Child Youth Care Forum (2013) 42:507–523
DOI 10.1007/s10566-013-9215-0

ORIGINAL PAPER

Children's Readiness Gains in Publically Funded, Community-Based Pre-kindergarten Programs for 4 Year Olds and Preschool for 3 Year Olds

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Published online: 19 July 2013

Abstract
Background Many states provide public funding to facilitate school readiness for community-based pre-K and preschool programs for 4 year old children and 'at risk' 3 year old children. Little research exists on the school readiness gains of children participating in these "garden variety" community-based programs.
Objective The current study evaluated the child outcome gains in cognitive, communication and social/learning domains of 4 year old pre-K children and 3 year old preschool children participating in publicly funded, community-based programs.
Methods A sample of 132 children (86 four year olds and 46 three year olds) participating in publicly funded community pre-K and preschool programs were assessed at the beginning and end of the year. Paired samples *t* tests were conducted to determine if the mean scores on posttests were significantly different than pretests on measures using SPSS software.
Results Findings revealed the 4 year old children significantly increased their standard scores (SS) in cognitive, receptive vocabulary and social–emotional development. No change in SS was reported on the communication subtest. There was no statistically significant change in SS of the 3 year olds in any of the areas assessed.
Conclusions Children attending the "garden variety" publicly supported community based pre-K programs make notable gains in school readiness, but growth rates remained stable for the 3 year olds. Mean scores at pretest on some of the subtests were below average indicating the programs are reaching at-risk children. Findings suggest differences in the structural variables of the two programs may have contributed to the outcomes.

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Keywords Pre-kindergarten · Preschool · School readiness · Program evaluation

Introduction

The motivation for national, and state funding for early childhood programs is to provide all children with an equal opportunity for school success (Magnuson et al. 2007; No Child Left Behind Act 2008). Opportunities that enhance school readiness (short term benefits) and school success (sustained benefits) for all children, especially disadvantaged children, are a priority (Wagner 2011). Early care and education has been proposed as one mechanism toward equal opportunity for school success. In the United States there has been public support for state initiatives increasing the availability of pre-kindergarten (pre-K) programs for 4 year olds, and a goal to increase availability of government supported preschool programs for 3 year old children at risk. Consequently, there has been an increase in the participation of young children in early childhood center-based programs supported by public funds and a heightened interest in child outcome information regarding these programs. Public policymakers and taxpayers need research on child outcomes to support the economic investment and to facilitate program improvement. States are increasing the regulation and accountability of state funded programs. The process of evaluating programs, including the measurement of student growth, can provide valuable information on the impact on school readiness. An itinerant program evaluation process must continue to reach the ultimate goal of equity: having all children ready for school.

Although there is substantial research as to the short and long term benefits of small, high quality pre-K programs (Campbell et al. 2002; Schweinhart et al. 2005), there is still a need for research as to the benefits of the "typical" publically funded, community-based 4 year old, pre-K program (Bassok et al. 2008; Winsler et al. 2008). There is also a need for research on the benefits of a year spent in community-based preschool programs (3 year olds) which serve subsidized child care recipients. The first goal of this study was to add to the existing research on the school readiness gains of 4 year old children participating in publicly funded, community-based pre-K programs. The second goal of this study was to expand the discussion of child outcomes for 3 year old children participating in publicly funded community-based preschool programs.

Measuring School Readiness

"Simply put, school readiness refers to the state of child competencies at the time of school entry (i.e. kindergarten) that are important for later success." (Snow 2006, p. 9). Although there is general agreement with this statement, a great deal of discussion exists as to the critical components of "school readiness". The one common thread in current attempts at defining "school readiness" is that it is multidimensional. Currently, there is an emphasis on both cognitive/pre-academic skills, communication skills, and social–emotional/learning behaviors (Denham 2006; Howes et al. 2008; Snow 2006).

Since the enactment of the Federal No Child Left Behind Act (NCLB 2001) and the ensuing development of state accountability systems, a strong emphasis has been placed on assessing early literacy and early math academic skills. Not surprising, the scores of kindergarten children on early reading skills, such as naming letters, phonological awareness skills, beginning sounds and comprehension, have had some predictive value for later reading achievement (National Institute of Child Health and Human Development 2000). Likewise, proficiency of early math skills (counting, number sense, etc.) in

kindergarten is correlated with later math achievement (Snow 2006). There is also a strong correlation between receptive and expressive language skills (including phonology, morphology, syntax and semantics) and later reading abilities (Carlisle 2004; McBride-Chang and Kail 2002; McGregor 2004; National Institute of Child Health and Human Development 2000; Rescorla 2002; Storch and Whitehurst 2002). Many professionals and researchers in the field of early childhood highlight the importance of socio–emotional development, especially learning behaviors, regulatory skills and social interaction skills for later school and life success (Denham 2006; Lasser and Fite 2011; Raver 2002).

