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Causal Effects of Inclusion on Postsecondary Education Outcomes of Individuals With High-Incidence Disabilities

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Abstract

Using data from the National Longitudinal Transition Study–2 results of a propensity score analysis revealed significant causal effects for inclusive placement in high school on postsecondary education outcomes for adolescents with learning disabilities or emotional-behavior disorders 2 years after high school completion. Students earning 80% or more of their academic credits in general education settings (inclusive placement) were twice as likely to enroll and persist in postsecondary education when compared with students receiving fewer credits in inclusive classroom settings. These findings extend results of past descriptive and correlational studies by detecting a direct causal link between inclusion and postsecondary education.

Keywords

inclusion, postsecondary education outcomes, high-incidence disabilities, propensity score analysis, NLTS-2

Federal initiatives such as the Individuals With Education Act (IDEA) of 2004 and No Child Left Behind have prompted renewed efforts to increase the full participation—that is, inclusion—of students with disabilities in school communities (Alquraini & Gut, 2012; Goodman, Hazelkorn, Bucholz, Duffy, & Kitta, 2011; Obiakor, Harris, Mutua, Rotatori, & Algozzine, 2012). In fact, substantial increases in general education placements and corresponding reductions in more restrictive (pull-out programming, separate classrooms) placements have been observed over the past several decades (McLeskey, Landers, Hoppey, & Williamson, 2011). The practice of inclusion reflects a philosophy that students with disabilities should be educated, to the maximum extent appropriate, in general education classrooms. While Federal legislation does not specifically define *inclusion*, many states characterize inclusive placement as being when students earns 80% or more of their school credits in general education settings (Goodman et al., 2011). For students with high-incidence disabilities—specifically, learning disabilities or emotional-behavior disorders—recent practice has resulted in greater percentages of academic credits earned in general education curricula than in the past. Newman et al. (2011) reported that students with high-incidence disabilities earned more credits in general education (77.0% for students with learning disabilities, 67.2% for students with emotional-behavior disorders) than other groups of students with disabilities. However, they also found that almost three fourths of these students still earn a portion of their academic credits from special education coursework.

Studies (e.g., Cole, 2006; Dessemontet, Bless, & Morin, 2012; Frattura & Capper, 2006; Katz, Mirenda, & Auerbach, 2002; Lindsay, 2007; McLeskey & Waldron, 2011; Salend & Duhaney, 1999) have demonstrated the merits of adopting a more inclusive philosophy toward classroom and program placement options for students with disabilities at all age levels. Academically, students with disabilities taught in general education classes tend to perform better on measures of achievement, including reading and mathematics, than students taught in partial or complete pull-out programs (Cole, Watdron, & Majd, 2004; Manset & Semmel, 1997; Rea, McLaughlin, & Walther-Thomas, 2002; Westling & Fox, 2009). The social benefits of inclusion have also been established (Calabrese, Patterson, & Liu, 2008; Katz et al., 2002). Foreman, Arthur-Kelly, Pascoe, King, and Downing (2004) reported that communication skills were also enhanced by inclusive placement.

Despite the positive impact of inclusion on school performance, relatively little is known about the influence of

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inclusion on postschool education outcomes for adolescents with learning disability or emotional-behavior disorder (Aron & Loprest, 2012). For example, do students with high-incidence disabilities who earn all or most high school credits in general education classes fare better after graduation than peers who complete a greater portion of their education through special education? It is appropriate to consider possible answers to this question for both student groups simultaneously as they comprise a large percentage of all students with disabilities served in special education; often share similar educational, behavioral, and social characteristics and problems; and require similar types of educational interventions (Barkley, 2006; Gregg, 2009; Hallahan, Kauffman, & Pullen, 2009; Sabornie, Evans, & Cullinan, 2006).

Recently, Test et al. (2009) completed an exhaustive review of literature that had examined predictors of postsecondary outcomes for individuals with disabilities. They found a moderate level of evidence for a connection between inclusive placement in high school and improved postsecondary outcomes. While these results are encouraging, existing studies rely on (a) descriptive and correlational analyses or (b) descriptions of best practices through survey, literature review, or qualitative assessment. To date, evidence of a causal link between the practice of inclusion and improved postsecondary outcomes is missing.

