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Childhood Placement in Special Education and Adult Well-Being

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Abstract

The present study investigates the relationship between childhood placement in special education and adult well-being among 1,377 low-income, minority children participating in the Chicago Longitudinal Study. Roughly 16% of the sample received special education services in grades 1-8. After accounting for sociodemographic factors and early academic achievement, children receiving special education services tended to have lower rates of high school completion and fewer years of education, as well as greater rates of incarceration, substance misuse, and depression. Eighth grade academic achievement significantly mediated the association between childhood placement in special education and adult well-being outcomes. The study contributes to the literature by providing support for a pathway from childhood special education placement to adult outcomes among an inner-city minority cohort.

Keywords

special education; well-being; academic achievement; longitudinal

Currently, there are more than 6.4 million children receiving special education services in the United States (National Center for Education Statistics, 2012). Special education instruction should provide children with disabilities the resources and specialized assistance needed to access the general curriculum, while also improving academic and behavioral outcomes (Individuals with Disabilities Education Act [IDEA], 2004). However, there is evidence that special education services may be ineffective.

In 2013, 60% and 65% of 8th grade students with disabilities scored below the basic level for reading and mathematics, respectively, on the National Assessment of Educational Progress (National Center for Education Statistics, 2013). Some studies also show that children with

disabilities are at increased risk for poor adult outcomes (e.g., education attainment, substance use) relative to their peers (Kepper, Monshouwer, Dorsselaer, & Vollebergh, 2011; Newman, Wagner, Cameto, Knokey, & Shaver, 2010; Sanford et al., 2011). In comparison to closely matched peers not receiving special education services, children who are placed in special education have lower academic performance and greater engagement in problem behaviors (Morgan, Frisco, Farkas, & Hibel, 2010). Previous findings show that children with disabilities are more likely to have poor adult outcomes, and childhood placement in special education may be associated with low academic achievement. However, few studies have the capacity to examine childhood special education placement in relation to outcomes beyond adolescence. The purpose of the present study is to examine the relationship between childhood placement in special education and adult outcomes, as well as academic achievement as a potential mediator.

Special Education and Adult Well-Being

Students placed in special education are at greater risk for high school dropout, fewer years of postsecondary education, unemployment, and lower earnings in comparison to students who are not placed in special education (Blackorby & Wagner, 1996; Sanford, et al., 2011). In 2010-2011, the high school graduation rate for students with disabilities was 59% in comparison to 79% for the total population (Stetser & Stillwell, 2014). Results from the 2005 National Longitudinal Transition Study of Special Education indicate that only 45.6% of high school graduates with disabilities enroll in postsecondary education compared with 62.6% of high school graduates in general education (Newman et al., 2010). Those students with disabilities who find work after leaving school typically work in entry-level jobs with low earnings and little potential for promotion (Phelps & Hanley-Maxwell, 1997; Sanford et al., 2011).

Placement in special education may also be related to risk-taking behaviors and poor mental health functioning, which often persist into adulthood (Colman et al., 2009). Placement in special education is associated with involvement in juvenile delinquency and arrest as an adult (Chen, Symons, & Reynolds, 2011; Newman et al., 2010). Compared with the national average, there is consistent overrepresentation of adolescents with disabilities in the correctional and criminal justice system (Quinn, Rutherford, Leone, Osher, & Poirer, 2005). Several studies indicate higher rates of substance use among adolescents in special education in comparison to adolescents in general education (Kepper et al., 2011; McNamara & Willoughby, 2010). Additionally, children with learning disabilities (LD) tend to report higher depressive symptoms, lower self-esteem, and less general life satisfaction than their non-LD peers (McNamara, Willoughby, Chalmers, & YLC-CURA, 2005).

Special Education, Academic Achievement, and Adult Well-Being

The association between special education placement and academic achievement is unclear. Studies are constrained when testing whether students with disabilities benefit academically from special education services because there are no adequate comparison groups. Several studies have used value-added approaches and propensity score matching techniques to address the lack of comparison groups. Some results suggest that special education boosts

the academic performance of students with disabilities (Hanushek, Kain, & Rivkin, 2002); while other results suggest that special education has either no effect or a negative effect on the academic performance of students with disabilities (Reynolds & Wolfe, 1999; Morgan et al., 2010). Although the results are mixed, recent findings from the 2013 National Assessment of Educational Progress show that students placed in special education tend to perform below average on academic assessments and are further behind academically in comparison to their general education peers (National Center for Education Statistics, 2013). The associations between low academic achievement and poor adult outcomes are well established (Chen & Kaplan, 2003; Wagner, Newman, Cameto, & Levine, 2006). Poor academic performance among children in special education may disrupt future educational and occupational trajectories (Chen & Kaplan, 2003). Therefore, academic achievement may serve as a mediator between childhood placement in special education and adult well-being.

