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Chronic Absenteeism and Preschool Children's Executive Functioning Skills Development

Mary Wagner Fuhs^a, Kimberly Turner Nesbitt^b, and Hannah Jackson^a

^aUniversity of Dayton; ^bUniversity of New Hampshire

ABSTRACT

Investments in preschool programs for children from disadvantaged backgrounds have historically been supported by research showing that these programs help children build school readiness skills and narrow the income-achievement gap. However, results from recent studies of the links between preschool participation and increases in school readiness skills are more mixed. Significant variation in regular preschool attendance and the availability of high-quality early learning environments could help explain mixed findings on preschool effectiveness. Using data from a preschool expansion demonstration project, we explored associations between children's attendance rates, classroom quality, and neighborhood poverty and children's fall to spring gains in a set of important school readiness skills in executive functioning. Children ($N = 197$) lived in neighborhoods where 26% of households (range = 0 - 92%) lived below the poverty line and attended 48 classrooms in public and private settings. Attendance rates, including chronic absenteeism, were significantly associated with children's gains in executive functioning skills, but only when children attended high-quality classrooms. Results suggest that efforts to increase attendance rates may benefit children's executive functioning skills among children living in higher poverty neighborhoods the most when communities also invest in increasing preschool classroom quality.

There is significant momentum around the expansion of early childhood education in the United States, especially among programs targeting enrollment in high-poverty neighborhoods (Phillips et al., 2017). However, recent mixed findings on the effectiveness of preschool programs for improving children's later academic achievement leave open questions about the conditions under which preschool programs actually help children develop these skills (e.g., Gormley, Gayer, Phillips, & Dawson, 2005; Lipsey & Farran, 2016; Puma et al., 2012). One potentially overlooked factor in the preschool educational effectiveness literature is the assessment of children's preschool attendance rates. This is a particularly salient issue as chronic absenteeism (defined as missing more than 10% of scheduled days, Balfanz & Byrnes, 2012) is especially high in preschool programs (Ehrlich et al., 2013), which may mitigate the potential benefits of these early learning environments. Moreover, in emphasizing academic achievement outcomes over other areas of school readiness, it is less clear how participation in preschool programs relates to children's development of non-academic skills in the area of cognitive control or executive functioning skills. Children's skills in this area are critical to study in early childhood as they show significant development during the preschool period and are strongly related to later academic success and well-being (e.g., Duncan et al., 2007; Fuhs, Nesbitt, Farran, & Dong, 2014; McClelland et al., 2007; Moffitt et al., 2011; Welsh, Nix, Blair, Bierman, & Nelson, 2010). In this study,

we examined the associations between chronic absenteeism and children's executive functioning skills in the context of variations in classroom quality and neighborhood poverty concentration.

Preschool programs and school readiness skills

The U.S. Department of Education, in its *Race to the Top Early Learning Challenge Program*, defined school readiness for individual children broadly as including “the domains of language and literacy development, cognitive and general knowledge (including early mathematics and early scientific development), approaches toward learning, physical well-being and motor development, and social and emotional development” (U.S. Department of Education, 2011, Definitions, para. 9). The rationale for investing in early childhood education includes that the benefits of an early childhood education, particularly for children who may be at risk for academic difficulties, pay off later by helping children develop these critical school readiness skills needed for long-term academic and personal success (Heckman, 2006). Empirical support for investments in preschool programs has historically been driven by a few high-impact studies conducted in the late 1960s and early 1970s, including the Abecedarian Project (Campbell, Ramey, Pungello, Sparling, & Miller-Johnson, 2002) and the Perry Preschool Project (Schweinhart et al., 2005). In both programs, long-term follow-up studies indicated that children in the experimental group receiving intensive early childhood education had more positive outcomes compared to a control group in a variety of areas, including higher educational attainment and less engagement in risky behavior (Campbell et al., 2002; Schweinhart et al., 2005).

The early childhood landscape has changed in many ways since these initial foundational studies took place, including the increasing availability of preschool through federally-funded programs like Head Start, public preschool offered through public school districts, community child care centers that may or may not use state funding, and even licensed home daycare providers. More recent preschool evaluations produced mixed results for children's gains in academic achievement in literacy, language, and mathematics (e.g., Gormley et al., 2005; Lipsey & Farran, 2016; Puma et al., 2012). For example, using a regression-discontinuity design, Gormley and colleagues (2005) found that Oklahoma's universal preschool program yielded significant benefits for children's academic achievement gains. On the other hand, an experimental evaluation of Tennessee's Voluntary Pre-K Program found that although children in the program group exhibited significantly higher academic achievement compared to a business as usual group at the end of preschool, these differences diminished or in some cases reversed by the third grade (Lipsey & Farran, 2016). The Head Start Impact Study also included an experimental evaluation of the effectiveness of Head Start preschool programs on children's school readiness skills (Puma et al., 2012). For the most part, early gains that children made in the areas of academic achievement faded by third grade, and there was only one effect that was favorable for Head Start on children's social-emotional skills. These mixed findings suggest that we need to take a closer look at variations in child, family, and classroom factors within the preschool experience that might point to specific targets for increasing the school readiness skills of preschoolers attending these programs.

Chronic absenteeism and school readiness skills

Given the changing landscape of increasing preschool enrollment alongside mixed findings for the effectiveness of more recent experimental studies of preschool effectiveness, it is critical to examine factors within these environments that may be related to more positive outcomes for children (Farran, 2016). Aligned closely with a bioecological model of development (Bronfenbrenner, 2005), UNICEF recently published a conceptual framework for school readiness that emphasized school readiness as not just consisting of children's skills in various areas, but also the readiness of the environment to promote these skills and both family and community readiness (Britto, 2012). Pertinent to the current study, missing from much of the current preschool effectiveness research is a focus on how preschool attendance rates once children are enrolled relate to children's ability to benefit from preschool in terms of improved school readiness. Chronic absenteeism is particularly high in preschool compared to elementary school, and many families face significant challenges to meet the 90% attendance

benchmark due to child illnesses, lack of transportation, and difficulty scheduling (particularly in half-day programs, Ehrlich et al., 2013). There is also no mandate for children to attend preschool, which was related to parents viewing preschool attendance as less important than K-12 attendance (Katz, Adams, & Johnson, 2015).

