seen no positive sustained effects from participation in their programs (Lipsey et al., 2013; Puma et al., 2012). In the case of Florida, there have been very few large scale studies on the VPK program and they have also not seen any positive long-term impacts from participation (Drummond, 2013; Hanshaw, 2016; Rodriguez, 2013).

The research on the sustained impact of prekindergarten participation offers inconclusive results, and in Florida there has been little research at all. With such variation in program implementation and results, there is a need for more research to determine the effectiveness of prekindergarten in general and individual state run programs. The focus of this research addresses this gap in the literature.

CHAPTER 3 METHODOLOGY

Introduction

This chapter describes the methodology used to address the two research questions guiding the study, to determine (1) if the effects of voluntary prekindergarten programs on academic achievement are moderated by demographic characteristics such as race, gender, socioeconomic status, discipline referrals, or chronic absenteeism and (2) how private and public voluntary prekindergarten programs influence academic achievement in the third grade. The study used extant de-identified data obtained directly from the study district from the 2018 administration of the Florida Standard Assessment (FSA) in Grade 3 reading and mathematics. Scale scores on the assessments were utilized to determine if there were statistically significant differences in achievement based on prekindergarten participation. The chapter contains five sections: research questions, participants, instrumentation, data collections, and data analysis.

Research Questions

The research questions for this study were:

1. Are the effects of prekindergarten programs on academic achievement moderated by demographic characteristics?
 - a. In what way, if any, does a student's race moderate the impact that prekindergarten has on reading and math achievement?
 - b. In what way, if any, does a student's gender moderate the impact that prekindergarten has on reading and math achievement?

- c. In what way, if any, does a student's socioeconomic status moderate the impact that prekindergarten has on reading and math achievement?
 - d. In what way, if any, does the presence of discipline referrals moderate the impact that prekindergarten has on reading and math achievement?
 - e. In what way, if any, does a student's chronic absenteeism moderate the impact that prekindergarten has on reading and math achievement?
2. How do private prekindergarten and voluntary prekindergarten programs influence academic achievement in reading and mathematics among third grade students?

Participants

The participants for this study are the 2017-2018 third grade students in the school district of interest. The participants had the option of participating in VPK in the 2013-2014 school year and were required to enroll in kindergarten in the 2014-2015 school year. When enrolling in the school district of interest, parents were asked to indicate what kind of program their students were enrolled in prior to kindergarten. They were given the following options: Head Start, None, Not Applicable, Prekindergarten Program for Children with Disabilities, Private Prekindergarten Program, Voluntary Prekindergarten Education Program, or they can leave the field blank. Participants were only used in this study if they selected one of three options: Private Prekindergarten Program, Voluntary Prekindergarten Education Program (VPK), or none. The specific programs of Head Start and Prekindergarten for Children with Disabilities were outside

the scope of this research study and the indicators of Not Applicable and blank responses did not provide enough information for the researcher to determine what program the student participated in prior to prekindergarten. This narrowed the original sample of 4,851 to a purposive sample of 2,498 students.

Since the study focused on the sustained impact of these programs, participants were further delimited to those with scores reported for the 2018 mathematics and reading FSA. This further limited the sample from 2,498 students to a final sample of 1,803 students. Table 1 displays the demographic variables for the participants in this study.

Table 1: Demographic Characteristics of the Sample ($n = 1803$)

Descriptor	Total	VPK Participants $n = 635$ (35)	Private Prekindergarten Participants $n = 1021$ (57)	Non- Prekindergarten Participants $n = 147$ (8)
Gender				
Female	898 (50)	326 (49)	510 (50)	79 (54)
Male	905 (50)	326 (51)	511 (50)	68 (46)
Race				
White	996 (55)	347 (55)	605 (59)	43 (29)
Black or African American	192 (11)	78 (12)	88 (9)	26 (18)
Hispanic	387 (21)	137 (22)	195 (19)	55 (37)
Asian	92 (5)	26 (4)	62 (6)	4 (3)
Multiracial	128 (7)	40 (6)	69 (7)	19 (13)
Hawaiian or Other Pacific Islander	7 (.4)	6 (1)	1 (.1)	0 (0)
American Indian	2 (.1)	1 (.2)	1 (.1)	0 (0)
Economic Status				
Free/Reduced Lunch Benefits	782 (43)	302 (48)	365 (36)	115 (78)
Non-Free/Reduced Lunch Benefits	1021 (57)	333 (52)	656 (64)	32 (22)
Discipline				
Received at least 1 Discipline Referral	76 (4)	27 (4)	39 (4)	10 (7)
Received no Discipline Referral	1727 (96)	608 (96)	982 (96)	137 (93)
Attendance*				
Chronically Absent (defined as 15 or more absences)	154 (9)	62 (10)	897 (92)	18 (13)
Not Chronically Absent	1575 (91)	555 (90)	74 (8)	123 (87)