Theoretical Framework

Ecological systems theory is used in the present study to understand how placement in special education may influence adult outcomes. Children's individual characteristics, their environment (e.g., school, family, community), and the interaction between individual characteristics and the environment affect child development (see Bronfenbrenner, 1992, for further explanation of ecological systems theory). Using this framework, adult well-being outcomes can be viewed as socio-psychological occurrences that are influenced by special education placement. For example, placement in special education is hypothesized to have stigmatizing effects on children, such that children are more likely to display learned helplessness behaviors (Valas, 2001). This psychological development may lead to poor educational attainment in the future. If the child performs poorly on an academic assignment while placed in special education, they may begin to feel that there is nothing he or she can do to improve their academic performance. This may contribute to lowered educational expectations, which is associated with lower educational attainment (Ou & Reynolds, 2008). Thus, it is likely that special education placement affects children's psychological development in ways that potentially lead to poor adult outcomes.

The Present Study

In the present study, two research questions are examined. First, is childhood placement in special education associated with educational attainment, incarceration, substance misuse, and depression in adulthood? Second, if there is an association between childhood placement in special education and adult outcomes, is it mediated by academic achievement? This study contributes to the literature on special education placement in relation to adult well-being in several ways. First, the study focuses on a predominantly ethnic minority population who may be at greater risk for both special education placement and poor adult well-being relative to the general population. Second, the prospective nature of the study provides a more accurate picture of the relationship between childhood placement in special education and adult well-being. This type of research design allows us to adjust for many covariates that have not been previously accounted for in other longitudinal studies. Third, due to the importance of academic performance for both special education placement and future outcomes, 8th grade reading achievement, as a measure of

academic achievement, is examined as a mediator between special education placement and adult well-being.

Method

Sample and Data

The study sample is made up of participants from the Chicago Longitudinal Study (Chicago Longitudinal Study, 2005), an ongoing and comprehensive investigation of the effects of Chicago's Child-Parent Center (CPC) Program. The original sample ($N=1,539$) of predominantly low-income African American children consists of 989 children who participated in the CPC preschool program, and 550 children (comparison group) who participated in an alternative government-funded program, without CPC program exposure. The sample in the present study included 1,377 participants (89.5% of the original sample) who were active in the Chicago Public Schools for at least four years during grades 1-8. No differential and selective attrition was found between the study sample and the original sample (Conyers, Reynolds, & Ou, 2003). The study sample included 895 children (90.5% of original sample) in the program group and 482 children (87.6% of original sample) in the comparison group. CPC is a comprehensive preschool program that emphasizes child-centered education and family-support services among families and children in high-poverty neighborhoods. Participation in the CPC preschool program was found to be associated with lower rates of special education placement (Conyers et al., 2003). CPC program exposure is not the focus of the present study, but it is included as a covariate in analyses due to its association with positive developmental outcomes (Ou & Reynolds, 2006; Reynolds, Temple, Ou, Arteaga, & White, 2011). Data were collected from various sources, including child, parent, and teacher surveys, as well as school records and other administrative data (Reynolds, 2012).

Measures

Special education placement—Special education placement was measured in three ways. First, incidence of special education placement (self-contained or mainstreamed) in grades 1-8 was measured dichotomously (0 = none; 1 = any). Timing of special education placement was examined through two variables: special education placement between grades 1-3 and between grades 4-8. Both were dichotomously coded (0 = none; 1 = any). Second, incidence of special education placement by disability type in grades 1-8 was measured. We distinguished placement for emotion or behavior disorder (EBD), specific learning disability (LD), speech and language impairment (SPL), and mental handicap (MH). Variables were dichotomously coded (0 = none; 1 = any). Finally, number of years in special education placement was measured, which ranges from 0 to 7 years.

Educational attainment—Two measures were used including high school completion and years of education by age 24. High school completion was dichotomously coded 1 if participants completed their secondary education with an official diploma or were awarded a General Education Development (GED) credential by age 24. Otherwise, the variable was coded 0. Years of education ranges from 7 to 16. Obtaining a GED credential was coded 12, and college years were coded 13 to 16 based on credits earned.

Incarceration—Incarceration was dichotomously coded 1 if participants were ever incarcerated or jailed for 30 or more days by age 26. Otherwise, the variable was coded 0. Participants who were in jail less than 30 days were not coded as incarcerated because it is possible that these people were waiting for their trial or sentencing and may not end up being convicted or serving a subsequent sentence.