Children in elementary, middle, and high school who are chronically absent from school score lower on academic achievement tests (e.g., Chang & Romero, 2008; Connolly & Olson, 2012; Gottfried, 2009, 2011; Gottfried & Kirksey, 2017; Morrissey, Hutchison, & Winsler, 2013). Unfortunately, we know less about how children's chronic absenteeism in preschool correlates with children's school readiness skills, particularly in areas outside traditional measures of literacy, language, and mathematics. This is especially important to consider as recent reports indicate that on average 1 in 4 preschool children meet criteria for chronic absenteeism (Balfanz & Byrnes, 2013; Ehrlich et al., 2013; Katz et al., 2015). Children who live in high-poverty neighborhoods who may be at risk for difficulties in school are also more likely to have parents or caregivers that face significant barriers to getting their child to preschool on a regular basis (Dubay & Holla, 2015; Katz et al., 2015).

Emerging evidence supports an association between chronic absenteeism and preschool children's academic skills gains (Ansari & Purtell, 2017; Ehrlich et al., 2013; Logan, Piasta, Justice, Schatschneider, & Petrill, 2011). For example, preschoolers attending Head Start programs who were chronically absent made significantly less gains in literacy and mathematics skills (Ansari & Purtell, 2017). In this study, there were also significant interactions between parent-reported estimates of chronic absenteeism and both classroom quality and children's entering skills in predicting gains in school readiness skills. One limitation of this study was the use of parent-reported estimates of absences to extrapolate to estimated attendance rates across the school year. In another study using a more objective measure of attendance recorded by teachers, overall attendance rates mattered for gains in children's language skills, but only in classrooms with higher classroom quality measured using instructional support ratings which assess the degree to which teachers provide formative feedback to support problem solving and communication skills (Logan et al., 2011). However, in this study, researchers used listwise deletion to account for missing data, which could introduce bias as children who had more missing data could have been more likely to be in the chronically absent group. In a more comprehensive study of absenteeism and children's school readiness skills and longer-term academic achievement in Chicago Public Schools, Ehrlich and colleagues (2013) found that chronic absenteeism was associated with mathematics, literacy, and teacher-rated socio-emotional outcomes. These studies point to the importance of considering chronic absenteeism to better understand the factors that are associated with children's ability to benefit from an early learning environment.

Chronic absenteeism and executive functioning skills

In the current study, we focus on children's executive functioning (EF) skills development in preschool. These domain-general skills include working memory, or the ability to hold information in mind and manipulate it, inhibitory control, or the ability to focus attention and inhibit attention to distractors, and attention shifting, or the ability to flexibly shift attention from one task to another (Miyake, Friedman, Rettinger, Shah, & Hegarty, 2001). Children make significant gains in their EF skills between the ages of 3 – 5, and these skills are strongly linked to children's later academic achievement, especially in the domain of mathematics (e.g., Fuhs et al., 2014; Schmitt, Geldhof, Purpura, Duncan, & McClelland, 2017). In early childhood, EF skills may facilitate learning by way of facilitating general learning-related behaviors. For example, children who had higher EF skills at the start of preschool were better able to engage in learning-related behaviors in the classroom, which in turn predicted their academic achievement gains (Nesbitt, Farran, & Fuhs, 2015). Thus, these early EF skills are important to consider in the context of early childhood program evaluations.

Current research leaves open the question of whether chronic absenteeism in preschool and EF skills gains are related. Instability in the early childhood environment and lack of regular routines and predictability can interrupt children's development of EF skills through disruptions in brain development in the prefrontal cortex (Shonkoff, 2011). From this, one could argue that the predictability and

structure that regular preschool attendance provides could be directly related to EF skills gains regardless of variations in specific contextual variables in children's classroom or family experiences. However, it is likely that this effect may be moderated by both classroom quality differences as well as risk factors such as living in a high-poverty neighborhood. There is evidence to suggest that children who live in higher-poverty neighborhoods benefit most from preschool programs in terms of their school readiness skills gains generally (Ladd, 2017), which could suggest that the positive effects of attending 90% or more of scheduled days would be stronger for children living in high-poverty neighborhoods. Also, classroom quality moderated the chronic absenteeism and academic achievement link in prior studies (Ansari & Purtell, 2017; Logan et al., 2011), where researchers found that chronic absenteeism mattered only for children who were attending classrooms with higher instructional quality. In other words, it was not simply the dosage of preschool that mattered for children's academic outcomes, but specifically dosage in the context of high-quality learning environments in which teachers provide feedback to expand and deepen skills and knowledge and opportunities for social learning.

Though the link between living in high-poverty neighborhoods and EF skills development specifically is both predicted by the toxic stress hypothesis and supported by empirical findings (Shonkoff et al., 2012), extant research on the overall links between classroom quality and EF skills specifically in preschool is somewhat unclear. This makes it difficult to determine if classroom quality would moderate the association between attendance rates and children's EF skills gains. On one hand, there is evidence to suggest that EF skills may be relatively less malleable in the preschool learning environment compared to academic skills. The percentage of variance in EF skills gains that can be attributed to classroom-level influences (as opposed to child-level influences) is typically lower than variance accounted for in academic outcomes (c.f., Arnold, Kupersmidt, Voegler-Lee, & Marshall, 2012; Lipsey et al., 2017). A recent large-scale evaluation of an EF skills focused curriculum showed that children in experimental classrooms did not improve their EF skills significantly more than children in the control group, although there were not effects for academic skills either (Farran & Wilson, 2014). On the other hand, recent randomized control trials indicated that targeted preschool program features produced increased gains in children's EF skills (Tominey & McClelland, 2011; Schmitt et al., 2017; Duncan, Schmitt, Burke, & McClelland, 2018; Raver et al., 2011), and correlational evidence suggested that specific processes within the preschool classroom environment explained variations in children's gains in EF skills in preschool (Fuhs, Farran, & Nesbitt, 2013). Exploring these potential moderating effects is important for the design of preschool initiatives to increase enrollment and regular attendance. Specifically, understanding the particular circumstances under which attendance initiatives may work best and if effects for EF skills are similar to those found for academic outcomes can help to inform funding priorities in the expanding preschool landscape in the United States.

Current study

Prior research leaves open questions of if, and under what conditions, chronic absenteeism is significantly related to children's school readiness in the area of EF skills. In the current study, we examined the associations between chronic absenteeism and children's gains in EF skills among a sample in which many children were at risk for later academic difficulties. We also examined possible moderating effects of classroom quality and neighborhood poverty concentration.