In summary, cognitive/pre-academic knowledge and skills, communication skills including both receptive and expressive language, and the development of social–learning behaviors appear relevant in any discussion or evaluation of "school readiness". This research study assessed the skill areas that are considered good indicators of child growth and readiness for kindergarten: cognitive/academic, language and social/emotional/learning development. The typical developmental sequence of learning in these domains for typical children is well documented.

Characteristics of 3 Year Old and 4 Year Old Children in Readiness Areas

Typical children between the ages of 3 and 4 years old have learned much in the area of cognitive development and pre-academic skills. At this age children can rote count up to 5, count five objects, and understands the concept of numbers (such as "give me 3"). They can recognize shapes and colors, sort objects into categories, and listen/understand simple stories. They will gladly tell you their full name and age. Communication skills for children (age 3–4) include an understanding of 1,500–2,000 words, the mean sentence length is 4.4 words and includes the use of past tense forms, contractions, some prepositions such as "in front of", 'behind' and the use of question words (what, who, why and how many). They can follow 3 step commands and will be able to explain the function of common objects. In social–emotional development the child begins cooperative play, shows affection and empathy to others, and likes to play dress up and show off. They begin to use strategies for self-regulation so emotional outbursts decline. At this age children can play group games using simple rules and can usually take turns (Berk 2012; Voress and Pearson 2006).

Between the ages of 4 and 5 years old additional pre-academic skills develop. They can now count up to 20 objects and understand the math concepts of "same", "more", "biggest". They can sort objects using more than one attribute and can classify objects into categories. Pre-literacy skills such as phonological awareness skills (rhyming and sound play) are evident along with the ability to recognize a few printed words. Early writing skills emerge such as printing their own name, drawing stick figures and other objects without a model. Receptive vocabulary is now about 2,500–2,800 words. Children at this age (4–5 years old) can tell stories using more complex sentence structure and a mean sentence length of about 5.7 words. They will use possessive forms and more prepositions (between, above, below, etc.). They understand many more concepts such as "top/bottom", "loud/quiet", "heavy/light", and "first, last, middle". Socially, they now prefer to play with other children rather than alone; they gain the attention of others in appropriate ways; and they develop special relationships with preferred friends. They take pride in their accomplishments and can talk about their own emotions. They can now play competitive games, explain the rules and wait their turn (Berk 2012; Voress and Pearson 2006).

Many preschool children develop this knowledge incidentally (naturally through the course of life's events and interactions). However, there are many children, especially from lower socioeconomic status (SES), that do not have the exposure and experiences to

acquire knowledge and skills considered a foundation for school success. Early childhood programs may provide the opportunity to remedy this disadvantage in school readiness.

Impact of Early Childhood Programs on School Readiness

Pre-K Programs

There is empirical evidence that intensive research and demonstration pre-K programs described as "high quality" have a positive impact on school readiness (Schweinhart et al. 2005). There is limited and sometimes conflicting evidence as to child outcomes for publicly-funded community-based preschool and pre-K programs (Bassok et al. 2008; Howes et al. 2008; Magnuson et al. 2007; Winsler et al. 2008). There are many different types and funding sources for pre-K with varying regulations, including Title 1 pre-K programs, Head Start, subsidized community child care programs and state funded universal pre-K programs (Abbott-Shim et al. 2003; Bassok et al. 2008; Burger 2010; Howes et al. 2008; Winsler et al. 2008). All publicly funded programs are not alike so it is important to delineate the different types of pre-K programs when comparing outcomes. For example, Head Start is multifaceted providing health services, parent training, and family support services, whereas most universal pre-K programs and subsidized programs do not. The research suggests that pre-K programs located at public elementary schools have better outcomes than those located in the community (Winsler et al. 2008). Some programs, such as Head Start, serve only low SES families, whereas state universal pre-K is open to any 4 year old child. Although Loeb et al. (2007) found all children benefited, regardless of ethnicity or income, from enrollment in pre-K prior to kindergarten, some researchers suggest children from low income families who begin programs with scores below children from higher SES groups may benefit most from pre-K programs (Bassok et al. 2008; Howes et al. 2008; Magnuson et al. 2007). The evidence to date suggests that most publicly funded pre-K programs (all types) provide modest short term improvements in cognitive skills, social–emotional skills, and receptive vocabulary (Gormley et al. 2005; Loeb et al. 2007; Winsler et al. 2008). Outcomes for communication skills (both receptive and expressive language) are more limited and inconsistent. Unfortunately, as Winsler et al. (2008) noted, publicly funded community-based programs that accept and serve children with subsidies are the programs that are the least researched.