*Attendance total population was $n = 1729$ as there were 74 students missing attendance data.

Note. Percentages are represented in parentheses.

Instrumentation

The results from the 2018 Florida State Assessment (FSA) were used to measure third grade reading and mathematics achievement. FSA Mathematics assesses students in Grade 3 on their Operations, Algebraic Thinking, Numbers in Base Ten, Fractions as Numbers, Measurement, Data, and Geometry. FSA English and Language Arts assesses

students in third grade on their ability to read and understand Key Ideas and Details, Craft Structure, Integration of Knowledge and Ideas, and Language and Editing (FDOE, 2017).

FSA scores for students for both subtests are scaled scores that range from 240-360. These tests are scaled and created so that test scores may be compared across versions and years (FDOE, 2017). As the FSA is administered in a single assessment, the test is analyzed for internal consistency. The third grade FSA Mathematics assessment consisted of 54 items ($\alpha = 0.94$) and the third grade FSA Reading assessment consisted of 50 items ($\alpha = 0.90$). Both the FSA Mathematics and FSA Reading assessments were also found to have high marginal reliability of 0.92 and 0.90 respectively. The standard error curve for both assessments also follow the typical expected trends. When analyzing validity, FSA Mathematics and Reading assessments underwent an independent alignment study to verify that items were aligned to the Language Arts Florida Standards (LAFS) and the Mathematics Florida Standards (MAFS). Using a confirmatory factor analysis, the FSA Mathematics and Reading assessments had a good fit across content domains with a root mean square error of approximation below 0.05. The test as a whole undergoes quality assurance tests for content validity, test difficulty, test reliability, and test fit to the IRT model (FDOE, 2017).

Data Collection

This study utilizes data collected and maintained by the study district and was obtained from the study district's department of Assessment and Accountability. The

research was conducted using extant, de-identified data obtained directly from the study district. Following the procedures of the study district, the deputy superintendent granted permission to use district data for this research study.

Using a unique student identifier from the de-identified data sheets, three spreadsheets were combined into one database that included student identifier, gender, free and reduced lunch (FRL) status, ethnicity, prekindergarten participation, 2018 FSA Reading Scale Score, 2018 FSA Mathematics Scale Score, number of absences for the 2017-2018 school year, and number of discipline referrals for the 2017-2018 school year. Although the number of absences and the number of discipline referrals were originally count variables, both were severely skewed ($g_1 = 2.5$ for absences and $g_1 = 10.088$ for referrals); therefore, they were recoded into categorical variables. Number of absences was recoded into either “chronic absenteeism” or “none” using the school district’s definition of “habitual truancy” of 15 or more absences (Seminole County Public Schools Student Conduct and Discipline Code, 2018). Discipline values were recoded into “received discipline referral” or “did not receive discipline referral.”

Data Analysis

A multivariate analysis of variance (MANOVA) was the most appropriate test for this investigation for several reasons. The multivariate approach allowed the test to interpret data from multiple dependent variables at the same time, thus accounting for correlations among the dependent variables and increasing the statistical power of any statistically significant results. The inclusion of moderator variables allowed the model

to (1) account for the potential influence of variables such as race, gender, socioeconomic status, discipline referrals, and chronic absenteeism on the outcomes of interest; and (2) explore the possibility of interaction effects among these variables and the factor variable (i.e., whether the relationship between VPK participation and third grade performance is moderated by any of these variables).