Substance misuse—Substance misuse was dichotomously coded 1 if participants self-reported any misuse, including drugs and/or alcohol over the course of their lifetime. Otherwise, the variable was coded 0.

Depression—Depression was measured using a depression scale comprised of five questions appearing in a modified version of the Derogatis Brief Symptom Inventory depression subscale (Derogatis & Melisaratos, 1983). Each item assessed how often one feels a manifestation of depression within the past month, ranging 0 (*not at all*) to 5 (*almost every day*). The items included feeling depressed, hopeless, lonely, sad, and believing that life is not worth living. Cronbach's alpha reliability coefficient was .84. The scale has been validated among several ethnic and minority samples (Pereda, Forns, & Pero, 2007; Prelow, Weaver, Swenson, & Bowman, 2005), and demonstrates evidence of construct and convergence validity (Derogatis & Melisaratos, 1983). Summing the items into a scale produced a continuous variable ranging from 0 to 25. Due to skewness and a hard to interpret continuous variable, a dichotomized variable, which used a cut-off point of 8 or above was used to approximate the top quartile of the depression scale scores. Participants with scores 7 or below were coded 0.

Sociodemographic factors—Several child and family variables that may be correlated with educational outcomes and adult well-being outcomes were included as covariates in the regression analyses. These include (1) race of child (0 = Not Black 1 = Black); (2) sex of child (0 = boy; 1 = girl); (3) low birth weight (below 2500 grams); (4) any child welfare case history ages 0-3; (5) mother was 18 or younger at child's birth; (6) mother did not complete high school by child's age 3; (7) single-parent by child's age 3; (8) 4 or more children in household by child's age 3; (9) AFDC participation; (10) eligibility for free lunch; (11) mother unemployed by child's age 3; and (12) school poverty level 60% or above in school attendance area. Some participants had missing data for some of the sociodemographic factors, including teen-parent status, maternal education, single parent status, family size, AFDC participation, school neighborhood poverty level, free lunch eligibility, and maternal employment status. Overall, variables had few missing values (missing values ranged from 0.5% to 3.2%). Missing data were imputed through multiple imputation procedures using the expectation-maximization (EM) algorithm (Schafer & Graham, 2002). Because missing values were imputed for some sociodemographic variables, a missing index was created. If participants had a missing value for any of the sociodemographic variables, they were coded 1. Otherwise, they were coded 0. This index was included in analyses because it allowed us to determine if participants with imputed data differ significantly from other participants.

CPC program participation—Two program components were measured: Preschool and school-age programs. The preschool and school-age variables were dichotomous (0 = none, 1 = any).

Academic achievement—The Iowa Test of Basic Skills (ITBS; Hieronymus & Hoover, 1990) was used to assess early academic achievement and 8th grade reading achievement. The ITBS has internal consistency reliabilities in the mid-.80s to low.90s (Salvia & Ysseldyke, 1998). The technical manual of the test reports no data on construct or criterion validity (Salvia & Ysseldyke, 1998). Early academic achievement was measured using word analysis subtests (an indicator of developed reading abilities) on at the end of kindergarten. Scores ranged from 22 to 99. Five participants were missing data, the mean, 63, was imputed for these missing scores. Eighth grade academic achievement was measured using the subtest scores for reading comprehension. Scores ranged from 77 to 212. The national average during the same year was a score of 166.

Data Analysis

Logistic regressions were used to analyze the dichotomous outcomes and multiple linear regressions were used to analyze the continuous outcome. To ensure there were no issues of multicollinearity, variance inflation (VIF) was examined. All individual VIF were less than 10 and all average VIF's were less than 6. STATA 13 was used to conduct all analyses. The coefficients for predictors in logistic regression analysis are presented as odds ratios. The odds ratio represents the odds that an outcome will occur given the predictor, compared to the odds of the outcome occurring in the absence of the predictor (Szumilas, 2010).

Following recommendations described by Preacher and Hayes (2004), we conducted a product of coefficients strategy to assess mediation. This strategy was used over a traditional causal-steps approach (Baron & Kenny, 1986) because simulations have shown this approach to be more powerful and effective compared with other mediation methods (Zhao, Lynch, & Chen, 2010). The product of coefficients strategy uses bootstrapping to directly test whether mediation exists by examining the difference between the total effect (c') of special education placement (IV) on adult outcomes (DV) and its direct effect (c) independent of 8th grade academic achievement (M). The bootstrapping approach estimates the indirect effects and calculates a 95% confidence interval (CI; $n = 5000$ bootstrapped resamples). If the CI interval of the indirect effect does not include 0, then the indirect effect is significant and mediation exists.

