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Abstract

Research Findings: The amount of time and type of program that children experience in early childhood settings may be associated with children's kindergarten-entry skills, or kindergarten readiness. Taking a person-centered perspective, in the present study, we examined the extent to which reliable and unique profiles of early childhood experiences among a heterogeneous group of preschool children could be identified ($N = 422$). Based on parent reports of children's early education experiences in the year before kindergarten, three distinct profiles were identified. The three groups (Part-Time Head Start, Public Preschool and Other Care Programs, and Full-Time Head Start) significantly differed based on family and child characteristics. Children in the Public Preschool and Other Care Programs profile resided in families with greater maternal educational levels and incomes, and were more likely to be white than children in the other profiles. However, differences in children's kindergarten readiness by profile were not observed.

Practice and Policy: Findings suggest that time spent in different care arrangements was not associated with children's kindergarten readiness. It is important for future work to examine other factors, such as quality of care, that may promote children's learning across settings.

Keywords: preschool attendance, latent profile analysis, kindergarten readiness, parent report

Profiles of Preschool Attendance and Children's Kindergarten Readiness

Rigorous evidence suggests positive short-term impacts of preschool programs on children's academic skills (Yoshikawa et al., 2013), and preschool attendance and program quality strengthens children's language, literacy, and math skills (Justice, Jiang, Khan, & Dynia, 2017; Yoshikawa, Weiland, & Brooks-Gunn, 2016). Due to variation in teacher qualifications and classroom quality across types of early childhood education programs, we expect to see differences in children's achievement based on program type (Coley, Votruba-Drzal, Collins, & Cook, 2016). The amount of time spent in the program may also influence the extent to which children benefit (Atteberry et al., 2019). The current study examines the joint effects of program type and dosage of early childhood care and education arrangements. The study adopts a person-centered approach, specifically latent profile analysis (LPA), to explore patterns of preschool attendance across several types of programming. This approach allows us to move beyond comparing the outcomes of children who attended a preschool program or children who did not. Given that enrolling in a program that offers part-time hours requires many parents to find an additional option to cover the remaining needed care hours, our approach allows us to consider that children may attend multiple early care and education programs for varying amounts of time.

The positive impacts of preschool attendance vary by subgroup with vulnerable groups, such as children living in or near poverty benefiting the most (Yoshikawa et al., 2013). However, the benefits of attending high-quality preschool programs have been documented across diverse subpopulations including middle-class children, disadvantaged children, typically developing children, children with special needs, dual-language learners, and native English speakers. For example, a study of Oklahoma's universal preschool program found significant test score

impacts of 3.00 points for early reading, spelling, and math compared to children who did not attend. Results indicated that Hispanic, Black, White, and Native American children all benefited from the program, as did children from a range of income brackets (Gormley, Gayer, Phillips, & Dawson, 2005).

On the other hand, findings are mixed for the impact of preschool programs on children's behavior and social-emotional skills (Yoshikawa et al., 2013). Some studies find positive effects of attending preschool on children's behavior, whereas others report negative effects of attendance on behavior (Coley, Votruba-Drzal, Miller, & Koury, 2013; Gormley, Phillips, Newmark, Welti, & Adelstein, 2011; Loeb, Bridges, Bassok, Fuller, & Rumberger, 2007; Magnuson, Ruhm, & Waldoegel, 2007; Weiland & Yoshikawa, 2013). Another important competency is self-regulation, which encompasses a set of behaviors that includes attention, working memory (Duncan et al., 2007; Skibbe, Connor, Morrison, & Jewkes, 2011). In terms of the association between program attendance and self-regulation findings are also mixed. Some studies report higher levels of self-regulation for preschool attenders and other report no benefits for self-regulation based off program attendance (Alejandro et al., 2016; Skibbe et al., 2011). It is possible that the influence of preschool on children's behavior may vary by the type of program children experience. However, when comparing children's externalizing behaviors, approaches to learning, and prosocial skills across early childhood education and care program types, no differences among home programs, Head Start centers, public centers, and private centers have been observed (Coley, Votruba-Drzal, Collins, & Cook, 2016). Though kindergarten readiness skills include a broad range of academic and social skills (Skibbe et al., 2011) that set up children up for success in the classroom, the current study focuses on academic skills and self-regulation.

Type of Education and Care

Given the diversity of teacher qualifications and classroom experiences across types of early childhood education programs, we would expect to see differences in children's outcomes based on the type of program (Coley, Votruba-Drzal, Collins, & Cook, 2016). Previous research suggests there are positive short-term effects of Head Start on vocabulary for children who would otherwise be in home-based care, but meaningful effects of Head Start on vocabulary are not found for children who attended other center-based care programs (Feller, Grindal, Miratrix, Page, 2016). When comparing types of center-based care to Head Start, research suggests that children who attend private centers showed the highest math, reading, and language skills at age 5, with children attending Head Start and public centers demonstrating higher math and reading skills relative to children who only experienced parent care (Coley et al., 2016). Differences among publicly funded programs have also been documented. For example, classrooms in public schools were more likely to be high quality, in terms of providing emotional support to students, than classrooms in Head Start programs (Burchinal, Vandergrift, Pianta, & Mashburn, 2016). Further, classrooms with greater instructional quality were more likely to be in public schools. However, it is important to note that quality did not relate to child outcomes differently based on program type.