Method

Participants

A university human subjects review board approved this study. Parents of 197 preschool-aged children provided consent for participation in the study. Children were attending preschool in classrooms that were part of a demonstration year project for a preschool expansion effort for 4-year-olds in targeted areas of a mid-size Midwestern city. Children were nested within 48 classrooms in a variety of preschool settings, including public and private school-based and child care settings. On average, there

were 4 children per classroom ($SD = 3$) in the consented sample (range = 1 – 12 children). Children's average age was 52 months ($SD = 5$ months) at the start of the school year (range = 40 – 64 months) and 55% of children were male. We did not have access to race/ethnicity information at the individual child level, but on average, 51% of individuals living in neighborhoods in which consented children resided were African-American ($SD = 36\%$; range = 0 – 100%).

Measures and procedures

EF skills

We used Head Toes Knees Shoulders (HTKS; Ponitz, McClelland, Matthews, & Morrison, 2009) to assess children's EF skills in the fall (October – November) and spring (March – May) of their pre-school year, with an average of five months between assessments. Trained research assistants conducted child assessments in children's classrooms or another quiet space in the preschool. This assessment has been shown to be reliable and valid, correlating highly with other measures of EF skills in preschoolers (Lipsey et al., 2017), and is similar to the popular children's game "Simon Says". An experimenter first asked children to demonstrate that they could touch their head and their toes, after which the experimenter explained that when she said "head", children were instructed to touch their toes and vice versa. Children completed practice trials before 10 test trials. Children received a score of zero if they answered incorrectly, one if they made a movement toward the incorrect answer but then self-corrected, and two if they responded correctly. Children who scored a four or higher on the first game then moved on to a second game with the same rules except that the experimenter instructed children to touch their shoulders and their knees. Children then completed a game that put all four rules together. Just as before, if children scored a four or higher on this game, they proceeded to a final game in which the four rules were switched. Final scores on the original task range from 0 – 60. However, consistent with other research (Fuhs et al., 2014), we included practice trials to increase variability at the lowest end of the scale.

Classroom quality

The Classroom Assessment Scoring System (CLASS; Pianta, La Paro, & Hamre, 2008) is a classroom observation assessment that includes assessor ratings of three dimensions of teacher-child interactions: Emotional support (e.g., positive climate and teacher sensitivity), classroom organization, and instructional support (e.g., modeling complex language, high-quality verbal feedback). Scores range from 1 – 7 with higher scores indicating higher classroom quality. Items on the instructional support subscale demonstrate high internal consistency (Hamre, Mashburn, Pianta, LoCasale-Crouch, & La Paro, 2006), and the subscale has convergent validity with the language reasoning subscale of the Early Childhood Environmental Rating Scale ($r = .52$; La Paro, Pianta, & Stuhlman, 2004). Certified CLASS observers conducted classroom observations in the fall of the academic year. We focused on the instructional support dimension because it was the only dimension that correlated with EF skills gains, and it is also the dimension that was found in previous research to moderate attendance rates in predicting language outcomes (Logan et al., 2011).

Demographics and attendance

Parents reported child demographics, including age and gender. Preschool centers involved in the demonstration project recorded child attendance and provided this information to researchers on a monthly basis. Attendance rates were calculated as the total number of days attended divided by the total possible days to take into account varying center schedules and late enrollments. Consistent with prior research, we defined chronic absenteeism as attending less than 90% of scheduled days.

Neighborhood poverty

Home address information provided by parents/guardians was geocoded to associate census block group level socioeconomic data from the American Community Survey to each observation. The socioeconomic variables utilized included the percent of the population under 50%, 100%, and 200% of the

federal poverty line, percent of families with single female head of household, percent of households in poverty, percent of households with public assistance income, percent of housing units that are vacant, and percent of housing units that are rental occupied.

Missing data

Of the 197 children whose parents consented, there were three students with missing data on HTKS in the fall due to absences, and seven additional cases of missing data were due to children either not assenting to the assessment or having difficulty finishing the assessment due to distraction. This resulted in a sample size of 187 children for the fall HTKS assessments. In the spring, there were 123 children who completed the HTKS assessment (with $N = 117$ having both fall and spring assessments). Four children did not assent to the assessment in the spring, and three children started but did not complete the assessment due to distraction. The remaining cases of missing data were due to student absences or to scheduling conflicts with schools (e.g., field trips, end of year schedule changes, etc.). We collected official attendance records from schools and childcare centers for 190 children. Classroom quality information about instructional support was available for 45 of the 48 classrooms. Information on the concentration of neighborhood poverty was available for 166 children.

We compared children who had a score for spring HTKS to children who were missing a score on a number of variables and found that children who were missing a spring score were significantly more likely to be male ($\chi^2(1) = 5.98, p = .017$), younger ($t(191) = 2.09, p = .038$), exhibit chronic absenteeism ($\chi^2(1) = 24.19, p < .001$), and live in a neighborhood with a higher poverty concentration ($t(164) = -3.61, p < .001$). This suggests a need to not limit the sample based on complete cases (i.e., analytic sample would be dissimilar from sample population), and therefore, we used Full Information Maximum Likelihood (FIML) estimation procedures in Mplus v. 8 (Muthén & Muthén, 2017) for our analyses. FIML estimation has been shown to be superior to listwise deletion by reducing regression coefficient bias (Enders, 2001), and in the current study, produced a similar pattern of results as listwise deletion.

Analytic plan

We conducted our analyses in Mplus v. 8 (Muthén & Muthén, 2017) with FIML estimation procedures and adjusting standard errors for the nesting of children in classrooms (type = complex). We regressed spring HTKS scores on covariates (age, pre-test, HTKS testing interval), chronic absenteeism, neighborhood poverty concentration, and CLASS instructional support. We also entered into our model interactions among chronic absenteeism, neighborhood poverty concentration, and CLASS instructional support scores. Children living within the same census block groups from which we drew our neighborhood poverty variables could suggest the inclusion of an additional nesting level for census block group that would be cross-classified with classroom in our multilevel models. However, the average number of children within a census block group was only two and the median number of children within a census block group was one. Given that the sample size was not especially large and that children within neighborhoods were often grouped together within the same classrooms and centers, we treated this variable as a fixed effect with standard errors adjusted for nesting of children within classrooms.