While information is limited, questions about the connections between high school curriculum and postsecondary outcomes are important (Morningstar et al., 2010; Test et al., 2009; Wagner, Newman, Cameto, Garza, & Levine, 2005). For example, IDEA of 1997 declared that "improved postschool outcomes are the driving force and focal point of a free and appropriate public education for students with disabilities" (Benz, Lindstrom, & Yovanoff, 2000, p. 509). This emphasis is punctuated by knowledge that, increasingly, some type of postsecondary education will be necessary for adolescents to attain their career goals. Unfortunately, while enrollment rates for students with high-incidence disabilities have increased, students are still less likely to attend college than nondisabled peers (Blackorby & Wagner, 1996; Newman, Wagner, Cameto, & Knokey, 2009; Seo, Abbott, & Hawkins, 2008; Wagner et al., 2005). Furthermore, students with disabilities who do enroll in postsecondary education often take longer to graduate and are more likely to drop out (Aron & Loprest, 2012; DaDeppo, 2009; Murray, Goldstein, Nourse, & Edgar, 2000; Newman, Wagner, Cameto, Knokey, & Shaver, 2010; Wessel, Jones, Markle, & Westfall, 2009).

Difficulties With Studying Effects of Inclusion

Lack of experimental control can explain the absence of comparative studies on inclusion. While random assignment is the best way to eliminate experimental bias, this is not feasible or desirable with educational interventions due to ethical, logistic, and legal barriers. Since decisions about inclusive placement are purposeful and uniquely tailored to students' individual needs, myriad confounding factors exist in classroom placement decisions and the effects of those decisions on postsecondary outcomes. These factors can confound experimental outcomes in unknown ways (Bryson, Dorsett, & Purdon, 2002; Dehejia & Wahba, 2002).

A relatively recent statistical development, propensity score matching (PSM), addresses the bias problem and can be used to determine causal effects in situations where nonrandomized assignment exists. PSM allows researchers to create treatment and control groups in such a way that existing differences in observed background variables are balanced. In effect, selection bias on observed characteristics is removed, and post-treatment differences between groups can be attributed to the effect of a treatment rather than observed factors. This is accomplished by matching treatment group participants with similar participants from a pool of nonparticipants using a propensity score. The propensity score is a scalar variable ranging from 0.00 to 1.00 that expresses the probability of being in the treatment condition based on observable covariates. The match of treatment and control group participants based on a propensity score results in the creation of equivalent groups that account for numerous sources of bias and allow for estimation of the average treatment effect (ATE; Caliendo & Kopeinig, 2008; Reiter, 2000).

Purpose

The inclusion of students with high-incidence disabilities in the general high school curriculum has been a principal strategy to increase students' chances for both high school and postschool success. Yet, despite their importance, relatively few studies have been conducted. Therefore, we examined the potential effects of inclusion on the postsecondary education outcomes of students with high-incidence disabilities. The availability of the National Longitudinal Transition Study–2 (NLTS-2) database and recent emergence of PSM as a statistical technique to equalize nonrandom groups on observable covariates provided an opportunity to pursue this analysis. We also took advantage of the longitudinal nature and scope of NLTS-2 data by combining three cohorts of graduating students. Thus, our sampling frame consisted of students with learning disabilities or emotional-behavior disorders (i.e., high-incidence disabilities) in the database who graduated from public education from 2000 to 2005.

Our research objective was to compare the postsecondary education outcomes of students with high-incidence disabilities earning 80% or more of their high school credits in general education settings (inclusion group; Goodman et al., 2011) and those earning fewer than 80% of their credits in general education settings (noninclusion). Postsecondary outcomes were measured 2 years after high school completion, and included (a) no postsecondary education or enrolled but dropped out, (b) currently enrolled or completed a 2-year or less academic or vocational program, and (c) currently enrolled in a 4-year college program.

General Model for Research Design and Covariate Selection

Historically, the educational experiences of youth with high-incidence disabilities during the first several years after high school have received limited attention (Gregg, 2007, 2009; Wagner et al., 2005; Young & Browning, 2005), even though this period can be difficult to navigate for all adolescents. While a full understanding of the transition process requires longer periods of assessment, any effects exerted by a school-based intervention like inclusion would likely be strongest in the first year or two after high school completion.