These findings mirror the results of Zhai and colleagues (2011), in which Head Start attendance was not associated with cognitive gains compared to attendance at prekindergarten or other center-based care programs. In terms of social-emotional and behavioral skills, Head Start attendance was linked to greater social competence relative to parental care, prekindergarten, and other center-based care programs and reduced attention problems compared with other center-based care and other non-parental care. Less is known about the quality of other non-parental

care options, such as family child care, and child outcomes. However, high quality care and teaching in family child care centers was associated with greater academic skills and fewer problem behaviors (Forry et al., 2013).

Child Care Dosage

The amount of time spent in the classroom is another factor that may influence the extent to which children benefit from preschool. There is a small body of research that has explored the impact of preschool dosage on children's development (Atteberry, Bassok, & Wong, 2019). Previous research suggests that more time spent in early childhood education is associated with greater cognitive skills, with children who entered care before the preschool years receiving higher scores on measures of cognitive development (Zaslow et al., 2016). Findings are mixed for behavioral outcomes, with some studies reporting benefits for greater time in early childhood education and others reporting increased problem behaviors. Increased time spent in preschool has been linked to greater achievement in specific skill sets, with children who attended 2 years of Head Start scoring significantly higher on vocabulary program exit and at the end of kindergarten compared to children who spent 1 year in Head Start (Xue et al., 2016). There is no evidence suggesting more years of Head Start programming was related to social skills or behavior.

In terms of hours, Xue and colleagues (2016) found no relationship between time spent in early childhood education programs and children's academic skills and social-emotional competencies in preschool. Conversely, greater time spent in child care was associated with increased quantitative skills and a decreased likelihood that behavior problem scores in the borderline or clinical score range for children ages 2 to 4 (Votruba-Drzal, Coley, Chase-Lansdale, 2004). Further, children who attended full-day preschool programs, rather than half-

day programs, significantly outperformed their peers on receptive vocabulary skills, cognition, literacy, math, physical and social-emotional development (Atteberry et al., 2019).

Early Education and Care Decisions

Parents' early childhood programming decisions are impacted by a complex set of proximal and distal factors unique to each family (Tang, Coley, & Votruba-Drzal, 2012). Many factors including access to child care and education, availability of family members to act as caregivers, employment demands, quality, convenience, flexibility, and location are considered by parents as they make early education and care decisions (Meyers & Jordan, 2006). In addition, ethnicity and social structure of the house may also influence parents' likelihood of enrolling their child (Fuller, Holloway, & Liang, 1996; Liang, Fuller, & Singer, 2000). Further, the socialization practices of early childhood education could promote different values and practices than families from particular ethnicities or cultural groups are accustomed.

Families select early education options that are compatible to their daily routines (e.g. work, school) which are impacted by cultural (values and beliefs about education) and ecological factors (e.g. availability of options, perceptions of quality) (Johnson, Padilla, & Votruba-Drzal, 2017). Additionally, parents' beliefs regarding education and awareness of preschool as an investment into their children's future might also relate to preschool enrollment (Crosnoe, Purtell, Davis-Kean, & Ansari, 2016; Liang et al., 2000). More specifically, factors such as maternal education and parents' expectations for their children could shape how parents manage and take advantage of educational opportunities in early childhood (Crosnoe et al., 2016).

Previous research suggests that program participation also varies based on demographic factors. In terms of socioeconomic status, the gap between preschool enrollment for 4-year-old children from families from highest income quantile and children from the lowest quantile equal

to about 15 percentage points in 2013 (Magnuson & Waldfogel, 2016). Preschool participation also varies by ethnicity. For example, 84% of African American 4-year-olds participate in non-parental care programs compared to 73% of Hispanic 4-year-olds (Barnett, Carolan, & Johns, 2013). Overall, Latino children are enrolled at the lowest levels in preschool (Yoshikawa et al., 2016), and African-American families are more likely than white or Latino families to enroll in centers (Fuller et al., 1996). In terms of English language status, limited information is available on the extent to which children learning multiple languages access preschool, as many states do not collect information on children's home language (Friedman-Krauss et al., 2018).

Variable-Centered Versus Person-Centered Approach

The studies discussed thus far have applied variable-centered approaches (means comparisons and correlations) to improve our understanding of the potential benefits of participating in early childhood programming. One limitation of variable-centered approaches in this context is that previous research assumes children experience only one type of care or program in the year before kindergarten. However, it is important to acknowledge that early care and education programs vary greatly in amount of programming time available to families. Enrolling in an early care and education program that offers part-time hours may require parents to find an additional option to cover the remaining hours of care that are needed. Many studies do not consider the time spent in child care experiences in a nuanced manner and instead consider broader concerns related to child care use, such as whether children attended a program on a regular basis (Espinosa et al., 2017).