Results

Table 1 presents characteristics of the study sample separately for participants who were ever placed in special education in grades 1-8 and those who were never placed in special education; these characteristics were similar across groups for most variables. There were significant differences for gender, maternal employment status, CPC preschool participation, and ITBS word analysis at kindergarten. A smaller percentage of children who were placed in special education participated in the CPC preschool program, were female, and had employed mothers by age 3 in comparison to children who were not in special education.

Children who were placed in special education also scored lower on the ITBS word analysis at kindergarten than children who were not placed in special education (56.6 vs. 65.0).

In comparison to children who were never placed in special education, children who were ever placed in special education had significantly lower rates of high school completion (52.5% vs. 71.5%), as well as had higher rates of crime (26.3% vs. 11.8%), depression (18.4% vs. 14.7%), and substance misuse (18% vs. 9.7%). Additionally, the number of years of completed education was significantly different between students who were ever placed in special education and students who were never placed in special education (11.3 vs. 11.9, respectively).

Educational Attainment

Children placed in special education in grades 1-8 were 39% less likely to complete high school than children not placed in special education in grades 1-8 ($OR = .61$, 95% CI [.42, .88]). Each additional year of children placed in special education was associated with 11% less likelihood of completing high school ($OR = .89$, 95% CI [.82, .98]). When timing of placement in education was examined, placement in special education in grades 1-3 was not significantly associated with high school completion while children placed in special education in grades 4-8 were 40% less likely to complete high school than children not placed in special education in grades 4-8 ($OR = .60$, 95% CI [.38, .96]). None of the specific disability categories were significantly associated with high school completion. Table for results of high school completion is available upon request.

Table 2 presents the regression models predicting years of education. Placement in special education in grades 1-8 ($b = -.36$; $p < .01$), and number of years in special education ($b = -.07$; $p < .05$) were significantly associated with fewer years of education. When timing of placement in education was examined, placement in special education in grades 1-3 was not significantly associated with years of education while placement in special education in grades 4-8 was significantly associated with fewer years of education ($b = -.49$; $p < .01$). Among the types of special education, placement for LD was the only disability category significantly associated with years of education ($b = -.49$; $p < .01$).

Incarceration

Table 3 presents the logistic regression models predicting adult incarceration. Children placed in special education in grades 1-8 were 55% more likely to be incarcerated than children not placed in special education in grades 1-8 ($OR = 1.55$, CI [1.0, 2.4]). Each additional year of children placed in special education were associated with 12% more likelihood of incarceration ($OR = 1.12$, 95% CI [1.0, 1.2]). When timing of placement was examined, placement in special education in grades 1-3 was not significantly associated with incarceration while children placed in special education in grades 4-8 were 100% more likely to be incarcerated than children not placed in special education in grades 4-8 ($OR = 2.0$, 95% CI [1.2, 3.3]). Among the types of special education, children placed in special education for EBD were about 1.6 times more likely to be incarcerated than children without an EBD disability category ($OR = 2.60$, 95% CI [1.2, 5.5]).

Substance Misuse

Table 4 presents the logistic regression models predicting substance misuse by age 24. Children placed in special education in grades 1-8 were 69% more likely to engage in substance misuse than children not placed in special education in grades 1-8 ($OR = 1.69$, 95% CI [1.1, 2.7]). Each additional year children placed in special education was associated with 12% more likelihood of engaging in substance misuse ($OR = 1.12$, 95% CI [1.0, 1.3]). When timing of placement was examined, placement in special education in grades 1-3 was not significantly associated with substance misuse while children placed in special education in grades 4-8 were 82% more likely to engage in substance misuse than children not placed in special education in grades 4-8 ($OR = 1.82$, 95% CI [1.0, 3.3]). Among the types of special education, children placed in special education for LD were 85% more likely to engage in substance misuse than children not in special education for LD ($OR = 1.85$, 95% CI [1.0, 3.3]).

Depression

Placement in special education in grades 1-8 and the number of years in special education was not significantly associated with depression. When timing of placement was examined, placement in special education in grades 1-3 was not significantly associated with depression while children placed in special education in grades 4-8 were 133% more likely to develop depression symptoms than children not placed in special education in grades 4-8 ($OR = 2.33$, 95% CI [1.4, 3.9]). None of the specific disability category of special education placement were significantly associated with depression. Table for results of depression is available upon request.