Results

Descriptive statistics

See Table 1 for descriptive statistics for all child-level variables included in analyses. On average, the attendance rate was 92% of scheduled days. There were 47 children (23.9%) in the sample who had attendance records consistent with chronic absenteeism. The average percentage of households living in poverty in neighborhoods in which children resided was 26%, but there was considerable variation

Table 1. Descriptive statistics.

	<i>N</i>	Min	Max	<i>M</i>	<i>SD</i>
Age in Months	194	40.00	64.00	52.51	4.02
Fall HTKS Total Score	187	0.00	63.00	11.97	15.94
Spring HTKS Total Score	123	0.00	72.00	18.93	20.99
Fall to Spring Testing Interval	117	3.00	7.00	4.68	0.89
Overall Attendance Rate	190	0.38	1.00	0.92	0.09
Census Block Groups					
% of population under 50% of FPL	166	0.00	0.63	0.14	0.12
% of population under 100% of FPL	166	0.00	0.90	0.29	0.20
% of population under 200% of FPL	166	0.03	0.96	0.53	0.23
% of families with single female head	165	0.00	1.00	0.52	0.31
% of households in poverty	166	0.00	0.92	0.26	0.22
% of households with public assistance income	166	0.00	0.25	0.06	0.06
% of vacant housing units	166	0.00	0.63	0.19	0.15
% of housing units rental occupied	166	0.00	1.00	0.48	0.23

Note: HTKS = Head Toes Knees Shoulders; FPL = Federal Poverty Level.

across neighborhoods with some neighborhoods including no households living below the poverty line while other neighborhoods had up to 92% of households living below the poverty line. Children’s HTKS scores at the beginning of preschool were comparable to similar samples (Fuhs, Farran, & Nesbitt, 2015; Nesbitt et al., 2015). Children significantly improved their HTKS scores from fall to spring ($t(116) = 4.964, p < .001$). The average CLASS Instructional Support score for classrooms was 3.54 ($SD = 1.20$; Range = 1.00 – 6.08).

Neighborhood poverty data reduction

Most of the census block group variables were strongly associated with each other ($r_s = .25 - .97, p_s < .001$), with the exception of percent of households with public assistance income which was not significantly associated with percent of housing units that are vacant ($r = .11, p = .159$). We conducted a principal component analysis for data reduction purposes that first yielded a two-factor solution in which only households with public assistance income loaded onto a second component. Given its low correlations with other variables and its single loading onto a separate component with an eigenvalue of 1.002, we removed this variable from analysis and re-ran the principal component analysis, yielding a single factor that accounted for 70.50% of the variance. All loadings were above .60. We used this component in analyses.

Correlations

Correlations among variables included in analyses were estimated in Mplus and are presented in Table 2. As expected, children who were older scored higher on the HTKS task in both fall and spring, and children’s fall and spring HTKS scores were strongly related. Neighborhood poverty concentration and both chronic absenteeism and overall attendance rates were related such that children who lived in neighborhoods with higher poverty concentration were more likely to be absent from school more often. Chronic absenteeism was negatively related to children’s spring HTKS total scores such that children who were chronically absent had lower spring HTKS scores. The HTKS testing interval was associated with classroom quality and chronic absenteeism, so this variable was included in our analyses. It is not entirely clear why this is the case for classroom quality, but it is possible that ease of scheduling of assessments was perhaps indirectly related to classroom quality. Children who had lower overall attendance rates were more likely to be assessed with a wider testing interval given that we had to go back to those schools more than once to try to assess them on subsequent days after being absent. Finally, one unexpected negative correlation emerged between age and classroom quality. Gender was not significantly correlated with any other variables and was not included analyses ($p_s > .05$).

Table 2. Correlations among variables used in analyses.

Variable	1	2	3	4	5	6	7
1. Age in Months	1.00						
2. Fall HTKS Total Score	.26**	1.00					
3. Spring HTKS Total Score	.35**	.62**	1.00				
4. Fall to Spring Testing Interval	-.12	.05	-.07	1.00			
5. Chronic Absenteeism	-.001	-.02	-.19 [†]	.17	1.00		
6. Overall Attendance Rate	.08	.06	.06	-.28 [†]	-.75**	1.00	
7. Neighborhood Poverty Composite	-.10	-.08	-.17 [†]	.09	.13 [†]	-.18**	1.00
8. Classroom Quality	-.19**	-.07	.06	-.32**	.03	.05	1.00

Note: These correlations were estimated in Mplus using full-information maximum likelihood estimates.

** $p < .01$. * $p < .05$. [†] $p < .10$.

Unconditional and conditional models

We first ran an unconditional model to determine the percentage of variance in spring HTKS scores that could be attributed to classroom and child-level differences. We found that 12% of the variance in spring HTKS scores could be attributed to classroom differences, with the remaining 88% attributable to child-level differences. This is relatively consistent with other reported studies (91% variance attributed to child-level differences in Fuhs et al., 2013).

We then ran two separate models predicting spring HTKS scores. In our first model, we entered chronic absenteeism as a predictor of spring HTKS scores. Children who attended 90% or more of their preschool days were scored as a 0, and children who attended less than 90% of their scheduled preschool days were scored as a 1 for meeting criteria for chronic absenteeism. We regressed spring HTKS scores on covariates (fall HTKS scores, age, HTKS testing interval), chronic absenteeism, neighborhood poverty composite, classroom quality, and interactions among chronic absenteeism and both classroom quality and neighborhood composite scores. In order to maximize the available sample size that could be used in estimation, we regressed each of our variables of interest on age to model them as endogenous. We also allowed the neighborhood poverty variable and chronic absenteeism to correlate given their association. Next, we re-ran the same model using overall attendance rates instead of the chronic absenteeism marker to explore if continuous variation in attendance rates both above and below the 90% threshold was associated with children's EF skills gains.

Results of the model using chronic absenteeism are presented in Table 3. Consistent with prior research in preschool academic gains, we found a significant negative main effect for chronic absenteeism on children's EF skills gains. That main effect was qualified by a significant interaction between chronic absenteeism and classroom quality. As illustrated in Figure 1, we probed the interaction using Preacher's computational macro (Preacher, Curran, & Bauer, 2006) and found that chronic absenteeism was significantly related to children's spring HTKS scores only when children were in high quality classrooms ($\beta = -.50$, $SE = .13$, $p < .001$).