In the present study, we extend previous work by utilizing a person-centered approach, specifically latent profile analysis (LPA), to identify possible patterns of preschool attendance across types of programming. With this approach, we assume heterogeneity among participants,

and expect that there may be subgroups of children who attend different early childhood options for varying amounts of time. This approach is particularly advantageous for studying the relationship between preschool attendance and children's kindergarten entry skills, or kindergarten readiness skills, because it acknowledges that the amount of time spent in early childhood education outside the home varies and that children may participate in multiple programs or care arrangements. This allows us to look at preschool participation in a more nuanced manner and examine the joint effects of program type and dosage of early childhood arrangements rather than simply compare differences between children who attended a preschool program or children who did not.

Examining the profiles of children's early childhood experiences allows us to better understand the experiences of children in the year before kindergarten and explore how these experiences may be associated with kindergarten entry skills. We situate this study in a context in which there are low levels of public support for preschool. Specifically, the current study focuses on preschool experiences in Ohio, where currently 26% of 4-year-olds are served through state and federally funded-programs, including Head Start and special education (Friedman-Krauss et al., 2018). In 2017, Ohio ranked 32nd among states for preschool access through public programs. In this regard, understanding variability in children's preschool participation distinguishes this work from studies conducted in contexts with large-scale participation. In the current study, we also examine the demographic factors associated with the profiles of children's early childhood programming experiences. Finally, we explore the extent to which profiles are associated with kindergarten school entry skills to examine the association between preschool experiences and children's achievement.

To summarize, the present study addresses the following research questions: (1) To what extent can reliable, distinct profiles of early childhood program participation among a heterogeneous group of preschool children be identified? (2) To what extent do these profiles differ based on family characteristics? (3) To what extent is profile membership associated with children's kindergarten readiness?

Methods

Procedure

Data were collected as part of the five-year Early Learning Ohio project, a study of classroom ecology and children's learning in the preschool through third grade. Classroom ecology is conceptualized as a multi-dimensional set of factors, including classroom composition, social networks and norms, teachers' practices, and children's classroom experiences. The study includes teachers and children in two large Ohio school districts, in classrooms from preschool to third grade, although only a minority of preschool classrooms were district-affiliated.

Teachers were recruited through informational meetings at schools located within district boundaries, following provision of a partnership agreement with district leadership. Enrolled teachers completed questionnaires on their students in the fall and spring of the academic year. Teacher background information was gathered through a questionnaire administered in the winter. Teachers received modest incentives for completing study activities with financial incentives prorated by level of participation in the study. Children attending classrooms of enrolled teachers were eligible to participate in the study. Several attempts to enroll children were made by sending consent packets home to parents. As part of the consent process, parents also completed a short, initial questionnaire as well as a family questionnaire in the spring. The

questionnaire included items on demographic information, child care and education before the kindergarten year, and other information on the family. Children completed a one-on-one assessment in the fall of the year by trained assessors. These were completed within the first eight weeks of the fall semester. Trained assessors administered the child assessments. Assessors read a training binder and completed a quiz to ensure understanding of the measure. Assessors practiced administering each assessment with another assessor reading from a “child” script. All of the field assessors either had received a bachelor’s degree or were in the process of earning a bachelor’s degree in education, speech and hearing science, or a related social science field. After two rounds of practicing each measure, an additional assessor observed administration of the task and provided feedback until the measure was correctly administered. To the extent possible, children were assessed in quiet areas outside of their classrooms. Children who were participating in the study were given age-appropriate storybooks following assessment periods (fall and spring).

Participants

The current study focuses on kindergarten students in the 2017-2018 academic year. Descriptive information is displayed in Table 1. The sample of interest to the present study comprises 422 kindergarten children (48% male, 52% female). The mean age of the children was 67.5 months ($SD = 4.69$) and 9% had a disability as noted in educational records. Of the 407 children with parent-reported information on race, the majority were white (71%) with 4% Asian or Asian American, 8% Black or African American, 7% other races, and 10% multiple races. Sixteen percent ($n = 68$) of children reported to be Hispanic or Latino with the majority of the sample not identified as Hispanic or Latino (84%; $n = 349$; no information available for 5 children). During the initial consenting process and a parent questionnaire in the spring, mothers

reported information on whether they had completed less than a high school diploma; completed a high school diploma or GED; AA/AS 2-year degree; a Bachelor's degree; or a graduate degree. Responses were converted to years of educational attainment: 10 (*less than a high school diploma*), 12 (*high school diploma*), 14 (*AA/AS 2-year degree*), 16 (*Bachelor's degree*), 18 (*graduate degree*). Family income was assessed in \$10,000 increments on a 0 to 20 scale. Family income information was available for 392 children, with 36% ($n = 140$) residing in households with \leq \$30,000 yearly income reported, 22% ($n = 86$) between \$30,001 and \$60,000, 20% ($n = 77$) between \$60,001 and \$90,000, and 22% ($n = 89$) with an annual income $>$ \$90,001. In terms of years of maternal education, information was available for 415 children. The average number of years of maternal education was 13.27 ($SD = 2.35$).