Treatment

Inclusion promotes the full participation of students with disabilities in general education, and was represented by a dichotomous variable reflecting the proportion of credits earned in the general education classroom compared with credits earned from special education. Students with 80% or more of credit earned in general education were assigned to the inclusion group; students with less than 80% of credits in general education were placed in the noninclusion group. The 80% threshold is used by the U.S. Department of Education (2011) and some states (Goodman et al., 2011) to indicate that a vast majority of education was received in an inclusive placement. The dichotomous nature of this characterization of inclusive placement limited our analysis, as we were not able to differentiate the effects of lesser degrees of inclusion on postsecondary outcomes. However, use of a common definition for inclusive placement allowed us to compare the postsecondary outcomes of two identifiable groups.

Postsecondary Educational Outcome

Adolescents with high-incidence disabilities are less likely to enroll in postsecondary education than nondisabled peers, and their work experiences are usually poor in terms of job type and duration (Newman et al., 2009). Poorer education outcomes is cause for concern since some type of postsecondary training is increasingly required for many career opportunities (Lindstrom, Doren, & Miesch, 2011). Postsecondary education outcomes were categorized into three categories reflecting individuals' current education status and included no school or school leaver, current enrollment in or completion of a postsecondary academic or vocational program up to 2 years in duration, and current enrollment in a 4-year college program. Two-year programs included options such as community college and technical training programs. Other vocational programs lasting less than 2 years were also included in this category. Since we were interested in whether inclusive education had a significant impact on current engagement in postsecondary education, we did not differentiate between 2-year academic programs or vocational programs lasting 2 years or less.

Method

Data and Participants

Data from the NLTS-2 were used. The availability of a variety of student/family, school-related, interventions, and outcome variables made NLTS-2 particularly useful for achieving our research objectives. Administered and managed by the National Center for Special Education Research (Newman et al., 2009), NLTS-2 provides data about special education students as they transition from secondary to postsecondary education and adulthood. NLTS-2 researchers employed a two-stage sampling strategy. The first stage involved stratified random selection of more than 1,200 U.S. school districts that provided special education to students with disabilities. A total of 500 school districts and 40 special schools agreed to participate and provided NLTS-2 researchers with rosters of students with disabilities. Next, student rosters were used in a random sample stratified with the 12 federal disability categories to assure equal representation of disability types. This two-stage sampling strategy resulted in 11,280 students with disabilities. Data collection was initiated in 2000-2001 (Wave 1) and included five biannual data collection waves over a 10-year period.

Several steps were taken to determine the final data pool. First, NLTS-2 transcript data was used to identify a total of 1,360 students with either a learning disability (n = 780) or emotional-behavior disorder (n = 580). Next, we selected only those students who graduated from high school in one of the first three data collection waves. Postsecondary educational outcome was measured in the next available data wave (Waves 2–4) following students' high school graduation. This selection process resulted in an unweighted cohort of 640 students (learning disabilities, n = 400; emotional-behavior disorders, n = 240). This reduced cohort included students who had graduated from high school in Wave 1 (n = 110; learning disabilities, n = 60; emotional-behavior disorders, n = 50), Wave 2 (n = 400; learning disabilities, n = 250; emotional-behavior disorders, n = 150), or Wave 3 (n = 130; learning disabilities, n = 90; emotional-behavior disorders, n = 40). Next, cases with missing values on all selected covariates, treatments, or postsecondary outcomes were discarded. As a result, the *pre-matched* unweighted samples contained 410 cases (64.1% of reduced data pool).

Next, propensity score estimates were calculated for each case to reflect the probability of receiving inclusion. Distributions of estimates for treated and untreated groups were compared to identify the region of common support for each model. Common support refers to the area where distributions of propensity score estimates for treated and untreated groups overlap. Cases not in the region of common support were discarded to ensure that any combination of characteristics observed in the treated group were also present in the untreated group (Bryson et al., 2002; Caliendo & Kopeinig, 2008; Lechner, 2000). This final treatment produced our data pools, consisting of 390 usable cases with propensity score estimates ranging from 0.15 to 0.88. This sample was used to match (weight) treatment and control cases and conduct our analyses.

PSM Covariate Selection

Perhaps the most important decision in the PSM process is selecting covariates to form the logistic regression model used to calculate propensity scores. Covariate selection seeks to identify prominent variables that influence the decision to both participate in the treatment *and* the outcome (Caliendo & Kopeinig, 2008; McCaffrey, Ridgeway, & Morral, 2004). The goal is not to specify a parsimonious model but to establish optimal balance between comparison groups (Rubin & Thomas, 1996).