Using SPSS 23, a series of two-factor (condition x moderator) multivariate analyses of variance (MANOVAs) were run. Five separate analyses were run in which prekindergarten participation (private prekindergarten, voluntary prekindergarten, no prekindergarten) was the independent variable; one of five demographic variables (race, gender, socioeconomic status, presence of a discipline referral, and chronic absenteeism) was a moderator variable; and academic performance in mathematics and reading were the two dependent variables. Finally, post hoc tests were used to examine the difference among the three categories of prekindergarten on mathematics achievement and reading achievement separately.

CHAPTER 4 RESULTS

Introduction

This study was designed to analyze the sustained impact of prekindergarten participation on third grade academic achievement and how demographic characteristics moderate this relationship. The chapter is organized into two sections: (a) statistical assumptions, and (b) inferential results for each research question. This chapter presents the results of the analyses used to answer the research questions below.

1. Are the effects of prekindergarten programs on academic achievement moderated by demographic characteristics?
 - a. In what way, if any, does a student's race moderate the impact that prekindergarten has on reading and math achievement?
 - b. In what way, if any, does a student's gender moderate the impact that prekindergarten has on reading and math achievement?
 - c. In what way, if any, does a student's socioeconomic status moderate the impact that prekindergarten has on reading and math achievement?
 - d. In what way, if any, does the presence of discipline referrals moderate the impact that prekindergarten has on reading and math achievement?
 - e. In what way, if any, does a student's chronic absenteeism moderate the impact that prekindergarten has on reading and math achievement?

2. How do private prekindergarten and voluntary prekindergarten programs influence academic achievement in reading and mathematics among third grade students?

Statistical Assumptions

The statistical assumptions for the MANOVAs were examined prior to performing the inferential tests using procedures outlined by Hahs-Vaughn (2017). These assumptions include independence of observations, multivariate normality of dependent variables, linearity among the dependent variables, and homogeneity of variances and covariances.

The assumption of independence was assessed by creating scatter plots that illustrated the relationship between the standardized residuals and the factor levels of the independent variable. The points on the scatter plots fell in a relatively random distribution with no apparent clustering. Despite not having random assignment of cases to groups, this gives some assurance that independence of the observations is a reasonable assumption (Hahs-Vaughn, 2017).

Multivariate normality was examined using several tests. First, standardized residuals were examined for univariate normality. Although the Shapiro-Wilk's tests suggested that neither of the standardized residuals were normally distributed ($p < .001$), these results could be an artifact of having such a large sample size (Hahs-Vaughn, 2017). Furthermore, graphic results indicated only minor departure from normality. The Q-Q plots suggested relative normality with the exception of the tails of distribution. The

histograms were slightly negatively skewed and leptokurtic. Likewise, for FSA Reading and FSA Mathematics skewness statistics were -.230 and -.186 and kurtosis statistics were .550 and .693 respectively. The small ranges of these statistics suggest that violations of normality are mild and unlikely to affect the validity of the MANOVAs (Hahs-Vaughn, 2017).

Second, Cook's D was used to determine whether any outliers in the distributions of the residual errors might affect the results of the MANOVA. Since the maximum Cook's D values for the residuals for the reading scores is .016 and the maximum value for the residuals for the mathematics scores is .021 which are less than 1, it is unlikely that there are any outliers exerting undue influence on the model. With the exception of the inferential tests of normality, this evidence generally suggests univariate normality.

Third, multivariate normality was examined using DeCarlo's (1997) SPSS macro for multivariate normality. Tests of multivariate skewness (Small's $\chi^2(2) = 19.6738, p = .0001$; Srivastavas $\chi^2(2) = 33.7089, p < .001$); multivariate kurtosis (Small's variant $\chi^2(2) = 29.5094, p < .001$; Srivastavas = 3.5382, $N(b2p) = 6.5974, p < .001$; Mardia's = 9.7889, $N(b2p) = 9.4949, p < .001$); and the omnibus test of multivariate normality (Small's test variant $\chi^2(4) = 49.1832, p < .001$) all suggest that the assumption of multivariate normality was violated. Like the previous inferential tests of normality, these may be inflated because of the large sample size. However, even with these violations, MANOVAs tend to be robust tests, so that violations of multivariate normality have minimal effect on Type I errors (i.e., rejecting the null hypothesis when it is true; Hahs-Vaughn, 2017).