Measures

Academic Achievement. Three subtests from the *Woodcock Johnson III Tests of Achievement* (Woodcock, McGrew, Mather, 2001) were used to evaluate children's academic achievement. The Letter-Word Identification subtest requires students to first name individual letters and then words as the test progresses. Applied Problems assesses a child's ability to solve math problems. The Picture Vocabulary subtest evaluates a child's expressive vocabulary by first asking the child to identify a picture of a named word. As the test progresses, children are required to name pictures. Scores are strongly correlated with other achievement tests, with correlations ranging from .60-.70 (Mather & Woodcock, 2001). Scores demonstrated adequate reliability, with split-half reliability coefficients of .81 for Picture Vocabulary, .94 for Letter-Word Identification, and .93 for Applied Problems. The number of test items varies based on the child's ability. Each test is complete when the child reaches the ceiling by answering six items incorrectly or the page with the last item has been administered.

Self-Regulation. The Head Toes Knees Shoulders (HTKS) task was administered to evaluate children's self-regulation (Ponitz, McClelland, Jewkes, Connor, Farris, & Morrison, 2008). Children were asked to play a game where they were required to the opposite of what the assessor said. Children were first instructed to touch their head (or their toes), but instead of following the assessors' instruction, the children should touch their toes. If children successfully complete the head/toes aspect of the assessment, children are asked to continue the task with additional commands for knees and shoulders. The task includes six practice items and twenty test items. Scores range from 0 to 52. Children receive a score of 0 for incorrect items, 1 for any motion to incorrect response, but self-correct to the correct response, and 2 for a correct response. HTKS scores exhibit construct validity with scores positively correlated with parent ratings of attentional focus and behavioral regulation and teacher ratings of behavioral regulation in classrooms (Ponitz, McClelland, Matthews, & Morrison, 2009). HTKS scores demonstrate adequate reliability with inter-reliability alpha coefficients of .95 for self-corrections and .98 for overall scores (Ponitz et al., 2008).

Preschool Education and Care. Early childhood education and care was ascertained from parent reports collected in the spring of the kindergarten year. Parents were asked to select a category to indicate the amount of time their child spent outside their care during daytime hours at several care and education options: Head Start programs; preschool in a public school; other preschool options (includes early education center, child care center, parochial child care center, or nursery school other than Head Start); an in-home child care program or family child care program; care by a family or household member; care by someone other than a family or household member; or other care options. Parents were also asked to select the number of days per week their child attended each option in the previous year. For the purposes of analyses we

combined the care by a family or household member and care by someone other than a family or household member categories into care by individual. Resulting categories for analyses included Head Start, preschool in public schools, other care options, care by an individual, or other preschool options. To calculate the number of hours per week spent in each option, we multiplied the number of days spent in each care options by the number of hours of care received each day. The number of hours of care in each category ranged from 0 to 47.5 hours. Full time in one care option equaled 9.5 hours a day for 5 days a week.

Analytic Approach

The current study utilized a two-step analytic approach to address research questions. First, latent profiles analysis (LPA) was used to group children into most likely profiles based on the time spent in early childhood programming outside of parent care (Samuelsen and Dayton, 2010). Five variables, namely time spent in Head Start, preschool in a public school, other types of preschool programs, other care programs (in-home child care or family programs), and care by an individual (care by a family or household member and care by someone outside the family or household), were used as indicators. Time spent in Head Start, preschool in a public school, and in-home child care or family programs were considered in hours per week. For the two child care options that were infrequently endorsed by parents (less than 6% reported using), other types of preschool programs and care by an individual, time spent in these options were two dichotomous variables with 0 denoting less than 10 hours of care per week in the care type and 1 denoting 10 or more hours of care.

Second, we explored the demographic characteristics associated with membership in each profile. General linear models were applied to examine differences in family and child characteristics based on profile membership.

Finally, we examined the relationship between care and education profiles and kindergarten achievement. Multilevel modeling via the SAS Proc Mixed procedure was applied to account for the nested nature (children within kindergarten classrooms) of the data with children's achievement serving as the outcomes of interest. Family and child characteristics were used as covariates. Two-level multilevel models were conducted for each outcome of interest to examine differences by profiles. Level 1 represented variance between children within classrooms and Level 2 represented variance between preschool classrooms. Missing predictor data was imputed using the Markov chain Monte Carlo (MCMC) multiple imputation method, as recommended by Rubin (1987) and Schafer (1997), for data considered to be missing at random.

Results

Overall, the average number of hours children spent in early care and education was 23 hours ($SD = 20$), with a range from 0 to 95. The majority (57%) of children participated in one type of care and education, with 21% participating in two types and 2% participating in three or more types; 20% of children were reported not participating in an outside care. In terms of the care and education options reported by families, 25% participated in Head Start, 33% participated in public school programs, 4% participated in other preschool programs (in-home child care or family programs), 5% participated in care by an individual, and 40% participated in other care options. Overall means of time spent in care and education programming are displayed in Figure 1. On average, children spent 5.11 hours in Head Start, 6.33 hours in public school programs, 0.86 hours in other preschool programs, 1.63 hours in care by an individual, and 11.08 hours in other care options.