Three Year Old Preschool Programs

For those children at-risk for school failure due to poverty related variables, 1 year of intervention may not be sufficient to achieve equity for school entrance (Burchinal et al. 2011; NICHD Early Child Care Research Network 2002). Although much focus is on the pre-K year, there is limited empirical evidence demonstrating the importance of earlier interactions and learning (Loeb et al. 2007). Most states provide some form of subsidized child care to support low income workers and job seekers. Aside from the workforce opportunities that these programs enable, a question remains as to the impact of these programs on child development and school readiness. It is likely that many 3 year old children from low income families have the opportunity to attend state subsidized programs prior to attending a pre-K. Evidence remains limited as to the specific outcomes of a year participating in a subsidized preschool program for 3 year old children.

Given the limited data available on child outcomes, this study sought to add to the current research on the effectiveness of publicly funded, community-based pre-K and preschool programs. The research was not intended to implement a particular curriculum or

intervention but rather to evaluate the impact of existing programs. The purpose was to complete a program evaluation by analyzing child outcomes in existing programs. We hypothesized that the standard scores of the 4 year olds participating in these pre-K programs would increase in school readiness domains (cognitive, communication, social/emotional). We also expected 3 year old children considered at-risk who participated in these preschool programs to demonstrate an increase in these school readiness domains (as measured by standard scores).

Method

Early Childhood Programs

Voluntary Pre-K Education Program (VPK)

Any child who resides in Florida and turns 4 four years of age by September 1 is eligible to participate in Florida's state funded VPK education program. This program is voluntary and available for free to any 4 year old in the state. There are no income requirements. Child care centers must meet minimum state requirements and comply with state rules to become a VPK provider. There are approved providers in the community including private and faith based child care centers. There are no public school based programs during the school year.

The goal of VPK is to better prepare children for kindergarten. The VPK program was provided for 3 h a day (5 days a week) which included whole group time, small group time, and child-directed inside and outside free play time. Some children remained at the centers for child care during the afternoons. Children attended VPK programs for 36 weeks with 32 weeks separating the pretest and posttest. At the time of the study, there was no centralized state VPK curriculum. However, pre-academic activities were encouraged by the state with a focus on early reading, math, writing and social skills. This included early literacy skills such as identifying and naming letters, phonological awareness skills such as rhyming and segmenting, and the use of increasingly more complex sentence structures. Early math skills included rote counting, understanding number concepts and identifying written numerals. The facilitation of social–emotional skills such as taking turns, problem-solving, self-regulation and following directions was encouraged. State law mandated a ratio of 1 instructor to 10 children; class size could not exceed 18 children and all VPK lead instructors must have a minimum of a child development associate credential (CDA) (Florida's Office of Early Learning 2012). Any class with more than 10 children also had an assistant teacher. The assistant teachers were required to have a high school diploma or equivalent.

School Readiness Program

School readiness programs (identified as preschool in this research) are financial assistance programs for working families with low incomes and also available to those children at risk of abuse, neglect or future school failure (Florida's Office of Early Learning 2012). Eligibility requirements include: (a) parents must be working or participating in an educational activity for minimum of 20 h per week; (b) parents must not exceed 150 % of the Federal Poverty Level; (c) parents pay nominal copay based on their income. The goal was to enable parents to remain in the workforce or training in

order to facilitate economic self-sufficiency by providing affordable child care. Therefore, children in preschool programs typically attended 5 days a week for 8 or more hours per day; however, the length of a preschool day varied for individual children. Children could attend preschool programs year round, the participants in this study attended a minimum of 32 weeks which separated the pretest and posttest. At the time of this research, the state had no curriculum recommendations or mandates for preschool programs. State standards were provided in the areas of safety and emergency procedures. The daily routine primarily consisted of whole group time for music and movement, and child-directed free play time both indoors and outdoors. Snack time, lunch and afternoon naptime were also part of the child's day.

Each county adopts its own rules for staff qualifications and ratios. The regulations in this county designated there must be one staff member that possesses a minimum of a CDA credential for every 20 children. There must be one staff member for every 15 children in a 3 year old program (Child Care Licensing and Enforcement 2012). These regulations are less stringent than the regulations for the VPK program. All 3 year old children in this study were eligible and participated in this program.

Funding for Programs

Each county has an Early Learning Coalition that is responsible for the implementation and accountability of publicly funded community-based pre-K and preschool programs. The state legislature sets the per child funding and the total funding for each coalition is based on the estimated number of pre-K children in the county and the estimated number of preschool children living in poverty. This funding amount can vary year to year and has yet to fund all children in need. The county coalition distributes the state funds for VPK and School Readiness (subsidized child care). The coalitions do not fund the Head Start programs. Approved community providers are contracted by the coalitions and receive funds based on the number of children they serve in School Readiness and/or VPK. The funding is distributed by the coalition (or contracted agency) and goes directly to the provider, not to parents (Florida's Office of Early Learning 2012).

Participants

Centers

This study was conducted in one of the largest counties in Florida with over 500 community-based centers supported by public funds distributed through the local coalition. From this pool a total of 40 centers were randomly chosen to participate in the study using a table of random numbers generated by SPSS 17. Since both 3 year old preschoolers and VPK participants were needed at each center, only centers which received public funding for the preschoolers were included. There were some centers that had the VPK program but only fee paid preschoolers (not state supported). This has significance because the 3 year old preschool program has income eligibility criteria and, therefore, it is more likely that the chosen centers were located in lower SES neighborhoods. The eligibility criteria was family income could not exceed 150 % above poverty level.