Linearity of the dependent variables was assessed with scatterplots and inferential tests of the relationship between the dependent variables. All scatterplots suggested at least a moderately strong positive linear relation. Tests revealed there was also a cubic relationship between dependent variables ($t(1801) = -4.710, p < .001$).

Finally, homogeneity of variances and covariances was tested using Box's M . Box's M was not statistically significant for chronic absenteeism (Box's $M = 20.264, p = .173$), discipline referrals (Box's $M = 15.240, p = .465$), or ethnicity (Box's $M = 38.165, p = .813$), but was statistically significant for gender (Box's $M = 43.068, p < .001$) and free and reduced lunch status (Box's $M = 26.844, p < .001$). Therefore, Pillai's Trace, which is a more robust test, was used to analyze all of the interactions and main effects from the MANOVAs (Hahs-Vaughn, 2017).

MANOVA Results

Research Question 1 focused on the moderator variables of race, gender, socioeconomic status, discipline referrals, and chronic absenteeism. The analysis explored the possibility of interaction effects among these variables and the relationship between prekindergarten participation and third grade performance.

The first MANOVA tested the interaction between race and prekindergarten participation. The omnibus test indicated that the effects of prekindergarten participation on achievement did not differ based on a student's race (Pillai's Trace = .008, $F(4, 3446) = .755, p = .770, \eta_p^2 = .004$).

The second MANOVA tested the interaction between gender and prekindergarten participation. The omnibus test indicated that the effects of prekindergarten participation on achievement did not differ based on a student's gender (Pillai's Trace = .003, $F(4, 3594) = 1.352$, $p = .248$, $\eta_p^2 = .002$).

The next MANOVA tested the interaction between socioeconomic status and prekindergarten participation. The omnibus test indicated that the effects of prekindergarten participation on achievement did not differ based on a student's socioeconomic status (Pillai's Trace = .001, $F(4, 3594) = .566$, $p = .687$, $\eta_p^2 = .001$).

The next MANOVA tested the interaction between discipline and prekindergarten participation. Discipline was measured based on whether a student received a referral or not in their third grade year. The omnibus test indicated that the effects of prekindergarten participation on achievement did not differ based on a student's discipline record (Pillai's Trace = .001, $F(4, 3594) = .579$, $p = .678$, $\eta_p^2 = .001$).

The next MANOVA tested the interaction between chronic absenteeism and prekindergarten participation. Chronic absenteeism was measured based on whether a student was absent fifteen times or more in their third grade year. The omnibus test indicated that the effects of prekindergarten participation on achievement did not differ based on a student's socioeconomic status (Pillai's Trace = .003, $F(4, 3446) = 1.192$, $p = .312$, $\eta_p^2 = .001$).

The five MANOVAs tested how the interaction of race, gender, socioeconomic status, discipline, and attendance moderated the effects of voluntary prekindergarten programs on academic achievement and revealed no significant interactions. Therefore,

any potential effects of a pre-kindergarten program on academic achievement are consistent across demographic groups.

Research question 2 focused how participation in private and voluntary prekindergarten programs may impact academic achievement in the third grade. The analysis explored the overall impact of prekindergarten participation but also examined the way prekindergarten participation impacted each participation group: private prekindergarten, voluntary prekindergarten, and no prekindergarten, and the way prekindergarten participation impacted mathematics and reading achievement distinctly.

A MANOVA was used to determine the effect that prekindergarten participation had on academic achievement. The omnibus test indicated that at least one of the measures of achievement was effected by prekindergarten participation (Pillai's Trace = .023, $F(4, 3600) = 10.508, p < .001, \eta_p^2 = .012$).

To determine which of the achievement tests was impacted by pre-kindergarten, a univariate ANOVA was run for each measure of achievement. The univariate ANOVA results for FSA Reading indicated that the effects of prekindergarten participation on FSA Reading achievement were significant ($F(2, 1801) = 18.052, p < .001, \eta_p^2 = .020$). In FSA Reading there was a statistically significant mean difference among all groups. Tukey HSD tests indicated that students who attended a private prekindergarten program ($M = 312.92, SD = 17.52$) had higher achievement scores in reading than those who attended a voluntary prekindergarten program ($M = 309.95, SD = 18.31$) and both students who attended private prekindergarten and the voluntary prekindergarten

programs had higher achievement scores in reading than those who did not attend prekindergarten ($M = 304.03, SD = 18.48$). Pairwise statistics are reported in Table 2.