Profiles of Hours Spent in Early Childhood Programming

To address the first research question, hours spent in Head Start, public preschool, and other preschool programs (in-home or family programs) along with indicator variables denoting 10 or more hours of care in other types of preschool programs and individual care were included in five LPA models in Mplus (Muthén and Muthén, 2006) and Mplus LCA helper (Uanhoro & Logan, 2017). Models with two to six profiles were assessed using several fit indices and the three-profile model was determined to be the ideal solution (see Table 2 for model fit indices). Plotting of the Bayesian Information Criteria (BIC; Kaplan 2000) values by profiles indicated that the slope of the curve substantially decreased after the three-profile model and supported the selection of the three-group solution. Entropy values of greater than .80 indicate good separation of classes (Celeux & Soromenho, 1996) and the three-group solution resulted in an entropy of .996. Classes with two profiles and with greater than three profiles also had entropy values greater than .80. The Lo–Mendell–Rubin test (LMR; Tech 11) and Bootstrap Likelihood Ratio Tests (BLRT; Tech 14) was significant ($p \leq .02$ for both tests), suggesting that the three-group model resulted in a significantly better fit than the two-group model (Lo, Mendell, & Rubin, 2001; McLachlan & Peel, 2000). The average time spent in each care and education profile is displayed in Table 3 and Figure 1.

Children in Profile 1, Part-Time Head Start (prevalence = 13%; $n = 54$), spent most of their time outside the home in Head Start classrooms and attended Head Start programs for 14.72 hours on average each week. The majority of the children were in Profile 2, Public School and Other Care Programs (prevalence = 77%; $n = 326$) and spent 7.56 on average in public school preschool programs and 13.08 hours in Other Care programs. Children in Profile 3, Full-Time Head Start (prevalence = 10%; $n = 42$) mainly participated in Head Start programs and attended for 30.95 hours a week.

Profile Membership and Family and Child Characteristics

We did not find differences across profiles based on children's gender ($F(2,419) = 0.39, p = .68$) or disability status ($F(2,371) = 0.99, p = .37$). However, there were significant differences in child age in months ($F(2,419) = 3.22, p = .04$) with children in the Public School and Other Care Programs profile significantly older ($M = 68, SD = 5$) than children who were in the Full-Time Head Start Program ($M = 66, SD = 4$). There were no differences in age between children in the Part-Time Head Start profile ($M = 67, SD = 3$) and children in the Full-Time Head Start and Public School and Individual Care profiles.

We observed significant differences in years of maternal education ($F(2,412) = 15.61, p < .001$) and family income ($F(2,389) = 22.41, p < .001$) based on profiles, with children in the Public School and Other Care Programs profile residing in families with greater incomes ($M = 6.10, SD = 4.72$) and higher years of maternal education ($M = 13.60$ years, $SD = 2.4$).

Children in the Public School and Other Care profile had mothers with greater years of education than children in the Part-Time ($M = 11.89, SD = 1.62, F(2,412) = 25.10, p < .001$) and Full-Time Head Start profiles ($M = 12.44, SD = 1.87, F(2,412) = 9.46, p = .002$). Similarly, children in the Public School and Other Care Programs profile resided in higher income families than children in the Part-Time ($M = 2.03, SD = 2.64, F(1,389) = 29.06, p < .001$) and Full-Time Head Start profiles ($M = 2.59, SD = 20.50, F(1,389) = 20.50, p < .001$).

In terms of differences by race ($F(2,408) = 30.16, p < .001$), the Public School and Other Care Programs profile had the largest proportion of white children (79%) compared to the Part-Time (42%; $F(1,408) = 32.57, p < .001$) and Full-Time Head Start profiles (37%; $F(1,408) = 35.38, p < .001$). Finally, we examined linguistic status of children based on profile and found differences in whether children spoke English as one of their primary languages in the home,

$F(2,387) = 5.81, p = .003$. The Public School and Other Care Programs profile had the largest proportion of children who spoke English as a primary language (89%) compared to the Part-Time (77%; $F(1, 387) = 4.85, p = .03$), and Full-Time Head Start profiles (73%; $F(1,408) = 7.99, p = .005$).

Profile Membership and Kindergarten Readiness

Means and standard deviations of kindergarten-entry skills, as an index of kindergarten readiness, by profiles are presented in Table 4. Results of multilevel models predicting kindergarten-entry skills by attendance profiles with the Part-Time Head Start profile as a reference group are displayed in Table 5. For comparisons by profile, we used Cohen's f^2 , a measure of local effect size appropriate for hierarchical models (Selya, Rose, Dierker, Hedeker, & Mermelstein, 2012). According to Cohen's (1998) recommendations, $f^2 \geq .02$ indicates a small effect size, $f^2 \geq .15$ to a medium effect size, and $f^2 \geq .35$ to a large effect size.