Children

A total of 195 children were randomly selected from the 40 centers using a table of random numbers generated by SPSS 17. The targeted goal was to have 2 three year olds and 3 four year olds from each center. Each selected child was administered pretests assessing cognitive, communication, social–learning skills and receptive vocabulary. The participants included 85 three year olds attending publicly funded, community-based preschool programs. The 110 four year old participants attended VPK programs. Only children who were proficient in speaking English were included. Eight months after pretesting, 132 children were post tested including 46 three year olds and 86 four year olds. Of the children who were post tested, 58 were female and 74 were male. Therefore, data analysis is based on the 132 children for whom all testing was administered. A G* Power analysis was conducted for paired samples *t* tests. Since the hypotheses were directional, one-tailed tests were selected. In order to obtain a moderate effect size (eta squared = .5), and sufficient power (d = .95) at an alpha level of .05, a minimum sample size of 45 would be required. Therefore, this sample (and the 3 year old and 4 year old group sizes) was appropriate for analysis. This study received full ethical approval from the university research review board. None of the families received incentives to increase participation or attendance. Table 1 provides information on the ethnicity of the population that participated in both pre and post testing.

Measures

Developmental Assessment

Developmental assessment in the cognitive, communication, and social–emotional domains was evaluated through the *developmental assessment of young children* (*DAYC*) (Voress and Maddox 1998). According to the manual, standard scores were normed on a sample of 1,269 children. Reliability coefficients met or exceeded .90. The authors present a rationale for item selection as evidence of content validity. Criterion related validity is reported with correlation coefficients ranging from .41 to .61 with the *Revised Gesell and Amtruda Developmental and Neurologic Examination* and the *Battelle Developmental Inventory*.

Receptive Vocabulary

The *peabody picture vocabulary test* (*PPVT-4*) (Dunn and Dunn 2007) was designed to measure an individual's receptive vocabulary knowledge for Standard American English,

Table 1 Number and percentage of participants by ethnicity

Race	Number	Percent
African-American	93	70.5
White	13	9.8
Asian	1	.8
Hawaiian	1	.8
Hispanic	1	.8
Mixed	23	17.4
Total	132	100.0

Mixed category = Mixed race group from ELC database categories of Hispanic/African-American, Hispanic/Hawaiian, African-American/White, and African = American/Asian

and was normed on American English speakers with an age range from 2 to 90 years old. Following the standard testing protocol, the examinee was shown four pictures while the examiner said a single stimulus word. The examinee verbally or nonverbally indicated which picture best represented the stimulus word. According to the examiner's manual of the *PPVT-4,* internal consistency alphas for the age groups from 2 to 90 ranged from .92 to .98 (median .95), and the test–retest coefficients ranged from .91 to .94. The PPVT-IV has an average correlation of .69 with the OWLS Listening Comprehension scale and .74 with the OWLS Oral Expression scale. Its correlations with measures of verbal ability are: .91 (WISC-III VIQ), .89 (KAIT Crystallized IQ), and .81 (K-BIT Vocabulary). Table 2 provides a description of the content of the *DAYC* subtests and the *PPVT-4.*

Procedures

The *DAYC* and the *PPVT* tests were administered by 14 assessors who received training on the instruments and procedures. The training was held in a 1 day session with a follow up half-day session prior to the post testing. All of the assessors' initial evaluations were supervised by two of the authors. Each assessment session was tape recorded to verify the accuracy of the administration and interpretation. All assessment protocols were reviewed for accuracy by the authors. All assessors held at least a Bachelor's Degree in Education, were experienced in assessing children, and were not affiliated with any of the centers or programs.

Written parental consent was obtained prior to pretest assessment. The timetable for the pre and posttest schedules was based upon the academic school year calendar since the VPK programs followed that schedule. Since the 3 year olds were enrolled year round in their preschool programs, they could be identified earlier and parental consent obtained prior to the official start of the school year. Thus, the 3 year old group was assessed first with the assessment beginning before the school year officially commenced for the VPK

Table 2 Description of content and examples of DAYC Subtests and PPVT-4

Subtest	Content	Examples
DAYC cognitive	Traditional pre-readiness and readiness skills including fine motor skills, math skills, responding to stories and books, and beginning alphabet knowledge	1. Counting objects 2. Draws face or figures 3. Naming letters
DAYC communication	Primarily expressive language skills including phonological awareness, concept development, syntax and sentence structure	1. Uses 3 and 4 word sentences 2. Identifying rhyming words 3. Definition: tell me about "a truck"
DAYC social/ emotional	Variety of social adaptation skills including interpersonal skills, self-expression and self-regulation. School readiness skills regarding self-regulation and attention	1. Greets familiar people 2. Takes turns 3. Follows rules
PPVT-4	Solely receptive vocabulary	1. Point to "pencil" 2. Point to "dancing" 3. Point to "farm"

DAYC is the developmental assessment of young children. *PPVT-4* is the peabody picture vocabulary test-4th edition

children. Post testing commenced 8 months after the pretest dates. Assessments for pre and post testing took 4 weeks for each group. Assessments were completed in the morning (always prior to lunch) at the centers each child attended. Assessors conducted observations in the children's classrooms during regular daily routines. Tasks that required direct assessment were completed in a quiet area (the reading center or empty office) provided by the center.