The univariate ANOVA results for mathematics indicated that the effects of prekindergarten participation on mathematics achievement were also significant ($F(2, 1801) = 16.489, p < .001, \eta_p^2 = .018$). In FSA Mathematics there was a statistically significant mean difference among all groups except between private prekindergarten and voluntary prekindergarten. Tukey HSD tests indicated that students who attended a private kindergarten ($M = 312.10, SD = 18.42$) had higher achievement scores in mathematics than those who attended the voluntary prekindergarten program ($M = 309.94, SD = 19.11$) but these results were not statistically significant. Students who attended private prekindergarten and the voluntary prekindergarten program both had higher achievement scores in mathematics than those who did not attend prekindergarten ($M = 302.73, SD = 20.12$). Pairwise statistics are reported in Table 2.

Table 2: Prekindergarten Participation Mean Scale Score Comparisons

Prekindergarten Participation	Mean Difference	Standard Error	<i>p</i>	Lower Bound	Upper Bound
FSA Reading					
Private Prekindergarten vs. No Prekindergarten	8.88	1.527	< .001	5.18	12.58
Private Prekindergarten vs. Voluntary Prekindergarten	2.96	.904	.003	.84	5.08
Voluntary Prekindergarten vs. No Prekindergarten	5.92	1.637	.001	2.08	9.76
FSA Mathematics					
Private Prekindergarten vs. No Prekindergarten	9.37	1.660	< .001	5.47	13.26
Private Prekindergarten vs. Voluntary Prekindergarten	2.16	.951	.060	-.07	4.39
Voluntary Prekindergarten vs. No Prekindergarten	7.21	1.722	< .001	3.17	11.25

CHAPTER 5 DISCUSSION

Introduction

The results of the study presented in Chapter 4 provided a reporting of the data analysis, this chapter includes a discussion and interpretation of those results. The chapter is organized into five sections: (a) summary of the study, (b) discussion of the findings, (c) implications for practice, (d) limitations, and (e) recommendations for future research.

Summary of the Study

Prekindergarten represents a significant investment that could be utilized to improve student achievement efforts in other ways. The research analyzing the impact of prekindergarten participation largely shows that prekindergarten positively impacts kindergarten readiness but studies analyzing whether those positive academic effects sustain through later grades are less conclusive. The purpose of this study was to analyze whether the impact of participation in prekindergarten persists to third grade in one large suburban school district in central Florida. Three categories of participation were analyzed: private prekindergarten, voluntary prekindergarten, and no prekindergarten. These group were determined by parent surveys conducted at school entry.

Academic achievement was measured by performance on the 2018 FSA Mathematics and Reading assessments administered in the third grade. A series of factorial two-way MANOVAs were used to determine if the impact of prekindergarten participation on third grade academic achievement might be moderated by student

characteristics such as race, gender, socioeconomic status, discipline record, and chronic absenteeism. A one-way MANOVA was used to determine the distinct impact of prekindergarten participation on academic achievement in third grade. Finally, Tukey HSD post hoc tests were utilized to distinguish the impact of each prekindergarten group on the FSA Mathematics and FSA Reading assessments independently.

The participants of this study consisted of students who received scores on the 2018 FSA in third grade and whose parents indicated they attended either private prekindergarten, voluntary prekindergarten, or no prekindergarten ($n = 1803$ students). 635 students indicated they attended voluntary prekindergarten, 1021 students indicated they attended private prekindergarten, and 147 students indicated they attended no prekindergarten.

Discussion of the Findings

The purpose of this study was to analyze the sustained impact of prekindergarten participation on third grade academic achievement. To strengthen the study and account for the possibility that long-term impacts of prekindergarten participation may be influenced by student characteristics, the design included race, gender, socioeconomic status, discipline record, and chronic absenteeism as moderator variables. The inclusion of moderator variables also allowed the study to explore the possibility of interaction effects among student characteristics and prekindergarten participation.