Table 3. Standardized results for correlations between chronic absenteeism and children's EF skills gains.

Predictor	β	SE	p
Fall HTKS Scores	.56	.08	< .001
Age	.23	.09	.006
HTKS Interval	-.01	.08	.866
Neighborhood Poverty	-.07	.07	.323
CLASS Instructional Quality	.08	.09	.382
Chronic Absenteeism (< 90% attendance = 1)	-.28	.05	< .001
Chronic Absent*Neighborhood Poverty	.02	.09	.778
Chronic Absent*CLASS Instructional Quality	-.22	.08	.008
Neighborhood Poverty*CLASS Instructional Quality	-.03	.11	.747
Three-Way Interaction	-.13	.13	.334

Table 4. Standardized results for correlations between attendance rate and children’s EF skills gains.

Predictor	β	SE	<i>p</i>
Fall HTKS Scores	.55	.08	< .001
Age	.22	.09	.010
HTKS Interval	-.05	.09	.571
Neighborhood Poverty	-.06	.09	.512
CLASS Instructional Quality	.07	.10	.448
Attendance Rate	.09	.11	.425
Attend*Neighborhood Poverty	-.14	.10	.178
Attend*CLASS Instructional Quality	.12	.09	.182
Neighborhood Poverty*CLASS Instructional Quality	.07	.10	.468
Three-Way Interaction	-.29	.12	.014

Next, we explored if that effect held when examining overall attendance rates. There were no significant main effects for overall attendance rate, nor were there significant interactions between attendance rate and classroom quality or neighborhood poverty concentration. There was, however, a three-way interaction in which the interaction between attendance rates and classroom quality was moderated by neighborhood poverty concentration. As illustrated in Figure 2, we probed the interaction and found that children’s spring HTKS scores were significantly higher when children had higher overall

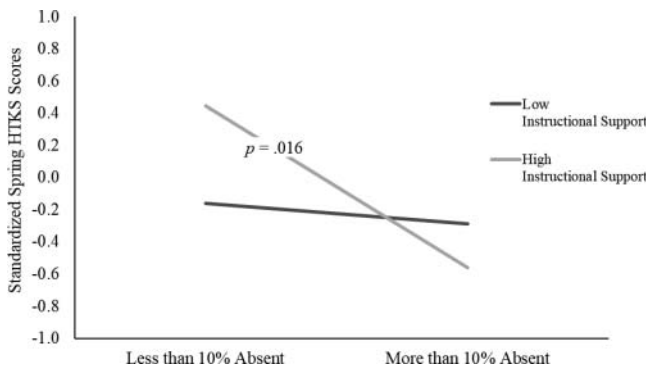


Figure 1. Interaction between classroom quality and chronic absenteeism on children’s spring EF skills. *Note.* Values reported here are model-fitted values from multilevel modeling results in Mplus, and spring HTKS scores therefore represent residualized gain scores controlling for fall HTKS and other covariates.

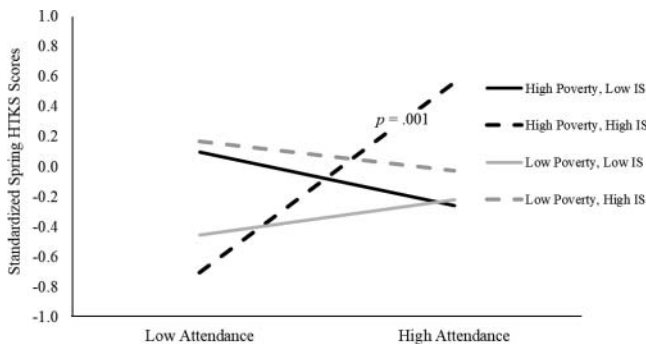


Figure 2. Effects of overall attendance rates on children’s spring EF skills moderated by neighborhood poverty and classroom quality. *Note.* Values reported here are model-fitted values from multilevel modeling results in Mplus, and spring HTKS scores therefore represent residualized gain scores controlling for fall HTKS and other covariates. Interactions were probed using Preacher et al.’s (2006) macro. IS = CLASS Instructional Support.

attendance rates when children were living in higher poverty neighborhoods and were in classrooms with higher CLASS instructional support scores ($\beta = .63, SE = .24, p = .001$). This suggests that overall attendance rates were associated with children's EF skills gains only for children who lived in neighborhoods with a higher poverty concentration and who attended high-quality preschool classrooms.

Discussion

We examined the associations between chronic absenteeism and overall attendance rates and children's EF skills gains in the context of variations in classroom quality and neighborhood poverty concentration. Chronic absenteeism was related to children's EF skills gains in preschool such that children who met criteria for chronic absenteeism made significantly less gains in their EF skills from fall to spring of their preschool year. This effect was qualified by an interaction between chronic absenteeism and classroom quality such that the differences in EF skills by chronic absenteeism were only present for children who were attending higher quality classrooms as defined by higher CLASS instructional support scores in the fall. We further explored if these effects held when examining continuous variation in attendance rates instead of a dichotomous marker for chronic absenteeism. We found that overall attendance rates were significantly associated with children's EF skills only among children who were living in neighborhoods with a higher poverty concentration and who were attending higher quality preschool classrooms.

Our work extends what is known about chronic absenteeism in preschool in two ways. First, our findings provide evidence that the potential associations between regular attendance in a preschool program and school readiness may extend beyond traditional measures of academic skills and also relate to EF skills. This is particularly important given the long-term associations reported between children's EF skills and not only their academic achievement but also their overall health and well-being (Moffitt et al., 2011). Thus, positive effects of regular attendance in a high-quality preschool classroom may yield benefits for children's skills both within and outside of school as well. There remains uncertainty about the extent to which young children's EF skills are malleable within the preschool classroom context, and this research provides evidence that chronic absenteeism could interfere with the potential learning benefits children experience in a high-quality classroom. One could argue that perhaps chronic absenteeism may be related to children's EF skills simply by providing a regular structure and predictable routine to children's days, rather than relating to specific aspects of the preschool learning environment *per se*. However, the fact that the association between chronic absenteeism and EF skills gains was moderated by classroom quality specific to teacher-child interactions involving use of more complex language and problem solving suggests that this association is centered on specific aspects of the preschool classroom environment involving teacher-student interactions.