Statistical Analysis of Growth Rates

To determine if there was a change in growth rates, two separate paired samples t tests were conducted (one for 3-year olds and one for 4-year olds) to determine if the mean scores on posttests were significantly different than pretests on measures of cognitive development, communication, social learning and receptive vocabulary domains.

Results

Outcomes for Four Year Old VPK Pre-kindergarteners

Of the 110 four year olds who were pre tested, 86 participated in posttests for this study. The mean age at pretest was 55 months and the mean age at posttest was 62 months. Four paired samples t tests were conducted to detect any significant differences from pre-to posttests. Table 3 presents the means and standard deviations and the results of the significance tests. Given the purpose of the pre-K programs to enhance the readiness of 4 years olds for kindergarten, these results indicate significant differences among pre and posttest results on the *DAYC* cognitive, $t(85) = 5.036$, $p = .021$, and social/emotional subtests, $t(85) = 2.344$, $p = .001$, as well as the *PPVT-4* test of receptive vocabulary, $t(85) = 2.718$, $p = .008$.

Of these three measures, a statistically significant increase in the standard score (+5.44) with a moderate effect size ($d = .54$) was found in cognitive skills for pre-K children. Modest effect sizes were found for the social/emotional subtest (SS = +3.93; $d = .26$), and for receptive vocabulary (SS = +2.71; $d = .29$). The posttest standard scores indicate the children participating in publicly funded community-based pre-K programs learned at an increased rate in cognitive development, social–emotional development and receptive vocabulary. However, in a measure of expressive and receptive language skills, there was no significant change.

Outcomes for Three Year Old School Readiness Children

Of the 85 three year olds who were pretested, 46 were post tested for this study. The mean age at pretest was 41 months and the mean age at posttest was 49 months. Table 4 presents the means, standard deviations and significance tests for pre and posttests of the *DAYC* subtests and the *PPVT-4* test results. As shown in Table 4, the t tests found no significant differences in the scores for 3-year olds on any of the measures. While there seems to be some movement (increases or decreases) on several of the measures, there is no statistical difference in the standard scores. The posttest standard scores indicated that the children learned at the same rate and ability level as prior to the participation year.

Table 3 Mean standard deviation and significance tests for pre-post tests of 4 year old participants

Subtests	M	SD	$t(85)$	p
DAYC cognitive				
Pretest	83.09	10.238		
Posttest	88.53	12.662	5.036	.021*
DAYC communication				
Pretest	82.92	11.703		
Posttest	82.30	11.231	.580	n/s
DAYC social/emotional				
Pretest	90.76	15.248		
Posttest	94.69	13.474	2.344	.001***
PPVT-4				
Pretest	93.01	12.040		
Posttest	95.72	12.059	2.718	.008**

DAYC is the developmental assessment for young children. *PPVT-4* is the peabody picture vocabulary test-4th edition

* $p < .05$; ** $p < .01$; *** $p < .001$

Discussion

The goal of this research study was to determine if there were any gains in school readiness skills by children participating in publicly supported community-based programs during their 4-year-old pre-K year or their 3-year-old preschool year. All areas (cognitive, communication, social–emotional and receptive vocabulary) were assessed using norm referenced standardized measures that adjust for expected growth due to age over time. No change in the standard scores on these measures would indicate the children were gaining skills at their expected rate. An increase in the standard scores would indicate the children gained readiness skills at a faster than expected rate. By measuring the growth in several school readiness components, we also hoped the data would provide insight as to the strengths and weaknesses of these programs to facilitate quality improvement. Since the 4 year old pre-K program and the 3 year old preschool programs have different eligibility criteria and different program requirements, this research explored the differences in child growth rates between these groups. And since the child outcomes were different, we will discuss each group separately.