Mediation

With the addition of 8th grade reading achievement the associations between special education variables and all adult well-being outcomes were no longer statistically significant, except for depression. Special education placement in grades 4-8 remained significantly associated with greater rates of depression. Table 5 presents only statistically significant mediation results from bootstrapping. Eighth grade reading achievement was a significant mediator between childhood placement in special education and high school completion, years of education, and incarceration.

Discussion

After adjusting for sociodemographic factors and early academic achievement, childhood placement in special education is associated with lower rates of high school completion, fewer years of completed education, as well as greater rates of incarceration, depression, and drug and alcohol misuse. Eighth grade reading achievement is a mediator between childhood special education placement and adult well-being outcomes. In other words, childhood placement in special education is associated with lower 8th grade reading achievement scores, which are in turn, associated with lower high school completion, fewer years of completed education, and greater rates of incarceration.

These findings are consistent with previous studies that have shown that special education services may be ineffective in improving academic and behavioral outcomes among children with disabilities (Reynolds & Wolfe, 1999; Morgan et al., 2010). It is unclear why special education services have been unable to improve these outcomes, as there have been several practices identified that have shown positive effects on learning and behavior among children with disabilities (Morgan & Sideridis, 2006; Vaughn & Linan-Thompson, 2003). It is likely that a discrepancy between research and practice may exist. Infrequent use of effective research-based practices by the school may result in poor academic performance and behavior among children with disabilities (Boardman, Arguelles, Vaughn, Hughes, & Klingner, 2005).

The other potential explanation is that the classroom environment may influence child development in a way that leads to poor adult outcomes. For instance, the label of special education may be harmful to the psychological development of children with disabilities, resulting in poor academic and behavioral outcomes. This label may generate stigmatization, bullying, lowered expectations from the student's teachers, and a focus on child deficits (Lauchlan & Boyle, 2007). In comparison to children without learning problems, children with disabilities often have lower self-efficacy and lower expectations for their own academic performance (Fulk, Brigham, & Lohman, 1998; Lackaye, Margalit, Ziv, & Ziman, 2006). The classroom environment is important in developing positive academic outcomes, as a positive classroom environment is linked with greater academic self-efficacy (Dorman, 2001). It is possible that the label of special education creates a poor classroom environment for children with disabilities. The poor classroom environment may interact with the child's individual characteristics in a way that results in the child experiencing academic failure, which contributes to poor future educational attainment.

Limitations

These findings should be considered in light of limitations. First, the sample consisted of a predominantly ethnic minority population located in one school district (Chicago). Thus, findings cannot be generalized to other populations. Second, we do not know what the adult well-being outcomes would have been if the sample had never been placed in special education as a child. It is possible that adult outcomes would have been worse without these services. Perhaps, special education services attenuated the strength of the relationship between academic and behavioral problems associated with specific types of disabilities and adult well-being outcomes. Third, regression analysis strategies were designed to control the effects that one variable may have on another. However, this type of statistical method may conceal the interactive relationship between multiple variables. Lastly, there was a significant difference between groups on the ITBS word analysis at kindergarten. Children who were placed in special education had significantly lower scores on the ITBS word analysis in comparison to children who were never placed in special education. Thus, children who were not placed in special education appear to differ from children who were placed in special education in relation to academic performance prior to placement.

Implications

We cannot advocate for large policy changes in special education, as the findings from the study are from one school district and may not be generalizable to other populations. Our findings, however, do suggest that academic performance may serve as a protective factor for children with disabilities, such that children who perform better academically may be less likely to have poor adult outcomes. Thus, our findings indicate that it is imperative to identify modifiable factors that may strengthen the academic performance of children placed in special education.

One modifiable factor may be the special education placement type. Unfortunately, the current study was unable to differentiate results based on different special education settings (e.g., inclusion, resource room, self-contained). Because more classrooms are moving towards inclusive settings, future studies should examine differences in academic performance and adult well-being outcomes among different placement types. Within inclusive classrooms, general education and special education students are taught together as opposed to separately. Arguably, inclusive classrooms may reduce stigmatization of children with disabilities. It is also believed that these classrooms may enhance participation and academic performance of disabled students (Mastropieri et al., 2005). However, research indicates that some students obtain better academic outcomes in inclusive setting whereas others perform better in other types of settings (Salend & Duhaney, 2007; Rea, McLaughlin, & Walther-Thomas, 2002). These inconclusive findings may be due to variability in the quality of instruction across different settings.