There were no significant difference between the Part-Time Head Start profile and Full-Time Head Start profile in terms of children's applied problems (coefficient = -0.12, $p = .97$, Cohen's $f^2 = .00$), letter-word identification (coefficient = -2.28, $p = .63$, Cohen's $f^2 = .00$), picture vocabulary (coefficient = 0.91, $p = .62$, Cohen's $f^2 = .00$), and self-regulation scores (coefficient = 3.52, $p = .29$, Cohen's $f^2 = .00$) based on attendance profiles at the beginning of the kindergarten year. Similarly, there were no significant differences between the Part-Time Head Start profile and Public School and Other Care profile in applied problems (coefficient = 0.84, $p = .76$, Cohen's $f^2 = .00$), letter-word identification (coefficient = 1.79, $p = .63$, Cohen's $f^2 = .00$), picture vocabulary (coefficient = -0.38, $p = .79$, Cohen's $f^2 = .00$), and self-regulation scores (coefficient = 2.81, $p = .28$, Cohen's $f^2 = .00$).

Table 6 displays results using the Full-Time Head Start profile as a reference group. Relative to the Full-Time Head Start profile, children in the Public School and Other Care profile demonstrated similar applied problems (coefficient = 0.95, $p = .74$, Cohen's $f^2 = .00$), letter-word identification (coefficient = 4.07, $p = .31$, Cohen's $f^2 = .00$), picture vocabulary (coefficient = -1.29, $p = .41$), and self-regulation skills (coefficient = -0.71, $p = .80$, Cohen's $f^2 = .00$).

Several covariates were significantly associated with children's entry skills. For all of the outcomes, children who were older, resided in families with more educated mothers, and did not have disabilities received higher scores on the assessments. Speaking English as a primary language was associated with higher achievement in applied problems (coefficient = 7.94, $p = .01$) and picture vocabulary (coefficient = 11.58, $p < .001$). In terms of race, children who were white scored significantly higher on picture vocabulary than children who were not white (coefficient = 2.49, $p = .03$).

Discussion

The current study sought to contribute to our understanding of the early education and care experiences for children in the year before kindergarten. This study utilized a person-centered approach, rather than a variable centered approach to examine the patterns of attendance across several types of education and care programs. This approach assumes that a child may participate in more than one type of program and allows us to consider the amount of time children spend in each type. LPA enables us to examine combinations of care and education arrangements to explore whether particular combinations and time in these arrangements is important to children's school entry skills. The person-centered approach affords a complementary perspective to the extant literature where parents might be asked more general

questions on child care use, such as whether children attended a program on a regular basis rather than the number of hours attended (Espinosa et al., 2017).

One of our major findings is the identification of three distinct profiles of child care and education, including Part-Time Head Start, Public School and Other Care Programs, and Full-Time Head Start. The Head Start profiles indicate that children experience varying amounts of time in Head Start classrooms. These profiles varied in several child and family factors. According to the LPA results, children in the Public School and Other Care Programs profile resided in families with greater maternal educational levels and incomes, suggesting that the differences between this profile and the Head Start profiles may be attributed to income eligibility requirements. Further, the proportion of white children was the highest in this profile suggesting children in the Part-Time Head Start and Full-Time Head Start profiles were more racially diverse. Children in the Public School and Other Care Programs profile were also older than children in the other profiles. Interestingly, we see no differences in child and family factors between the children in the Part-Time Head Start profile and children in the Full-Time Head Start profile, suggesting that parents with lower socioeconomic status or lower education level might be equally likely to enroll their children to a part-time or a full-time Head Start program.

Surprisingly, we found no difference in children's academic skills and self-regulation between children across the three child care and education profiles. This finding contradicts with previous findings (see Zaslow et al., 2016 for a review) showing positive impacts of child care dosage on young children's academic skills. However, it is important to note that care and education programs featured in previous research differ from the arrangements considered in the current study. For example, Atteberry et al., (2019) explored differences in achievement between children who attended half-day and full-day public school prekindergarten, but did not consider

that children may have attended other care and education programs. Given that enrolling in a program that offers part-time hours requires many parents to seek additional programming to cover the remaining needed care hours, our approach advances the field by considering that children may attend multiple early care and education programs. In terms of differences by program type, our results are consistent with the Zhai and colleagues (2011) that Head Start programs do not differ from other center-based care in their academic impacts. In combination with the LPA results, the current findings indicate that whether attending preschool can benefit children's academic learning and development cannot be directly understood by program type or child care dosage.

In the current study we examined the relationship between profile membership and children's kindergarten school entry skills. We explored four outcomes of interest, transcending language/literacy, math, and self-regulation based on indices of letter-word identification, picture vocabulary, applied problems, and self-regulation. Importantly, we did not find differences in kindergarten skills at the beginning of the academic years among the three profiles when accounting for key covariates. This differs from previous research that documented some differences by care and education program type (Feller et al., 2016). One possible explanation of the opposite findings might be that previous research largely relied on variable-centered approaches. For example, Feller et al. (2016) showed that children attending a Head Start program performed more poorly on vocabulary knowledge than children attending other center-based care programs, but better than children who attended home-based care. These analyses do not account for combinations of care and education arrangements or consider the amount of time children spent in each setting. It is important to note that the children in our profiles spent most of their time in Head Start, public school programs, and other care programs (in-home or family

programs). In the current study, few children spent time in other types of preschool programs, such as private programs. Thus, we are unable to examine the school entry skills of children who spent the bulk of the year before kindergarten in non-Head Start preschool programs.