Table 4 Mean standard deviation and significance tests for pre-post tests 3 year old children

Subtests	M	SD	$t(45)$	p
DAYC cognitive				
Pretest	82.24	8.246		
Posttest	80.88	8.400	1.211	n/s
DAYC communication				
Pretest	82.07	7.761		
Posttest	82.15	8.532	−.75	n/s
DAYC social/emotional				
Pretest	95.48	17.867		
Posttest	99.59	14.911	−1.288	n/s
PPVT-4				
Pretest	91.00	9.381		
Posttest	89.41	10.182	−1.258	n/s

DAYC is the developmental assessment of young children. *PPVT-4* is the peabody picture vocabulary test-4th edition

Four Year Old VPK Pre-kindergarteners

The results of this research indicate participation in the publicly funded community-based pre-K programs increased the learning of knowledge and skills of 4 year olds at a faster than expected rate in the areas of cognitive development, social/emotional development and receptive vocabulary. It is important to note that the mean average pretest scores on the cognitive and communication subtests would be considered below average (i.e., 1 standard deviation below the mean). This is consistent with previous research on other publicly funded programs (including Head Start, Title 1, and pre-K programs in the community and at public schools) in this particular state (Winsler et al. 2008). This demonstrates that the policy goal of reaching and providing opportunities to at-risk children was achieved.

Cognitive Outcomes

Although the mean cognitive pretest score was considered below average, the mean posttest score was within 1 standard deviation of the norm sample. The pre-K children in this research increased their standard score on the cognitive subtest (which included early reading and early math skills) by (+5.44) with a moderate effect size ($d = .54$). The pre and posttest scores on the cognitive/academic measure suggests participation in this program closed the percentage gap between these 4 year old children and national norms which is similar to the findings of other pre-K programs in this state (Winsler et al. 2008) and several cohorts of Head Start participants in other states (FACES 2006). The effect size reported in this study was less than the effect size ($d = .79$) reported for gains in letter/word identification seen in children attending Oklahoma's Universal Pre-K programs but greater than the gains reported for applied math problems ($d = .38$) (Gormley et al. 2005). Oklahoma's universal pre-K programs differed from the programs in this study as they were housed in public schools and employed certified teachers. The effect size in this study was greater than the gains reported on applied math problems ($d = .16$) from research on children attending a variety of different types of state funded pre-K programs in several states (Howes et al. 2008). Utilizing the data from the ECLS-K Class of 1998–1999, Magnuson et al. (2007) noted that children who attended pre-K programs scored higher in reading skills and math concepts than children who did not attend pre-K at the beginning of Kindergarten. The effect sizes were small (.18 for reading and .17 for math) and the authors caution that the ECLS-K participants were economically advantaged.

Although there was not a control group in our research for comparison, the children participating in these publicly funded "garden variety" community-based pre-K programs did improve school readiness skills when compared to national norms within the year. Since the children were significantly below the norms at pretest, attendance in pre-K appears to positively affect their preparedness in pre-academic areas for kindergarten. Thus, in our study the children's standard score gains indicate that their cognitive growth rate increased at a greater rate than expected and with a larger effect size (d = .54) than reported by most other research.

Social–Emotional Outcomes

The pre-K participants made statistically significant gains in the social–emotional subtest with a standard score gain (+3.93) and a modest effect size ($d = .26$). This is consistent with the modest gains ($d = .24$) reported by Winsler et al. (2008), and similarly, was the domain yielding the strongest pretest and posttest scores. This area depends heavily upon

teacher report and, therefore, could be influenced by the desire of teachers to have their children and programs viewed positively. In contrast, Howes et al. (2008) found minimal gains on unstructured measures of social skills. Magnuson et al. (2007) found higher levels of behavior problems during kindergarten and first grade in children that attended pre-K programs. Therefore, the children in this study appear to have made similar or larger gains in social–emotional development in the pre-K year than most of the current reported research.

Communication Outcomes

The pre-K children in this study also increased their standard scores on the *PPVT-IV* receptive vocabulary test by (+2.71) with a modest effect size of (d = .29). Howes et al. (2008) research on state funded programs (the majority based in public schools with teachers holding a BA) also reported gains with a modest effect size ($d = .33$) for participants. Likewise, several cohorts of pre-K children in Head Start reported gains in receptive vocabulary (FACES 2006). In a review of Georgia's pre-k programs, including universal pre-K, Head Start and private preschool, Henry et al. (2005) found all 4 year olds increased receptive vocabulary skills with children from low income families having the lowest mean pretest scores and showing the most gains.

The pre-K children in this study did not show a statistically significant increase on the communication subtest of the DAYC. This subtest assesses expressive and receptive language skills including phonology, morphology, syntax and semantics. This finding is significant because most research reported in the literature does not utilize a comprehensive language assessment. Winsler et al. (2008) report results from the LAP-D language subtest which includes a limited expressive component, primarily naming pictures, and a comprehensive receptive language component which evaluates the child's understanding of a variety of language structures. They reported the language component as the weakest of assessed areas both at pretest and posttest although the community-based preschool children did show gains beginning the year at the 33 percentile and ending the year at the 47th percentile (standard scores were not reported). Using the *Oral and Written Language Scales* (*OWLS*) expressive subtest, Henry et al. (2005) reported in the Georgia study that children enrolled in the pre-K program had a mean score of 90.7 at pretest and 94.1 at posttest. The children attending the Head Start pre-K programs in Georgia had a much lower mean score of 83.2 at pretest and 85.8 at posttest. These scores are similar to the 82.9 pretest and 82.3 posttest mean scores attained by the children in this research. The children in these Head Start Programs had the lowest ranked SES in the Georgia study. These Head Start scores, similar to those reported in this study, may indicate the influence of poverty.