The second way that this work extends prior work examining absenteeism and child outcomes is that we found associations not only for chronic absenteeism in high-quality classrooms but also between continuous variation in attendance rates and children's EF skills depending on both neighborhood poverty concentration and classroom quality variations. Parents of children living in poverty or in high-poverty neighborhoods often experience more difficulty with regular preschool attendance (Ehrlich et al., 2013), and our correlational findings are consistent with prior work. This could suggest that using a dichotomous marker for chronic absenteeism may also capture children who have other risk factors for difficulties in academic and non-academic skills, which could present a confound. Utilizing the continuous variation in attendance rates may help to parse apart the effects of both attendance and poverty on children's gains in their school readiness skills. Indeed, continuous variation in attendance rates was linked to children's EF skills gains only for children who lived in neighborhoods with a higher poverty concentration and who were attending high-quality preschool classrooms. These associations did not hold for children from neighborhoods with a lower concentration of poverty regardless of the quality of the classroom environment. Prior evidence links neighborhood and family poverty to lower EF skills in preschoolers (e.g., Noble, Norman, & Farah, 2005), and thus, higher attendance rates in a higher quality classroom could serve as a protective factor of children's EF skills development in the context of poverty.

Implications

Specific attention to preschool attendance provides a more comprehensive picture of the factors that are associated with children's school readiness gains. Specifically, regular attendance in a high-quality preschool experiences may serve as a protective factor for optimal brain development, particularly in areas of the prefrontal cortex that show significant change in the preschool years and that are known to be related to children's EF skills (Shonkoff, 2011). Testing this prediction causally is an important direction for future work because evaluations of preschool effectiveness have often assessed enrollment in a preschool program of interest without specific attention to elements of quality and factors that increase or decrease regular attendance. Our findings suggests that policy initiatives aimed towards increasing regular attendance rates coupled with resources to increase classroom quality could have specific benefits for children's EF skills among children living in higher poverty neighborhoods.

Importantly, there is evidence that attendance and classroom quality are both malleable factors that could be targeted to improve young children's EF skills in vulnerable populations. In a recent randomized control trial, researchers used postcards to give parents of elementary through high school students information about the benefits of regular attendance and found that children in the experimental group significantly improved their attendance as compared to the control group (Rogers et al., 2017). Likewise, there is experimental evidence that classroom quality is malleable through specific teacher training with elementary school teachers (Brown, Jones, LaRusso, & Aber, 2010). Although much of this work has not been extended to preschool, the potential effects of an informational postcard could be even more important for parents of preschoolers given that parents may view preschool attendance as less important as compared to elementary school (Katz et al., 2015). Classroom-based interventions could also be even more important among preschool teachers in improving child outcomes given the sensitive period children experience in preschool around EF skills. There could also be potential reciprocal benefits of a combined effort to increase attendance rates alongside programs to increase classroom quality as increases in classroom quality may foster more positive attitudes about preschool attendance among children and parents, and increased attendance may improve a teacher's ability to foster high-quality interactions in the classroom.

Limitations

Several limitations to this research should be noted. These data were collected as part of a demonstration year project to expand preschool availability, yielding a diverse sample and access to both administrative and researcher-collected information. However, there were limitations to this data including sample size and missingness across variables. We accounted for missingness using best practices to reduce bias, but future work should include replication of these associations in a larger sample with special attention to reducing missing data for children who are absent frequently from preschool. There were also limitations in our ability to capture a broad range of demographic variables at the child level. For example, we relied on geocoded census block group information from the American Community Survey to create a neighborhood poverty concentration composite variable for each individual. Although there is likely considerable overlap in neighborhood poverty concentration and individual family income, we did not have access to individual household income. Future studies should consider the role of individual family income as the associations between chronic absenteeism and children's EF skills gains may be more specifically tied to individual family income rather than neighborhood poverty concentration. Despite this limitation, we were able to use children's initial EF skills at school entry as a covariate, and research has suggested that pre-test scores capture considerable variance that overlaps with other common demographic covariates (Lipsey & Hurley, 2009). Another limitation to the current study was the use of a single measure of EF skills. Confirmatory factor analysis does support a single-factor construct as the best fitting model of EF skills in preschoolers (Wiebe et al., 2011), suggesting that measures of EF skills such as the HTKS likely capture elements of working memory, inhibitory control, and attention shifting. In addition, HTKS is highly correlated with other measures of EF skills (Lipsey et al., 2017). However, using a battery of tasks in future studies can help minimize

noise that can result from the use of a single indicator. Finally, we used a longitudinal correlational design to examine the links between attendance rates and children's EF skills gains, which prevents us from making causal claims about the role of attendance in preschool children's EF skills gains.

Conclusions

Current efforts to expand access to preschool are underway in many cities across the United States. To ensure that increased access has the intended effect of better preparing children for school through increased EF skills, our research suggests we must support families in their efforts to get their children to preschool on a regular basis and also strive to offer high-quality experiences through teacher supports for extending children's problem solving and conversational skills through feedback to expand and deepen skills and knowledge (i.e., instructional support). Future research evaluating these programs for their effectiveness in improving children's EF skills, especially among children living in poverty, should consider experimentally testing programs to increase both attendance rates and classroom quality simultaneously.