Limitations and Future Directions

A limitation of our study is that we do not include a comprehensive set of social-emotional competences, like problem behaviors scores, that have been linked to time in child care. Previous research suggests that spending more time in child care from ages 2 to 4 was associated with a decreased likelihood of clinical or borderline scores in problem behavior (Votruba-Drzal et al., 2004). It is also important to note that our study does not capture details on early childhood programming attendance beyond type and time spent in each care arrangement. Our approach does not allow us to understand whether quality is more important for children's learning, rather than the type or duration of program. There is sparse research on the quality of programs outside of centers, such as care by individuals in family child care, and child outcomes (Forry et al., 2013). More research is needed to examine the interplay between type, dosage, and quality of care and their impacts on children's development. Future research should also include children who participated in non-Head Start preschool programs to allow for comparisons between Head Start preschool programs and other combinations of early care and education programs.

Another limitation of our study is that we do not have information on logistical factors, such as convenience, cost, and location, which might be considered by parents as they make early education and care decisions (Meyers & Jordan, 2006). In addition to considering these logistical factors, future research should also investigate other factors, such as parents' beliefs about education and awareness of preschool as a future investment that might influence parent

selections (Crosnoe et al., 2016; Liang et al., 2000). Practitioners looking to expand enrollment in their programs should seek to understand the logistical factors, such as family income, as well as parent beliefs around the purpose of early care and programming to develop programs that meet families' needs.

Conclusions

The current study contributes to our knowledge about the early childhood programming. Our approach acknowledges that children may spend varying amounts of time in more than one setting. Early care and education programs differ in the amount of programming time available to families and part-time programs may require parents to select additional programming. The profiles classified subgroups into Part-Time Head Start, Full-Time Head Start, and Public School and Other Care Programs groupings. Children in the Public School and Other Care Programs profile resided in families with higher incomes and greater maternal education than children in the two Head Start profiles. Children in the Part-Time Head Start and Full-Time Head Start programs were not distinguished by child and family characteristics. There may be other factors, beyond the scope of the current study, that influence the amount of time that children spend in Head Start programs.

In the current study, we found no differences in children's kindergarten school entry skills and profile membership. These findings suggest that whether attending preschool is beneficial to children's development cannot be directly understood by program type or child care dosage. Other factors, such as quality, may be more important than program type or dosage. Future research should incorporate program characteristics and indicators of program quality that may be important for children's learning. Current research largely focuses on quality in center-

based care neglecting to consider quality in other settings, such as individual care providers in home settings (Forry et al., 2013).

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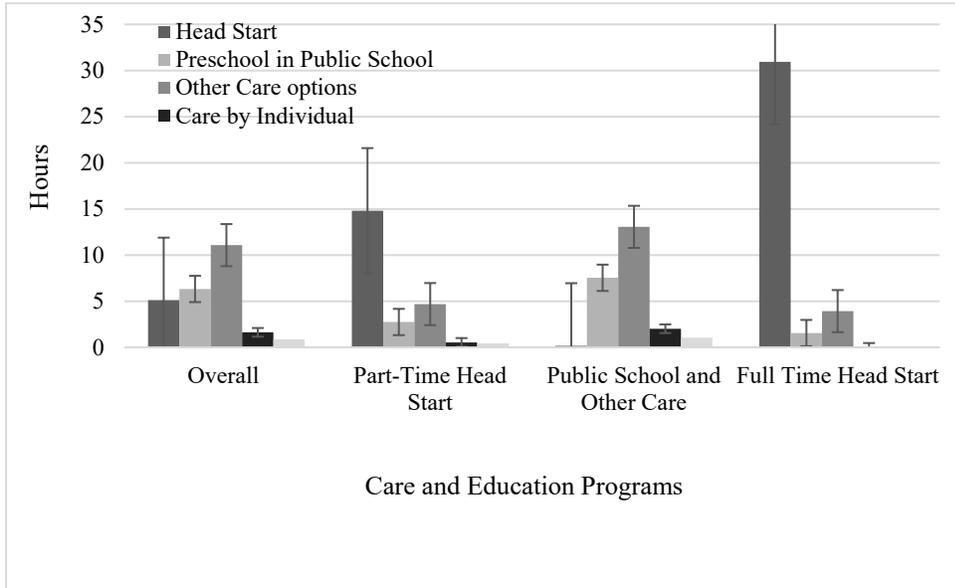
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Figure 1

Means of Time (in hours per week day) Spent in Care and Education Programs Overall and by Profile Group



Note. Bars represent standard errors.