Interaction Effects

Interaction effects allow researchers to analyze how the effect of an independent variable or factor variable on the dependent variables in the study depends on the level of another independent variable (Laerd Statistics, n.d.). This study analyzed how the impact of prekindergarten participation on third grade academic achievement might be different according to student characteristics such as race, gender, socioeconomic status, discipline record, and chronic absenteeism. The hypotheses were supported from the literature as previous studies have seen different effects based on student characteristics (Andrews et al., 2012; Dodge et al., 2016; Cascio & Schanzenbach, 2013; Gormley & Gayer, 2005; Hill et al., 2015; Peisner-Feinburg & Schaaf, 2010). The review of the literature also revealed some studies did not find interaction effects among student characteristics and prekindergarten participation, which was consistent with the findings of this study (Huang et al., 2012; Lipsey et al., 2016).

Multiple factorial MANOVAs revealed there were no significant interaction effects among the tested student characteristics and prekindergarten participation. The effect of prekindergarten participation did not depend on race, gender, socioeconomic status, discipline record, or chronic absenteeism. Thus, the impact of prekindergarten participation is not dependent upon student characteristics—the impact applies equally to all students.

Main Effects

The main purpose of this study was to analyze the sustained impact of prekindergarten participation on third grade academic achievement. A MANOVA with prekindergarten participation as the independent variable and FSA scale scores in third grade mathematics and reading as the dependent variables revealed statistically significant differences among prekindergarten participation groups (Pillai's Trace = .023, $F = 10.508$, $df = 4$, $p < .001$). Participating in prekindergarten has a positive impact on academic achievement through the third grade.

These results align, generally, with research reviewed in chapter 2. Many studies showed broad positive sustained effects of prekindergarten participation through early elementary years (Barnett et al., 2013; Dodge et al., 2016; Haslip, 2018; Huang et al., 2012; Peisner-Feinberg & Schaaf, 2010) and later elementary through middle school (Barnett et al., 2013). Other studies have shown other positive sustained effects such as retention rates, crime rates, or special education placement (Almarode et al., 2015; Andrews et al., 2012; Phillips et al., 2016; Smith, 2016) or for specific sub groups (Cascio & Schanzenbach, 2013; Gormley & Gayer, 2005; Hill et al., 2015). Although the results of this study counter some studies that found no sustained effects (Lipsey et al., 2013; Puma et al., 2012).

The mean scale score in FSA Mathematics for private prekindergarten attendees was 312.10 ($SD = 18.42$), voluntary prekindergarten attendees was 309.94 ($SD = 19.112$), and no prekindergarten attendance was 302.73 ($SD = 20.122$). The mean scale score in FSA Reading for private prekindergarten attendees was 312.92 ($SD = 17.522$), voluntary

prekindergarten attendees was 309.95 ($SD = 18.311$), and no prekindergarten attendance was 304.03 ($SD = 18.480$). Attending prekindergarten, either private or voluntary prekindergarten, had significantly higher mean scores than not attending prekindergarten.

In order to understand the distinct impact prekindergarten participation has on FSA Reading and FSA Mathematics, each dependent variable was analyzed separately. A univariate ANOVA revealed that prekindergarten participation had a significant impact on reading achievement in third grade ($F(2) = 18.052, p < .001$). Tukey HSD tests indicated there was a statistically different mean among all prekindergarten groups. Students who participated in private prekindergarten had the highest mean reading scores ($M = 312.92, SD = 17.52$), while students who attended voluntary prekindergarten ($M = 309.95, SD = 18.31$) had higher mean scores than students who attended no prekindergarten ($M = 304.03, SD = 18.48$). These results reveal the positive effects of any prekindergarten participation through third grade on reading achievement. They also show that participating in private prekindergarten provides students an advantage in third grade reading achievement over participating in voluntary prekindergarten.