The lack of gains in the communication subtest of the *DAYC* is a concern because children who enter kindergarten with poor language and literacy skills are more likely than their peers, with well-developed language and literacy skills, to have difficulties with early reading development and long-term reading deficits (Gallagher et al. 2000; Storch and Whitehurst 2002). Language and literacy skills are easier to remediate in the preschool years, thus increasing the need for more intensive intervention during that period for those at-risk (Justice et al. 2008; Lonigan et al. 1998). Although the 4 year olds did show significant gains on the *PPVT-4* test of receptive vocabulary, they still showed deficiencies in other component areas including expressive language skills as noted on the *DAYC* Communication subtest. Many of the communication tasks of the *DAYC* require more abstract thinking skills, such as identifying relationships, rhyming, making inferences,

discriminating concepts, providing definitions, and using language to explain their thoughts and experiences.

Three Year Old School Readiness Preschoolers

There was no statistically significant change in the standard scores from pretest to posttest of the 3 year olds who participated in preschool. No change in the standard scores indicates the children were learning new skills at their expected growth rate. Like the 4 year olds in this study, it is important to note that the mean average pretest scores on the Cognitive and Communication subtests would be considered below average and remained below average at posttest. The families of the 3 year old children are considered low SES.

Current literature focuses primarily on pre-K programs (i.e., the child must be 4 at the beginning of the school year in August). When 3 year old children are included in the research, it is generally reported cumulatively, for example, the effects of 2 years in preschool programs (Burger 2010). The ECLS-K data indicates starting center-based care initiated at age 3 boosts early reading and math skills more than if started later (Bridges et al. 2004). The above mentioned studies do not delineate the growth of participation in a preschool program for 1 year. The Head Start Impact Study (US Department of Health and Human Services 2010) attempts to measure child outcomes for a year spent in a 3 year old program. However, the Head Start impact study report notes it must be interpreted with caution as the authors indicate they utilized a "relaxed statistical standard" $p \leq .10$ to evaluate child gains and effect size. Even utilizing this "relaxed standard" only small effect sizes were reported: the *PPVT* (receptive vocabulary) $d = .18$; the *Woodcock–Johnson III* Letter—Word identification subtest $d = .26$, Pre-academic subtest $d = .22$, and no change reported in the Oral Comprehension subtest. The limited data reported in the literature for a year spent in a preschool program and our research results with a small sample size does not allow for any strong conclusions on child outcomes.

Lacking a control group for comparison, it is hard to interpret the impact of a year in the community preschool programs for these children. It is possible if the children did not have this experience, their posttest scores may have been lower or the same. It is also possible this year in preschool provides the foundation for learning in pre-K or that the gains in development were not assessed in this assessment protocol. More research on the impact of early care and education programs is needed.

Implications

Standard Scores (one's relative standing in comparison to a norm sample) are expected to remain stable. Since the standard scores increased on multiple domains for children during the year of participation in the pre-K program, it appears this program has had a positive impact on school readiness and should continue to be supported. The fact that pretest scores were below average on the cognitive and communication subtest provides evidence the state is reaching and providing opportunities for many children at-risk for school problems through this program. Future goals should focus on improving quality with an emphasis on strategies to facilitate expressive and receptive language skills in children.

The difference in the results for the pre-K program and the preschool programs encourages further exploration. Although this study did not measure instructional/process variables in the center based programs, because of state regulations, several differences in structural/environmental variables between the programs for 4 year olds and those for 3 year olds are worth discussing. Those differences may have also contributed to the

outcomes. These structural/environmental variables include the curriculum guidelines, teacher qualifications, teacher/child ratios and income eligibility requirements.

The pre-K programs have a framework of state standards to use as guidelines for the implementation of a curriculum designed to promote school readiness. The state encouraged the state funded pre-k programs to facilitate learning in early reading and math skills, communication skills and social–emotional development. Although this study did not determine if the centers were indeed implementing a curriculum, all of these centers were evaluated and given state grades based on the performance of their participants (in the pre-K programs) on a kindergarten readiness test given at the beginning of the kindergarten year. In other words, all children entering public school kindergarten are given a state designed readiness evaluation; those results are then used to evaluate the centers offering the publicly funded pre-K program. The centers are given scores based on their children's performance. Obviously, this evaluation system encourages these pre-K programs to focus on pre-academic skills as outlined in the state standards. Perhaps this focus on curricular implementation based on standards may explain why the 4 year olds in this study showed significant improvement in three of the subtests (i.e., cognitive, social/emotional and receptive vocabulary). Many of the items on these subtests would be considered "traditional academic readiness skills", such as counting, sorting, and print awareness, following class rules, and working cooperatively. The researchers also speculate the recent focus and accountability of the 4- year- old pre-K programs may have resulted in increased attention on the pre-K programs and less attention on the preschool programs. This speculation prompts the need to have the following questions answered: Has this accountability system affected center staffing and resources? Are the better skilled teachers being moved to the pre-K classes? Is there a difference in the use of identified developmental or curriculum standards in classes for preschool and pre-K classes?