Table 1

Descriptive Statistics for Participants

Characteristic	Overall M (SD) or proportion
<hr/>	
Child/family characteristics	
Male	0.48
Age	67.49 (4.69)
Child race	
White	0.71
Asian	0.04
African American	0.08
Multiple races	0.10
Other races	0.07
Hispanic	0.16
Mothers' years of education	13.27 (2.35)
Income	
≤ \$30,000	0.36
\$30,001 - \$60,000	0.22
\$60,001 - \$90,000	0.20
> \$90,001	0.22

Table 2. *Model Fit Indices for the Profiles of Hours Spent in Early Childhood Programming*

Classes	-2LL	df	AIC	BIC	Entropy	Tech 11	Tech 14
2	-4961.817	14	9951.633	10008.263	0.967	0.0027	0
3	-4721.328	20	9482.656	9563.557	0.996	0.0238	0
4	-4542.196	26	9136.393	9241.563	0.997	0.1209	0
5	-4411.455	32	8886.91	9016.351	0.978	0.0828	0
6	-4289.392	38	8654.784	8808.494	0.981	0.5712	0

Note: Bold indicates the selected model. -2LL = -2 log likelihood; df = degrees of freedom; AIC = Akaike Information Criterion; BIC = Bayesian Information Criterion; Tech 11 = Lo-Mendall-Rubin Likelihood Ratio Test; Tech 14 = Parametric Bootstrap Likelihood Ratio Test.

Table 3. *Means and Standard Deviations of Time Spent in Each Care and Education Type by Profile*

Profile	Head Start	Public School	Other Care	Care by Individual	Other Preschool
Part-Time Head Start	14.81 (1.93)	2.75 (7.24)	4.69 (11.15)	0.54 (3.74)	0.42 (3.06)
Public School and Other Care	0.17 (1.04)	7.54 (11.70)	13.06 (18.37)	2.02 (8.56)	1.05 (5.09)
Full Time Head Start	30.95 (5.21)	1.55 (7.09)	3.93 (10.51)	0.00 (0.00)	0.00 (0.00)

Table 4. *Means and Standard Deviations of Kindergarten Entry Skills by Profile*

Profile	Applied Problems	Letter-Word	Picture Vocabulary	Self-Regulation
Part-Time Head Start	419.31 (14.97)	356.63 (19.88)	465.65 (14.47)	23.55 (17.77)
Public School and Other Care	425.19 (18.64)	364.27 (25.89)	470.58 (10.23)	31.24 (16.39)
Full Time Head Start	418.76 (20.53)	356.29 (19.32)	467.22 (8.56)	28.22 (18.34)

Table 5. Results of Multilevel-Effects Models to Predict Kindergarten Entry Skills from Profiles of Hours Spent in Early Childhood Programming with Part-Time Profile as Reference Group

Predictor	Applied Problems		Letter-Word		Picture Vocabulary		Self-Regulation	
	Estimate	<i>p</i>	Estimate	<i>p</i>	Estimate	<i>p</i>	Estimate	<i>p</i>
Intercept	415.66	< .001	363.06	< .001	459.80	< .001	22.31	< .001
Full-Time Head Start profile (reference group = Part-Time)	-0.12	.97	-2.28	.63	0.91	.62	3.52	.29
Public School and Other Care profile (reference group = Part-Time)	0.84	.76	1.79	.63	-0.38	.79	2.81	.28
Age in months	0.52	.004	0.61	.02	0.41	< .001	0.57	.001
White (white = 1)	2.85	.19	-3.38	.26	2.49	.03	2.27	.28
Gender (female = 1)	-0.22	.89	0.01	.99	-0.21	.82	2.63	.10
Years of maternal education	1.21	.008	2.86	< .001	0.67	.01	1.56	< .001
IEP Status	-13.87	< .001	-11.42	.01	-7.22	< .001	-11.41	< .001
Household income	0.28	.23	0.27	.42	0.13	.27	0.03	.89
English as a primary language	7.94	.01	1.36	.75	11.58	< .001	3.53	.23

Note: All continuous predictors were grand-mean centered. Income was reported in \$10,000 increments. Coefficients in bold were statistically significant at $p < .05$. IEP status represents the presence of an Individualized Education Program.

Table 6. Results of Multilevel-Effects Models to Predict Kindergarten Entry Skills from Profiles of Hours Spent in Early Childhood Programming with Full-Time Head Start Profile as Reference Group

Predictor	Applied Problems		Letter-Word		Picture Vocabulary		Self-Regulation	
	Estimate	<i>p</i>	Estimate	<i>p</i>	Estimate	<i>p</i>	Estimate	<i>p</i>
Intercept	415.54	< .001	360.78	< .001	459.80	< .001	25.83	< .001
Part-Time Head Start profile (reference group = Full-Time)	0.12	.97	2.28	.63	-0.91	.62	-3.52	.29
Public School and Other Care profile (reference group = Full-Time)	0.95	.74	4.07	.31	-1.29	.41	-0.71	.80
Age in months	0.52	.004	0.61	.02	0.41	< .001	0.57	.001
White (white = 1)	2.85	.19	-3.38	.26	2.49	.03	2.27	.28
Gender (female = 1)	-0.22	.89	0.01	.99	-0.21	.82	2.63	.10
Years of maternal education	1.21	.008	2.86	< .001	0.67	.01	1.56	< .001
IEP Status	-13.87	< .001	-11.42	.01	-7.22	< .001	-11.41	< .001
Household income	0.28	.23	0.27	.42	0.13	.27	0.03	.89
English as a primary language	7.94	.01	1.36	.75	11.58	< .001	3.53	.23

Note: All continuous predictors were grand-mean centered. Income was reported in \$10,000 increments. Coefficients in bold were statistically significant at $p < .05$. IEP status represents the presence of an Individualized Education Program.