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References

- Ansari, A., & Purtell, K. M. (2017). Absenteeism in Head Start and children's academic learning. *Child Development*. Advance online publication. doi:10.1111/cdev.12800
- Arnold, D. H., Kupersmidt, J. B., Voegler-Lee, M. E., & Marshall, N. A. (2012). The association between preschool children's social functioning and their emergent academic skills. *Early Childhood Research Quarterly*, 27, 376–386. doi:10.1016/j.ecresq.2011.12.009
- Balfanz, R., & Byrnes, V. (2013). *Meeting the challenge of combating chronic absenteeism: Impact of the NYC Mayor's interagency task force on chronic absenteeism and school attendance and its implications for other cities*. Baltimore, MD: Everyone Graduates Center, School of Education, Johns Hopkins University.
- Balfanz, R., & Byrnes, V. (2012). The importance of being in school: A report on absenteeism in the nation's public schools. *Education Digest*, 78, 4–9.
- Britto, P. R. (2012). *School readiness: A conceptual framework*. New York, NY: United Nations Children's Fund.
- Bronfenbrenner, U. (2005). *Making human beings human: Bioecological perspectives on human development*. Thousand Oaks, CA: Sage Publications.
- Brown, J. L., Jones, S. M., LaRusso, M. D., & Aber, J. L. (2010). Improving classroom quality: Teacher influences and experimental impacts of the 4rs program. *Journal of Educational Psychology*, 102, 153–167. doi:10.1037/a0018160
- Campbell, F. A., Ramey, C. T., Pungello, E., Sparling, J., & Miller-Johnson, S. (2002). Early childhood education: Young adult outcomes from the Abecedarian project. *Applied Developmental Science*, 6, 42–57. doi:10.1207/s1532480xads0601_05
- Chang, H. N., & Romero, M. (2008). *Present, engaged, and accounted for: The critical importance of addressing chronic absence in the early grades*. New York, NY: National Center for Children in Poverty.
- Connolly, F., & Olson, L.S. (2012). *Early elementary performance and attendance in Baltimore City Schools' prekindergarten and kindergarten*. Baltimore, MD: Baltimore Education Research Consortium.
- Dubay, L., & Holla, N. (2015). *Absenteeism in DC Public Schools early education program: An update for school year 2013–14*. Washington, DC: Urban Institute.
- Duncan, R. J., Schmitt, S. A., Burke, M., & McClelland, M. M. (2018). Combining a kindergarten readiness summer program with a self-regulation intervention improves school readiness. *Early Childhood Research Quarterly*, 42, 291–300. doi:10.1016/j.ecresq.2017.10.012
- Duncan, G. J., Claessens, A., Huston, A. C., Pagani, L. S., Engel, M., Sexton, H., ... Japel, C. (2007). School readiness and later achievement. *Developmental Psychology*, 43, 1428–1446. doi:10.1037/0012-1649.43.6.1428

- Ehrlich, S. B., Gwynne, J. A., Pareja, A. S., Allensworth, E. M., Moore, P., Jagesic, S., & Sorice, E. (2013). *Preschool attendance in Chicago public schools: Relationships with learning outcomes and reasons for absences*. Chicago, IL: The University of Chicago Consortium on Chicago School Research.
- Enders, C. K. (2001). The performance of the full information maximum likelihood estimator in multiple regression models with missing data. *Educational and Psychological Measurement*, 61, 713–740. doi:10.1177/00131644001615001
- Farran, D. C. (2016). *We need more evidence in order to create effective pre-K programs*. (Evidence Speaks Reports, Vol. 1, #11). Washington, DC: Brookings Institution.
- Farran, D. C., & Wilson, S. J. (2014). *Achievement and self-regulation in prekindergarten classrooms: Effects of the Tools of the Mind curriculum* (Research Report). Nashville, TN: Vanderbilt University, Peabody Research Institute.
- Fuhs, M. W., Farran, D. C., & Nesbitt, K. T. (2013). Preschool classroom processes as predictors of children's cognitive self-regulation skills development. *School Psychology Quarterly*, 28, 347–359. doi:10.1037/spq0000031
- Fuhs, M. W., Farran, D. C., & Nesbitt, K. T. (2015). Prekindergarten children's executive functioning skills and achievement gains: The utility of direct assessments and teacher ratings. *Journal of Educational Psychology*, 107, 207–221. doi:10.1037/a0037366
- Fuhs, M. W., Nesbitt, K. T., Farran, D. C., & Dong, N. (2014). Longitudinal associations between executive functioning and academic achievement across content areas. *Developmental Psychology*, 50, 1698–1709. doi:10.1037/a0036633
- Gormley, W. T., Gayer, T., Phillips, D., & Dawson, B. (2005). The effects of universal pre-k on cognitive development. *Developmental Psychology*, 41, 872–884. doi:10.1037/0012-1649.41.6.872
- Gottfried, M. A. (2009). Excused versus unexcused: How student absences in elementary school affect academic achievement. *Educational Evaluation and Policy Analysis*, 31, 392–419. doi:10.3102/0162373709342467
- Gottfried, M. A. (2011). Absent peers in elementary years: The negative classroom effects of unexcused absences on standardized testing outcomes. *Teachers College Record*, 113, 1597–1632.
- Gottfried, M. A., & Kirksey, J. J. (2017). “When” students miss school: The role of timing of absenteeism on students' test performance. *Educational Researcher*, 46, 119–130. doi:10.3102/0013189x17703945
- Hamre, B. K., Mashburn, A. J., Pianta, R. C., LoCasale-Crouch, J., & La Paro, K. M. (2006). *Classroom Assessment Scoring System technical appendix. Classrooms Assessment Scoring System (CLASS)*. Baltimore, MD: Brookes Publishing Company.
- Heckman, J. J. (2006). Skill formation and the economics of investing in disadvantaged children. *Science*, 312, 1900–1902. doi:10.1126/science.1128898
- Katz, M., Adams, G., & Johnson, M. (2015). *Insights into absenteeism in DCPS early childhood program: Contributing factors and promising strategies*. Washington, DC: Urban Institute.
- Ladd, H. F. (2017). *Do some groups of children benefit more than others from pre-kindergarten programs? The current state of scientific knowledge on pre-kindergarten effects*. Washington, DC: Brookings Institution.
- La Paro, K.M., Pianta, R.C. & Stuhman, M. (2004). The Classroom Assessment Scoring System: Findings from the pre-kindergarten year. *The Elementary School Journal*, 10, 409–426. doi:10.1086/499760
- Lipsey, M. W., & Farran, D. C. (2016). *Effects of a state prekindergarten program on children's achievement and behavior through third grade* (Research Report). Nashville, TN: Vanderbilt University, Peabody Research Institute.
- Lipsey, M. W., & Hurley, S. M. (2009). Design sensitivity. In L. Bickman & D. J. Rog (Eds.), *The SAGE handbook of applied social research methods*, 2nd Edition (pp. 44–76). Thousand Oaks, CA: Sage Publications.
- Lipsey, M. W., Nesbitt, K. T., Farran, D. C., Dong, N., Fuhs, M. W., & Wilson, S. J. (2017). Learning-related cognitive self-regulation measures for prekindergarten children: A comparative evaluation of the educational relevance of selected measures. *Journal of Educational Psychology*, 109, 1084–1102. doi:10.1037/edu0000203
- Logan, J. A., Piasta, S. B., Justice, L. M., Schatschneider, C., & Petrill, S. (2011). Children's attendance rates and quality of teacher-child interactions in at-risk preschool classrooms: Contribution to children's expressive language growth. *Child & Youth Care Forum*, 40, 457–477. doi:10.1007/s10566-011-9142-x
- McClelland, M. M., Cameron, C. E., Connor, C. M., Farris, C. L., Jewkes, A. M., & Morrison, F. J. (2007). Links between behavioral regulation and preschoolers' literacy, vocabulary, and math skills. *Developmental Psychology*, 43, 947–959. doi:10.1037/0012-1649.43.4.947
- Miyake, A., Friedman, N. P., Rettinger, D. A., Shah, P., & Hegarty, M. (2001). How are visuospatial working memory, executive functioning, and spatial abilities related? A latent-variable analysis. *Journal of Experimental Psychology: General*, 130, 621–640. doi:10.1037//0096-3445.130.4.621
- Moffitt, T. E., Arseneault, L., Belsky, D., Dickson, N., Hancox, R. J., Harrington, H., ... Caspi, A. (2011). A gradient of childhood self-control predicts health, wealth, and public safety. *Proceedings of the National Academy of Sciences*, 108, 2693–2698. doi:10.1073/pnas.1010076108
- Morrissey, T. W., Hutchison, L., & Winsler, A. (2013). Family income, school attendance, and academic achievement in elementary school. *Developmental Psychology*, 50, 741–753. doi:10.1037/a0033848
- Muthén, L. K., & Muthén, B. O. (2017). *Mplus user's guide* (8th ed.). Los Angeles, CA: Muthén & Muthén.
- Nesbitt, K. T., Farran, D. C., & Fuhs, M. W. (2015). Executive function skills and academic achievement gains in prekindergarten: Contributions of learning-related behaviors. *Developmental Psychology*, 51, 865–878. doi:10.1037/dev0000021
- Noble, K. G., Norman, M. F., & Farah, M. J. (2005). Neurocognitive correlates of socioeconomic status in kindergarten children. *Developmental Science*, 8, 74–87. doi:10.1111/j.1467-7687.2005.00394.x