Covariate selection was completed using prior research on factors influencing placement of adolescents with disabilities in inclusive classroom settings and on postsecondary outcomes. We adopted a risk-resilience framework to guide our selection to avoid a deficit perspective, and to acknowledge variations in individuals' potential for and ability to deal with difficulty or success (Gregg, 2009; Murray, 2003). Covariates were grouped into several categories denoting individual characteristics and behavior, and family circumstances and context.

Individual. Eleven individual factors were identified as possible influences on students' (a) propensity to be placed in an inclusive environment and (b) postsecondary outcomes. Descriptive data included student's disability type, gender, race/ethnicity, English proficiency, and age. Academic achievement was represented by cumulative grade point average (GPA) in Grade 12.

Several indicators of students' social competence and behavior were included. Social competence was measured with 11 items taken from the Social Skills Rating System, Parent Form (Cameto, Cadwallader, & Wagner, 2003; Gresham & Elliot, 1990). Parents were asked to rate their child's social ability in three areas—social self-control, social assertion, and social cooperation. Self-control indicated the ability to cope with frustration and to deal with conflict appropriately. Four items measured students' self-control: ends disagreements calmly, stays out of trouble situations, receives criticism well, and controls temper when arguing with peers. Parents' responses ranged from 0 to 8, higher scores indicated greater self-control. Assertion referred to the ability and willingness to become involved in social activities. Four items assessed assertion: joins group activities without being told, makes friends easily, seems confident in social situations, and starts conversations. Parents' responses ranged from 0 to 8, higher scores indicated greater assertiveness. Cooperation was defined as the ability to work with others and stay on task. Three items measured this construct: keeps working at something until finished, speaks in an appropriate tone at home, and cooperates with family members by behaving at home. Parents' responses ranged from 0 to 6, higher scores indicated greater cooperation. Classroom behavior scale items included the following: Student in general education setting completes homework on time, takes part in group discussions, stays focused on work, and does not withdraw from activities. Parents also reported the occurrence of any suspension or expulsion from high school.

Family. Recent studies have revealed that family factors (family composition, socioeconomic status, parents' education expectations, and parent discussion) play a critical role in helping students persist, complete, or be successful in postsecondary education and work outcomes (Rojewski, Lee, Gregg, & Gemici, 2012). Therefore, 10 factors that reflected the role of family were included as covariates. Family composition was determined by asking students whether they lived with one or two parents. Indicators of family socioeconomic status were represented by household income and receipt of free or reduced-price meals. Parents' level of education and their employment status were included, since it has been determined that these factors influence career choice (Howard et al., 2011). The role of parental support was represented by indicators of parents' expectations for their son or daughter after high school, level of family support, and parents' involvement in school-related activities.

Analysis

A propensity score weighting approach was adopted using boosted logistic regression models to estimate propensity scores. These estimated propensity scores were then used to create two weights to estimate the asymptotically unbiased causal parameters of curriculum experience. The first weight, standardized mortality/morbidity ratio (SMR), estimated the average effect of the treatment of the treated (ATT). The SMR approach assigns a weight of 1.0 to treatment cases and a weight that reflects propensity score estimate divided by 1.0 minus propensity score estimate (*pse* / 1.0 − *pse*) for control cases. The second weight, inverse probability of treatment weight (IPTW) estimator, assigns a weight determined by the inverse of the propensity score for treatment cases and the inverse of 1.0 minus the propensity score for control cases to estimate the ATE (Robins, Hernan, & Brumback, 2000).

SMR and IPTW weights were calculated for treatment and control cases. Covariate balance between treatment and control cases was examined before and after the SMR- and IPTW-adjusted matching processes to ensure equivalence between treatment and control groups on observed covariates. Regions of common support for each treatment distribution were identified to select the final data pool. Finally, two-way contingency tables and an ordered logit model were used to examine the effects of inclusive placement on postsecondary education outcomes, conditional on observed covariates.

Results

Assessment of Matching Quality

To determine the success of weighting, covariate scores between treatment and control groups before and after weighting were compared. Balance is achieved when any pre-weighting differences in covariates are minimized. Standardized effect size, the difference of sample means in treatment and control groups divided by the standard deviation of the control group, was used to check for significant differences in treatment and control group covariate scores (Ridgeway, McCaffrey, Morral, Burgette, & Griffin, 2012).