Rather than placement type, it may be the quality of instruction that is essential to improving academic and behavioral outcomes among students with disabilities (Hocutt, 1996). Multiple studies have shown that high-quality instruction is critical to the academic success of children in special education (Vaughn & Linan-Thompson, 2003; Vellutino, Scanlon, Small, & Fanuele, 2006). A number of characteristics of high-quality instruction have been identified including small group instruction, emotional support through encouragement and feedback, supervised independent practice, and frequent monitoring and evaluation of student progress (Swanson, 2001; Vaughn & Linan-Thompson, 2003).

Despite the development and identification of effective, research-based practices for children with disabilities, some studies suggest that few of these practices are implemented within the classroom environment, regardless of setting type (Landrum, Tankersley, & Kauffman, 2003; Vaughn & Linan-Thompson, 2003). This research-to-practice gap may be partially due to the shortage of highly qualified special education teachers (see McLeskey & Billingsley, 2008 for a review). The shortage and lack of retention of effective special education professionals is concerning as effective teachers are crucial to the academic success of students with disabilities (Brownell et al., 2009). For example, Sanders and Rivers (1996) showed that students who were assigned the most effective teachers for three subsequent years scored higher on academic measures than students who were assigned the least effective teachers. Thus, it is imperative for researchers and administrators to identify factors that contribute to the training and expertise of emerging special education teachers, as well as what factors may help recruit and retain such teachers within the school system.

Lastly, early identification may be especially important as children's achievement in primary school often predicts achievement and behavior through middle and high school (Montague, Enders, Cavendish, & Castro, 2011). Early childhood education programs may be an alternative way to improve academic and behavior outcomes, as well as adult well-being outcomes. In fact, multiple early childhood education programs have been associated with lower rates of special education placement (Campbell & Ramey, 1995; Conyers et al., 2003; Schweinhart & Weikart, 1997), as well as greater adult well-being outcomes (Campbell, Ramey, Pungello, Sparling, & Miller-Johnson, 2002; Reynolds et al., 2011).

Conclusions

When taking into account sociodemographic factors and early academic achievement, childhood placement in special education was associated with lower academic achievement and greater rates of depression, substance misuse, and incarceration. This relationship was mediated by 8th grade academic achievement. The present study contributes to the literature by providing support for the association between special education placement and adult well-being among an inner-city minority cohort and the potential pathway from special education to adult outcomes. Future research should continue to study the effectiveness of childhood placement in special education, as well as its relation to adult outcomes. These studies should be conducted among diverse populations, including ethnic minorities, who may be at greater risk for both placement in special education and poor adult outcomes. Additionally, future studies should examine early childhood experiences and how children's individual characteristics may interact with their classroom environment in order to identify what practices are most helpful in developing resilient children who are more likely to have positive adult outcomes.

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Table 1

Sociodemographics and academic achievement among study sample

Child characteristics	Study sample (N=1,377)	If ever in SPED in grades 1-8 (N=217)	Never in SPED in grades 1-8 (N=1,160)	P value
Black, %	93.1	94.5	92.8	.39
Female, %	50.8	30.4	54.6	.00
Low birth weight (< 2500 grams), %	12.2	12.9	11.5	.58
Child Welfare case history ages 0-3, %	3.8	6.0	3.4	.06
Mother did not completed high school by child's age 3, %	54.4	54.4	45.6	.05
Single parent by child's age 3, %	77.3	78.3	77.1	.68
Mother was <18 at child's birth, %	16.3	12.4	17.1	.09
4 or more children in household by child's age 3, %	16.6	15.2	16.9	.54
Eligible for free lunch by child's age 3, %	84.9	87.1	84.5	.32
Mother unemployed by child's age 3, %	67.1	73.7	65.9	.02
Income level is 60% in school attendance area, %	76.2	78.3	75.8	.42
AFDC Participation by child's age 3, %	63.8	66.4	63.4	.40
CPC preschool participation, %	64.9	53.9	67.1	.00
CPC follow-on participation, %	58.5	52.5	59.7	.05
ITBS word analysis at kindergarten (mean) *	63.7	56.6	65.0	.00
ITBS reading score at 8 th grade (mean) *	144.7	127.8	147.9	.00

Note: SPED = Special education placement

* Test statistics are F statistics. Others are Pearson chi-square

Table 2

Linear regression odds ratio model predicting years of education by age 24 (N = 1,265)