- Phillips, D. A., Lipsey, M. W., Dodge, K. A., Haskins, R., Bassok, D., Burchinal, M.R., ... & Weiland, C. (2017). *The current state of scientific knowledge on pre-kindergarten effects*. Washington, DC: Brookings Institution.
- Pianta, R. C., La Paro, K. M., & Hamre, B. K. (2008). *Classroom Assessment Scoring System*. Baltimore, MD: Paul H. Brookes Publishing Company.
- Ponitz, C. C., McClelland, M. M., Matthews, J. S., & Morrison, F. J. (2009). A structured observation of behavioral regulation and its contributions to kindergarten outcomes. *Developmental Psychology, 45*, 605–619. doi:10.1037/a0015365
- Preacher, K. J., Curran, P. J., & Bauer, D. J. (2006). Computational tools for probing interaction effects in multiple linear regression, multilevel modeling, and latent curve analysis. *Journal of Educational and Behavioral Statistics, 31*, 437–448. doi:10.3102/10769986031004437
- Puma, M., Bell, S., Cook, R., Heid, C., Broene, P., Jenkins, F., ... Downer, J. (2012). *Third grade follow-up to the Head Start Impact Study final report* (OPRE Report # 2012–45). Washington, DC: Office of Planning, Research and Evaluation, Administration for Children and Families, U.S. Department of Health and Human Services.
- Raver, C. C., Jones, S. M., Li-Grining, C., Zhai, F., Bub, K. & Pressler, E. (2011). CSRPs impact on low-income preschoolers' pre-academic skills: Self-regulation as a mediating mechanism. *Child Development, 82*, 362–378. doi:10.1111/j.1467-8624.2010.01561.x
- Rogers, T., Duncan, T., Wolford, T., Ternovski, J., Subramanyam, S., & Reitano, A. (2017). *A randomized experiment using absenteeism information to “nudge” attendance*. (REL 2017 -252). Washington, DC: U.S. Department of Education, Institute of Education Sciences, National Center for Education Evaluation and Regional Assistance, Regional Educational Laboratory Mid-Atlantic.
- Schmitt, S. A., Geldhof, G. J., Purpura, D. J., Duncan, R., & McClelland, M. M. (2017). Examining the relations between executive function, math, and literacy during the transition to kindergarten: A multi-analytic approach. *Journal of Educational Psychology, 109*, 1120–1140. doi:10.1037/edu0000193
- Schweinhart, L. J., Monti, J., Xiang, Z., Barnett, W. S., Belfield, C. R., & Nores, M. (2005). *Lifetime effects: The High/Scope Perry Preschool Study through age 40*. Ypsilanti, MI: High/Scope Press.
- Shonkoff, J. P. (2011). Protecting brains, not simply stimulating minds. *Science, 333*, 982–983. doi:10.1126/science.1206014
- Shonkoff, J. P., Garner, A. S., The Committee on Psychosocial Aspects of Child and Family Health, Committee on early Childhood, Adoption, and Dependent Care, and Section on Developmental and Behavioral Pediatrics, Siegel, B. S., Dobbins, M. I., Earls, M. F. Wood, D. L. (2012). The lifelong effects of early childhood adversity and toxic stress. *Pediatrics, 129*, e232–e246. doi:10.1542/peds.2011-2663
- Tominey, S. L., & McClelland, M. M. (2011). Red light, purple light: Findings from a randomized trial using circle time games to improve behavioral self-regulation in preschool. *Early Education & Development, 22*, 489–519. doi:10.1080/10409289.2011.574258
- U.S. Department of Education. (2011). Race to the top – Early learning challenge program. Retrieved from <https://www.ed.gov/comment/2682>
- Welsh, J. A., Nix, R. L., Blair, C., Bierman, K. L., & Nelson, K. E. (2010). The development of cognitive skills and gains in academic school readiness for children from low-income families. *Journal of Educational Psychology, 102*, 43–53. doi:10.1037/a0016738
- Wiebe, S. A., Sheffield, T., Nelson, J. M., Clark, C. A., Chevalier, N., & Espy, K. A. (2011). The structure of executive function in 3-year-old children. *Journal of Experimental Child Psychology, 108*, 436–452. doi:10.1016/j.jecp.2010.08.008