Initially, each of 11 *pre-weighted* covariates (race/ethnicity, income level, education status of mother, employment status of mother, parents' involvement in school, free or reduced-price meals, parents' expectation, self-control, assertiveness, classroom behavior, and school suspension or expulsion) had significantly large standardized effect size coefficients ranging from .21 to .45. These initial differences between treated and control groups indicated the presence of bias. However, after weighting, the differences were minimized on all covariates with effect sizes ranging from .03 to .26. No statistically significant differences were found when treatment and control group covariate scores were compared, reflecting a well-balanced sample after weighting (see Table 1).

Weighted Analysis

Inclusion-postsecondary education. To clarify treatment effects, we employed an ordered logit regression model while accommodating two different weights; the SMR estimated the ATE on the treated (ATT), and the IPTW estimated the average treatment on the population (ATE). SMR-weighted contingency table analysis revealed a significant association between inclusive education and postsecondary education outcome ($\chi^2 = 12.40$, $df = 2$, $p < .01$; Cramer's $V = .17$; see Table 2). The SMR-weighted ordered logit regression also found a positive impact for inclusive education on postsecondary education outcomes. The SMR odds ratio equaled 2.09, that is, the odds of students in the *more inclusive* group being enrolled in postsecondary education were more than 2 times higher than for students in the *less inclusive* group (SMR coefficient = .736, $SE = .228$, $Z = 3.23$, $p < .01$).

IPTW-weighted contingency table analysis indicated a significant positive association between inclusive education and postsecondary education outcome ($\chi^2 = 18.87$, $df = 2$, $p < .01$; Cramer's $V = .17$; see Table 2). The ordered logit model also identified a statistically significant ATE for inclusive education. The IPTW odds ratio equaled 2.10, meaning the odds of students in the *more inclusive* group being enrolled in postsecondary education were more than 2 times higher than for students in the *less inclusive* group (IPTW coefficient = .744, $SE = .181$, $Z = 4.11$, $p < .01$).

Discussion

We examined the causal effects of inclusion on the postsecondary education outcomes of adolescents with learning disabilities or emotional-behavioral disorders. A number of compelling reasons exist to conduct this type of inquiry. For example, inclusion reflects a commitment to social justice and equal access to education for all students (Foreman & Arthur-Kelly, 2008; Obiakor et al., 2012). Therefore, studies designed to better understand the effects and contributions of inclusion to student outcomes, in high school and post–high school, are warranted. Moreover, students with disabilities in inclusive placements tend to perform better academically and socially than students in more restrictive environments (Calabrese et al., 2008; Cole, 2006; Cole et al., 2004; DaDeppo, 2009; Dessemontet et al., 2012; Frattura & Capper, 2006; Katz et al., 2002; Manset & Semmel, 1997; McLeskey et al., 2011; McLeskey & Waldron, 2011; Rea et al., 2002; Salend & Duhaney, 1999; Westling & Fox, 2009). Even so, available studies do not provide experimental evidence about the lasting benefits of inclusive placement after high school. It is likely that a lack of alternatives for controlling selection bias and the nature of educational placement decisions are main reasons for this limited attention. One contribution of this investigation was use of propensity score analysis to establish initially equivalent groups for nonbiased comparison and examine causal relationships. Despite technical challenges, special educators are encouraged to adopt propensity score analysis in future investigations to isolate intervention effects that have not been fully studied because of inherent bias and

Table 1. Selected Covariates by Inclusion Status, Before and After Weighting (Before Common Support).