	1	2	3	4	5	6	7
<i>Special Education Placement (SPED)</i>							
Ever in SPED (grades 1-8)	-.36**						
Ever in SPED (grades 1-3)		.08					
Ever in SPED (grades 4-8)		-.49**					
Number of years in SPED (grades 1-8)			-.07*				
Ever placed for LD (grades 1-8)				-.49**			
Ever placed for EBD (grades 1-8)					-.42		
Ever placed for MH (grades 1-8)						-.34	
Ever placed for SPL (grades 1-8)							.06
<i>Covariates</i>							
Black	-.37*	-.36	-.37	-.38*	-.38*	-.38*	-.39*
Female	.65***	.64***	.47***	.65***	.67***	.68***	.69***
Low birth weight (< 2500 grams)	-.09	-.10	.05	-.10	-.09	-.09	-.09
Child welfare case history ages 0-3	-.48*	-.46*	-.22	-.49*	-.49*	-.48*	-.50*
Mother was <18 at child's birth	.00	.00	-.14	.01	.02	.02	.03
Mother did not complete high school by child's age 3	-.42***	-.41***	-.26**	-.42***	-.43***	-.43***	-.43***
Single parent by child's age 3	-.10	-.11	-.10	-.11	-.11	-.10	-.10
4 or more children in household by child's age 3	-.24*	-.24*	-.33**	-.24*	-.23	-.23	-.23
AFDC participation by child's age 3	-.34**	-.34**	-.36**	-.33*	-.33*	-.32*	-.32*
Eligible for free lunch by child's age 3	-.16	-.15	-.28*	-.15	-.16	-.15	-.16
Mother unemployed by child's age 3	-.10	-.09	.00	-.10	-.12	-.12	-.12
Income level is 60% in school attendance area	-.07	-.07	-.06	-.05	-.08	-.07	-.07
Any missing risk ages 0-3	-.13	-.11	-.10	-.14	-.12	-.13	-.13
CPC preschool participation	.17	.18	.12	.17	.19	.18	.18
CPC follow-on participation	.03	.02	.08	.03	.03	.03	.03
ITBS word analysis at kindergarten	.02***	.01***	.01***	.01***	.02***	.02***	.02***

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	1	2	3	4	5	6	7
R Squared	.152	.154	.153	.152	.147	.147	.146

* $p < 0.05$,
 ** $p < 0.01$,
 *** $p < 0.001$

Table 3

Logistic regression odds ratio predicting incarceration by age 26 (N=1,372)

	1	2	3	4	5	6	7
<i>Special Education Placement (SPED)</i>							
Ever in SPED (grades 1-8)	1.55*						
Ever in SPED (grades 1-3)	.71						
Ever in SPED (grades 4-8)	2.00**						
Number of years in SPED (grades 1-8)			1.12*				
Ever placed for LD (grades 1-8)			1.28				
Ever placed for EBD (grades 1-8)				2.60*			
Ever placed for MH (grades 1-8)					2.31		
Ever placed for SPL (grades 1-8)							1.44
<i>Covariates</i>							
Black	.74	.73	.71	.75	.74	.73	.74
Female	.03***	.03***	.03***	.03***	.03***	.03***	.03***
Low birth weight (< 2500 grams)	.79	.79	.79	.80	.80	.81	.79
Child welfare case history ages 0-3	2.42*	2.44*	2.47*	2.49*	2.36*	2.45*	2.48*
Mother was <18 at child's birth	1.19	1.17	1.21	1.15	1.16	1.15	1.15
Mother did not complete high school by child's age 3	1.12	1.10	1.10	1.13	1.16	1.14	1.16
Single parent by child's age 3	.79	.80	.80	.80	.81	.79	.80
4 or more children in household by child's age 3	1.50	1.50	1.52	1.47	1.51	1.47	1.48
AFDC participation by child's age 3	3.17***	3.07***	3.13***	3.06***	3.14***	3.09***	3.12***
Eligible for free lunch by child's age 3	1.26	1.26	1.27	1.27	1.24	1.24	1.25
Mother unemployed by child's age 3	.48**	.49*	.48**	.49*	.49*	.49*	.48*
Income level is 60% in school attendance area	.93	.94	.93	.94	.97	.94	.95
Any missing risk ages 0-3	.98	.97	.99	1.00	.92	.97	.99
CPC preschool participation	.62*	.60*	.63*	.62*	.58**	.62*	.62*
CPC follow-on participation	.97	1.00	.98	.98	1.01	1.00	.97
ITBS word analysis at kindergarten	.99	.99	.99	.99	.99	.99	.99
Pseudo R Squared	.253	.256	.254	.250	.255	.252	.250

$p < 0.001$

$p < 0.01$
**

$p < 0.05$
*

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Table 4

Logistic regression odds ratio predicting substance misuse by age 24 (N=1,048)