When analyzing the effects of prekindergarten participation on mathematics achievement in third grade, a univariate ANOVA revealed that prekindergarten participation had a significant impact ($F(2) = 16.489, p < .001$). Tukey HSD tests indicated that the mean score for students who did not attend prekindergarten ($M = 302.73, SD = 20.12$) was significantly different than both private prekindergarten and voluntary prekindergarten. Though mean scores were higher for private prekindergarten ($M = 312.10, SD = 18.42$) there was not a significant difference from the mean scores of

students who attended voluntary prekindergarten ($M = 309.94$, $SD = 19.11$). These results reveal that participating in prekindergarten in either a voluntary prekindergarten program or a private one has a positive effect on third grade mathematics achievement.

Implications for Practice

Prekindergarten programs have been rapidly expanding in the last few decades as states invest more resources to expand and improve their prekindergarten programs (Cascio & Schanzenbach, 2013). Prekindergarten was intended to help prepare students for kindergarten, but it was also proposed as a way to help students escape poverty. There is an expectation that the positive effects of prekindergarten would be sustained into later grades and even adulthood (Lipsey et al., 2015). However, previous research conducted on these sustained results has been inconclusive.

The purpose of this study was to examine the sustained effects of prekindergarten participation in one large suburban school district in central Florida. The results confirmed that prekindergarten participation, either private or in the voluntary prekindergarten program, have lasting positive effects for students' academic achievement in third grade. This aligns with much of the literature on prekindergarten achievement (Almarode et al., 2015; Andrews et al., 2012; Barnett et al., 2013; Cascio & Schanzenbach, 2013; Dodge et al., 2016; Gormley & Gayer, 2005; Haslip, 2018; Hill et al., 2015; Huang et al., 2012; Peisner-Feinberg & Schaaf, 2010; Phillips et al., 2016; Smith, 2016) but does counter two major studies documenting no sustained positive effects from prekindergarten participation (Lipsey et al., 2013; Puma et al., 2012). These

results support the study district investing more resources into their voluntary prekindergarten program as the return on this investment yields academic achievement gains for at least four years following the intervention. As both private prekindergarten attendees and voluntary prekindergarten attendees outperformed the students who attended no prekindergarten, the study district may want to consider partnering with private providers in order to increase enrollment in both voluntary prekindergarten programs and private ones. In addition, the study district may want to investigate reasons why students do not attend a prekindergarten program. A qualitative study may reveal salient features of their home life, parental involvement, cultural background, or learning environment that is contributing to their lack of enrollment. The study district could try to mitigate these circumstances in order to help all students receive the benefit that this study demonstrates attending prekindergarten has on sustained academic achievement.

Though the study district's voluntary prekindergarten program had significant gains compared to the students who attended no prekindergarten program and was statistically similar to mathematics gains of students who participated in private prekindergarten, students who attended private prekindergarten outperformed their voluntary prekindergarten counterparts on the third grade FSA Reading assessment. The study district may want to investigate the practices in private prekindergarten programs that yield more significant reading gains and implement those practices into their voluntary prekindergarten programs. Since private prekindergarten programs are not required to use state curriculum, the study district may want to investigate what curriculum these successful institutions are utilizing and either incorporate these practices

into their own curriculum or lobby the state department of education to change their recommendations and requirements based on this information.

Another goal of this study was to examine how prekindergarten participation impacts certain groups of students differently. Many studies have seen prekindergarten gains vary by various demographics (Andrews et al., 2012; Cascio & Schanzenbach, 2013; Dodge et al., 2016; Gormley & Gayer, 2005; Hill et al., 2015; Peisner-Feinburg & Schaaf, 2010). This study found no significant interaction effects among race, gender, socioeconomic status, discipline record, or chronic absenteeism. These promising results show that participation in prekindergarten in the study district benefits all students regardless of student characteristics. Thus, the positive sustained impact of prekindergarten participation is not dependent upon student characteristics—the benefits apply equally to all students. This study offers insights for other districts who may want to replicate the study district’s voluntary and private prekindergarten programs as they are equally serving all populations.

Limitations

As with all research, there are limitations to this study that must be acknowledged. This study was conducted in one large suburban school district in central Florida. Though the results have direct implications for the private and voluntary prekindergarten programs in that district, they are not necessarily generalizable to other school districts. It may be that the study district serves a different population of students than other Florida districts who are either more likely to attend or be successful within a

prekindergarten program. Other districts may also have different requirements for institutions that administer prekindergarten or have different resources and support than the stud district. Also, due to the large variation in prekindergarten programs across the nation, the results cannot be generalized to programs outside of Florida as their program models differ greatly from Florida's voluntary prekindergarten program limiting the external validity of the study.