	Before weighting				After weighting					
	Less inclusive (control group)		More inclusive (treatment group)		Less inclusive (control group)[a]		Less inclusive (control group)[b]		More inclusive (treatment group)[b]	
Variables	*n*	%	*n*	%	*n*	%	*n*	%	*n*	%
Student characteristics										
Disability										
Emotional-behavioral disorder	60	35.29	80	33.33	60	31.58	120	33.33	130	35.14
Learning disability	110	64.71	160	66.67	130	68.42	240	66.67	240	64.86
Gender										
Men	120	70.59	170	70.83	130	68.42	260	72.22	260	70.27
Women	50	29.41	70	29.17	60	31.58	100	27.78	110	29.73
Family characteristics										
Free or reduced-price meals										
Yes	50	29.41	30	12.50	20	10.53	70	19.44	60	16.22
No	60	35.29	130	54.17	100	52.63	160	44.44	190	51.35
Missing	60	35.29	80	33.33	70	36.84	130	36.11	120	32.43
Data collection (HS, 2-years PS)										
Waves 1, 2	30	17.65	40	16.67	40	21.05	80	22.22	60	16.22
Waves 2, 3	90	52.94	120	50.00	90	47.37	170	47.22	190	51.35
Waves 3, 4	50	29.41	80	33.33	60	31.58	110	30.56	120	32.43
	M	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*	*M*	*SD*
Student characteristics										
Social self-control	4.51	1.75	4.94	1.74	4.99	1.78	4.76	1.79	4.82	1.76
Social assertion	4.90	2.07	5.66	1.90	5.67	1.93	5.30	2.03	5.49	1.92
Social cooperation	3.75	1.42	3.99	1.30	3.92	1.31	3.83	1.36	3.95	1.32
Classroom behavior	11.29	2.98	12.05	2.95	11.52	3.08	11.41	3.03	11.81	3.00
Age	10.88	1.11	10.69	1.15	10.87	1.12	10.88	1.12	10.72	1.14
Family characteristics										
Parents' expectation	2.27	0.68	2.07	0.54	2.08	0.59	2.17	0.65	2.12	0.56
Family support	6.06	1.19	6.13	1.16	6.14	1.13	6.11	1.16	6.08	1.19
Parent school involvement	3.40	2.86	4.06	2.69	3.90	2.66	3.66	2.77	3.81	2.69

Note. Three sets of frequencies are presented, including frequencies (a) before weighting, (b) after weighting using the SMR estimator, and (c) after weighting using the IPTW estimator. The SMR estimator assigned a weight of 1.0 to treatment cases. Therefore, descriptive data for weighted treatment cases were equal to data for unweighted treatment cases. Refer to the *Before weighting, More inclusive* column (immediate left) for SMR-estimated weighted results for treatment cases. SMR = standardized mortality/morbidity ratio; IPTW = inverse probability of treatment weight.
[a]SMR estimator. [b]IPTW estimator.

lack of experimental control (cf. Morgan, Frisco, Farkas, & Hibel, 2008, for a recent example).

The initial (before weighting) bias we detected in the treated and untreated groups warrants brief mention. A greater number of adolescents in the less inclusive group were poor (i.e., received free or reduced-price school lunch), were identified as members of a racial/ethnic minority group, and had less educated mothers who were also more likely to be unemployed than adolescents in the inclusive group. The problem of disproportionately higher representation of racial/ethnic minority students in special education, especially for those with high-incidence disabilities, has received a great deal of attention (Harry & Klingner, 2006; Losen & Orfield, 2002; Parrish, 2002). In contrast, the representation of students with disabilities in inclusive or restrictive placements based on race/ethnicity, poverty, or other factors is less well documented (Skiba et al., 2008). However, existing evidence indicates that racial/ethnic minority students are less likely to be placed in inclusive settings than nonminority peers (Fierros & Conroy, 2002; Skiba, Poloni-Staudinger, Gallini, Simmons, & Feggins-Azziz, 2006). Descriptive results of our sample corroborate these earlier findings. We echo the sentiments of Skiba et al. (2008) and others who have identified a critical need for continued research on this issue.

Table 2. Cross-Tabulation of Postsecondary Education Outcomes by Inclusion Status, After Weighting.

	Less inclusive (control group)		More inclusive (treatment group)	
Postsecondary education status	*n*	%	*n*	%
SMR estimator				
None	150	78.95	150	65.22
2-year postsecondary education	30	15.79	50	21.74
4-year postsecondary education	10	5.26	30	13.04
Total	190	100.00	230	100.00
IPTW estimator				
None	280	80.00	250	71.43
2-year postsecondary education	50	14.29	60	17.14
4-year postsecondary education	20	5.71	40	11.43
Total	350	100.00	350	100.00

Note. Unweighted sample size equaled n = 410 (less inclusive, n = 170; more inclusive, n = 240). Totals for SMR and IPTW estimators reflect the result of weighting and rounding after accommodating the region of common support. In SMR, treated cases were assigned a weight of 1.0, but in IPTW were assigned a weight of 1/propensity score estimate. SMR = standardized mortality/morbidity ratio; IPTW = inverse probability of treatment weight.