The staffing qualifications for the pre-K programs (4 year old programs) are higher than those of the 3 year old programs (see www.fldoe.org/earlyleaning). There is also a higher standard for child–teacher ratios in the publicly funded pre-K programs in comparison to the preschool programs. The greater child–teacher ratio for preschool programs may result in less frequent interactions and individual attention with the 3- year- olds. In one research study of publicly funded pre-kindergarten programs, the observed quality of the classrooms went down as the ratio of children to adult went higher (LoCasole-Crouch et al. 2007).

One notable observation we made in this study is the difference in the attrition rate of the two programs. The observed attrition rate of the 4 year olds was much less than expected. The researchers were expecting a 50 % attrition rate and this was fairly accurate for the 3 year old preschool children. However, only about 20 % of the 4 year old children dropped out from the beginning of the year to the end. The implication is that parents recognize the importance of continuity and perhaps perceive pre-K more as "school" and preschool as childcare. Additional data is needed to see if this translates into higher attendance rates, being on time, and parent-teacher communication.

The results of the preschool participants may have also been influenced by the many variables associated with poverty. The 3 year old participants in this research study all met income eligibility restrictions in order to participate in the School Readiness program. In comparison to children from middle and upper income families, young children from low SES homes commonly have fewer resources and fewer opportunities that are associated with cognitive and communicative growth. Research that compares multiple program types such as private preschool, universal pre-K, and Head Start have found lower pretest and posttest scores for the most disadvantaged (Henry et al. 2005; Winsler et al. 2008).

Limitations

The absence of a control group is a limitation in design. It would have been difficult to identify and assess children for a control group. The waiting list children could not ethically be refused entry to a program when openings came available. The original purpose of the research was to provide the state funding agency information as to child performance during participation in their programs. The use of a norm referenced assessment allows for a comparison of the scores of a standardization sample to the scores attained by the children assessed in this research. This allowed for the determination of gains in growth rates but does not determine if the same gains or lack of gains occurred with non-program participants.

Another limitation of our research design is the need to choose centers that had both pre-K programs and 3 year old preschool programs. One criteria of subsidized childcare (preschool program) is income eligibility, therefore, our pool of 3 year olds is from low SES families. In contrast, we did not have income data on the 4 year olds. However, since it is likely the 4 year old children at the center were from the same neighborhoods as the 3 year olds, there is a strong possibility that the 4 year olds in this study are actually a lower income subset of all 4 year olds enrolled in community center based pre-K program. It is possible that 4 year olds from middle income families may or may not have the same pretest averages or gains during the pre-K year. The results are important for public policy decisions since children from disadvantaged backgrounds are the priority.

An additional limitation is the prior participation record of the children. An unknown number of the children may have been in programs prior to the beginning of this study; however, we were unable to collect this data or assess the impact, if any, of these prior experiences on our results. Nor did we have data on the length of day for each child; some children only participated in a half day program whereas others may have been at the center for early and/or after care. And finally, the exclusion of non-English speakers reduced the numbers of other ethnic groups, in particular the Hispanic population. Future research on community-based programs needs to determine if outcomes vary based on years in program, length of day, race/ethnicity, and second language learning. Additional research on child outcomes for earlier publicly funded preschool, toddler, and infant programs is a significant need.

Clearly, there are alternative explanations to understanding any research phenomena. We do not have and cannot rule out some of the differences might have been influenced by parent education, single parenthood, and other demographic variables.

Conclusion

In summary, this study shows that 4 year old children attending the "garden variety", publicly supported, community-based pre-K programs made notable gains in school readiness during the year with increased knowledge and skills in pre-academic/cognitive, receptive vocabulary, and social/emotional domains. The facilitation of communication (receptive and expressive language) skills is an area of weakness in these programs and should be a focus for improving quality. This study furthers the discussion of child outcomes for the years spent in community-based programs prior to the pre-K year. A year spent in the publicly funded, community-based programs for 3 year olds in this study showed no differences in standard scores from pretest to posttest in the areas assessed in this assessment protocol. However, the sample size was small and further research in child

outcomes for participants in community preschool programs is a noted need. The below average pretest scores indicate these programs are providing educational opportunities to children at-risk for school difficulties.

Acknowledgments This research was supported in part by a grant from the Early Learning Coalition of Broward County, Florida, awarded to Peggy Goldstein (FAU Grant Number 550141).

Conflict of interest The authors declare that they have no conflict of interest.

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