Another limitation is that students were included in the study if their parents reported they either attended private prekindergarten, voluntary prekindergarten, or no prekindergarten. The data could be unreliable as parents may not report accurately the program their students attended. Data that was left blank was not included in this study and only parents who actively indicated their student attended "no prekindergarten program" were included in the "none" category. Parents may still have misidentified which prekindergarten program, voluntary prekindergarten or private prekindergarten, their student attended which may affect the means and standard deviations within the ANOVAs. Though the study still showed both voluntary and private prekindergarten students outperformed students who did not attend any prekindergarten program.

Since this is a quasi-experimental study, it is also limited by selection bias. Without random assignment to programs, there may be underlying features of the groups that the study did not account for. It may be that students who attend prekindergarten are inherently different from students who do not, and their achievement in third grade reflects this inherent difference rather than participation in prekindergarten. Students who attend prekindergarten may have parents with higher education themselves or come

from families who inherently value education more than students who do not. It may be that students who attend prekindergarten are more likely to have parents that work in a professional field or are more likely to have older siblings within the school system to act as educational role models. All of these attributes, not included within this study, could be influencing the results.

Recommendations for Future Research

This study highlights an issue within the study district on data collection. The first recommendation for future research would be to change the way information on prekindergarten participation is collected. Specifically, requiring all students to indicate prekindergarten participation and collecting information on which institution students attended. This would allow researchers to magnify the available data to study and expand their research to evaluate the effectiveness of specific voluntary and private prekindergarten institutions. Within this study, a qualitative analysis could be completed to evaluate the factors that contributed to the success of individual institutions over others. It may be that certain private or voluntary prekindergarten institutions are significantly producing higher sustained effects and identifying and studying these institutions could lead to more precise and replicable results.

This study provides a model to replicate annually within the study district. As the voluntary and private prekindergarten programs have already changed in the previous four years, this replicated data would help district stakeholders track whether the

prekindergarten programs in the study district continue to have sustained effects. By examining other cohorts, it would also help establish the external validity of the study.

Continuing the research of this study by following the cohort of students within this study would also yield information on whether the effects of prekindergarten participation fade-out through middle school or high school. Should these results show a fade-out in later years, it may provide district personnel with data to add support or scaffolds to sustain the effects documented in this study.

Finally, as this study focuses on one Florida district, research into other Florida districts would be beneficial. If these positive results are seen in districts across Florida, it may provide other states with a model for implementing their own universal prekindergarten programs. If the study district's results are unique, it would provide information for other school districts in Florida to use to improve or change their own prekindergarten programs.

APPENDIX IRB
APPROVAL LETTER



University of Central Florida Institutional Review Board
Office of Research & Commercialization
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www.research.ucf.edu/compliance/irb.html

NOT HUMAN RESEARCH DETERMINATION

From: **UCF Institutional Review Board #1**
FWA00000351, IRB00001138

To: **Marissa Melin**

Date: **October 30, 2018**

Dear Researcher:

On 10/30/2018, the IRB determined that the following proposed activity is not human research as defined by DHHS regulations at 45 CFR 46 or FDA regulations at 21 CFR 50/56:

Type of Review: Not Human Research Determination
Project Title: The Sustained Impact of VPK Participation on Third Grade
Academic Performance
Investigator: Marissa Melin
IRB ID: SBE-18-14382
Funding Agency:
Grant Title:
Research ID: N/A

University of Central Florida IRB review and approval is not required. This determination applies only to the activities described in the IRB submission and does not apply should any changes be made. If changes are to be made and there are questions about whether these activities are research involving human subjects, please contact the IRB office to discuss the proposed changes.

This letter is signed by:

A handwritten signature in black ink, appearing to read "AS" or similar initials.

Signature applied by Adrienne Showman on 10/30/2018 12:50:41 PM EDT

Designated Reviewer

LIST OF REFERENCES

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