	1	2	3	4	5	6	7
<i>Special Education Placement (SPED)</i>							
Ever in SPED (grades 1-8)	1.69*						
Ever in SPED (grades 1-3)		.84					
Ever in SPED (grades 4-8)		1.82*					
Number of years in SPED (grades 1-8)			1.12*				
Ever placed for LD (grades 1-8)				1.85*			
Ever placed for EBD (grades 1-8)					1.64		
Ever placed for MH (grades 1-8)						1.41	
Ever placed for SPL (grades 1-8)							1.09
<i>Covariates</i>							
Black	.88	.87	.86	.89	.90	.90	.91
Female	.15***	.15***	.15***	.15***	.15***	.14***	.14***
Low birth weight (< 2500 grams)	.80	.80	.81	.81	.81	.80	.80
Child welfare case history ages 0-3	1.70	1.69	1.70	1.73	1.76	1.73	1.78
Mother was <18 at child's birth	1.07	1.05	1.07	1.03	1.02	1.02	1.01
Mother did not complete high school by child's age 3	.89	.89	.89	.91	.92	.93	.93
Single parent by child's age 3	.67	.67	.68	.68	.68	.67	.67
4 or more children in household by child's age 3	1.14	1.15	1.16	1.13	1.13	1.13	1.13
AFDC participation by child's age 3	1.43	1.37	1.39	1.35	1.40	1.39	1.40
Eligible for free lunch by child's age 3	.71	.71	.70	.72	.71	.70	.71
Mother unemployed by child's age 3	1.18	1.22	1.21	1.22	1.21	1.22	1.22
Income level is 60% in school attendance area	.97	.98	.98	.96	.98	.98	.99
Any missing risk ages 0-3	1.40	1.39	1.43	1.44	1.36	1.37	1.37
CPC preschool participation	.74	.72	.74	.74	.71	.72	.73
CPC follow-on participation	.97	.99	.98	.99	.99	.98	.96
ITBS word analysis at kindergarten	.99	.99	.99	.99	.99	.99	.99
Pseudo R Squared	.144	.144	.143	.143	.140	.139	.139

*** $p < 0.01$.

1000.0 < p

, $p < 0.05$,
*
*

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Results on testing 8th grade reading achievement as a mediator between special education placement and adult outcomes

Table 5

	Path C' Total effect	Path C Direct effect	Bootstrap coefficient Indirect effect	95% CI of Indirect effect
DV: Completed High School				
IV: Ever in SPED 1-8	-0.1055 (0.0345)**	-0.0555 (0.0348)	-0.0499 (0.0106)***	-0.073 – -0.030
IV: Ever in SPED 4-8	-0.1176 (0.0443)**	-0.0606 (0.0446)	-0.0602 (0.0119)***	-0.085 – -0.039
IV: Num. of years in SPED	-0.0242 (0.0082)**	-0.0100 (0.0083)	-0.0142 (0.0028)***	-0.020 – -0.009
DV: Year of Education				
IV: Ever in SPED 1-8	-0.3599 (0.1264)**	-0.0999 (0.1253)	-0.2599 (0.0476)***	-0.359 – -0.173
IV: Ever in SPED 4-8	-0.4878 (0.1625)**	-0.1933 (0.1604)	-0.3113 (0.0508)***	-0.411 – -0.214
IV: Num. of years in SPED	-0.0918 (0.0301)**	-0.0180 (0.0301)	-0.0738 (0.0002)***	-0.098 – -0.051
IV: Ever in SPED for LD	-0.4907 (0.1693)**	-0.0964 (0.1692)	-0.3942 (0.0658)***	-0.531 – -0.274
DV: Incarceration				
IV: Ever in SPED 1-8	0.0637 (0.0253)*	0.0318 (0.0258)	0.0318 (0.0075)***	0.018 – 0.047
IV: Ever in SPED 4-8	0.1154 (0.0318)***	0.0803 (0.0324)*	0.0359 (0.0084)***	0.020 – 0.053
IV: Number of years in SPED	0.0159 (0.0061)**	0.0072 (0.0062)	0.0087 (0.0020)***	0.005 – 0.013
IV: Ever in SPED for EBD	0.1786 (0.0545)**	0.1501 (0.0543)**	0.0285 (0.0105)**	0.009 – 0.051

Note: Standard errors are presented in parentheses. DV is dependent variable. IV is independent variable. Indirect effect is mediated effect. Mediation test was used only among variables that met the following criteria for mediation: (1) the IV must be a significant predictor of the DV; (2) the IV must be a significant predictor of the mediator; (3) the mediator must be a significant predictor of the DV, while controlling for the IV (Baron & Kenny, 1986). Variables that did not meet these criteria were not included in the mediation analysis.

* $p < 0.05$,

** $p < 0.01$,

*** $p < 0.001$