Increasingly, special educators are emphasizing the need to provide inclusion opportunities for students with disabilities, in terms of both physical placement and curriculum engagement (McLaughlin & Tilstone, 2000). This call to action is supported by data linking inclusion to positive school outcomes, for example, increased academic achievement, emotional growth, and social skills development (Algozzine & Ysseldyke, 2006; Alquraini & Gut, 2012; Cole et al., 2004; Foreman & Arthur-Kelly, 2008; Katz et al., 2002; Obiakor et al., 2012; Westling & Fox, 2009). Data showing a positive connection between inclusion and postsecondary educational outcomes have also been available, although evidence is correlational in nature and tends to focus more on students with severe disabilities (Test et al., 2009).

In our study, inclusive classroom placement over an extended high school experience had a significant positive impact on postsecondary education participation for students with high-incidence disabilities during the first two years after high school. Students earning a majority (at least 80%) of their high school credits in inclusive classrooms were twice as likely to be involved in some type of postsecondary education compared with peers earning fewer credits in inclusive settings. This finding is strengthened by our use of propensity score analysis that eliminated competing explanations such as placement bias or group assignment based on some unknown underlying rationale (Dehejia & Wahba, 2002), and extends the descriptive work of past research (e.g., Newman et al., 2011; Wagner et al., 2005).

Several possibilities exist to explain our results. Students earning a majority of their high school credit in inclusive classrooms may have educational aspirations raised by exposure to higher academic standards and expectations or student performance. If so, the role of support service delivery on educational aspirations, academic self-efficacy, and secondary education outcomes would be an important area of subsequent research. Future research should also examine the role of different aspects of the inclusion experience/process that may affect postsecondary education outcomes, for example, role of social components of inclusion, ways that inclusion supports students' pursuit of postsecondary education, and amount of time (or number of credits) in inclusive placements necessary to positively affect postsecondary education.

The positive causal effect detected for inclusive placement on postsecondary education outcomes has implications for policy and practice. Perhaps most important, our findings support the educational practice of maximizing the access of students with high-incidence disabilities to inclusive academic options as they prepare for and engage in the transition from secondary to postsecondary education. Investigation on ways to provide more options at entry and exit points to postsecondary education and employment through controlled studies would also be beneficial (Gregg, 2007, 2009).

Future federal special education policy should continue to advocate for and provide guidelines for the inclusive placement of students with high-incidence disabilities in secondary curriculum. Special educators and administrators at the local school level in charge of placement decisions should also be mindful of the causal connection between educational placement and subsequent outcomes when discussing secondary placement options with parents and students. In addition, all secondary educators and administrators, not just special educators, should be aware of the positive benefits of inclusive placement for students with high-incidence disabilities. Necessary classroom supports for teachers and students, as well as professional development, would go a long way to ensure that inclusive placements were successful for all involved.

Additional research is needed to refine the general findings of the present study. First, while a causal relationship between inclusion in high school and postsecondary education outcomes was detected, we did not examine the effect of inclusive placement on earlier academic (or social) achievement. It is possible that elementary or middle school students with high-incidence disabilities might benefit from instruction in more restrictive environments at earlier developmental stages. Inquiry into the role of inclusive (or restrictive) placement on the immediate academic achievement of elementary or middle school students, as well as on their long-term postsecondary outcomes, is needed. Second, while we used a dichotomous definition of inclusive placement to group students, it is likely that lower levels of inclusion still hold positive benefits for students, both academically and in preparation for career and adult life. Third, our findings are delimited to students with high-incidence disabilities that transitioned to some type of postsecondary education. Investigation with students not pursuing postsecondary education would further clarify the benefits of inclusion for this group of students.

Conclusion

Our study examined causal relationships between a school-based intervention (inclusive placement) and postsecondary education outcomes for individuals with learning disabilities or emotional-behavior disorders. Past investigations on postschool outcomes have been limited by lack of random assignment and selection bias inherent in educational placement decisions. To address this limitation, propensity score analysis was used to establish initially equivalent groups and identify the causal relationship between inclusion and postsecondary education outcomes. While propensity score analysis is not a panacea for poor research designs, and elimination of bias is limited to selected model covariates, its future use may provide insight into a broad array of school and student practices previously obscured because of the biasing effects of nonrandom assignment and selection bias. Future research is recommended to identify those elements of inclusive placement that contribute to its apparent positive contribution to postsecondary education outcomes.

Authors' Note

The opinions expressed are those of the authors and do not represent views of the Institute of Education Sciences or the U.S. Department of Education.

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