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Support Receipt: Effect on Postsecondary Success of Students With Learning Disabilities

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Abstract

In contrast to the increase in college enrollment rates of youth with learning disabilities (LD), graduation rates have remained stagnant and low. Using propensity methods, this study examined the effect of disability-specific and universally available support receipt on the college perseverance and completion of students with LD. Based on secondary analysis of National Longitudinal Transition Study 2 (NLTS2), findings indicate that students who received supports—those available to the full student body and/or disability-specific supports—were more likely to persist in, and successfully complete, 2-year or 4-year college. Implications include that transition staff need to ensure students not only are prepared to seek disability supports once on campus, but that equal emphasis should be placed on helping students access supports available to the full student body.

Keywords

learning, disabilities, postsecondary, education, postschool outcomes, support services, research

Characteristics Affecting Retention and Graduation

As students with learning disabilities (LD) transition from secondary to postsecondary school, they encounter a new legal framework within which the responsibility for accessing disability-related supports shifts from the school to the student. In high school, special education is governed by the Individuals With Disabilities Education Act of 2004 (IDEA, 2004), and schools are mandated to identify and provide supports and accommodations students may need (Wolanin & Steele, 2004). In contrast, students with LD enrolled in college are under the auspices of two civil rights laws—Subpart E of Section 504 of the Rehabilitation Act of 1973 (Rehabilitation Act, 2014), and the Americans With Disabilities Act of 1990 (ADA, 2014) and its Amendments Act of 2008 (ADAAA, 2008)—and a student is responsible for registering as a student with a disability to access accommodations and services (Walker, Getzel, Dukes, & Madaus, 2018). Disability disclosure is voluntary in postsecondary education, and only 24% of students with LD inform their school of their disability (Newman et al., 2011). Without disclosure, students are not eligible for disability-related accommodations, despite emerging research that shows that accessing accommodations can make a positive difference in the academic experience of students with disabilities, including those with LD (McGregor et al., 2016; Pingry O'Neil, Markward, & French, 2012; Troiano, Liefeld, & Trachtenberg, 2010).

Given the low rate of self-disclosure, and therefore disability-support receipt of students with LD, it is important to understand what other factors can influence their postsecondary education success, particularly in consideration of their low completion rates. Postsecondary enrollment rates for students with LD dramatically increased between 1990 and 2005 (Newman, Wagner, Cameto, Knokey, & Shaver, 2010). By 2009, 67% of young adults with LD had enrolled in a postsecondary school within 8 years of leaving high school (Newman et al., 2011). In contrast, their completion rates remained stagnant over time, with no significant difference in the decade and a half between 1990 and 2005 (Newman et al., 2010). By 2009, only 40% of students with LD who had enrolled in postsecondary school had successfully completed their program (Newman et al., 2011).

Without self-disclosing, students with disabilities still can avail themselves of academic supports that are

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universally available to all college students, such as tutoring and writing centers (Walker et al., 2018). Newman, Madaus, Lalor, and Javitz reported that students with disabilities who had accessed such supports were more likely to have positive postsecondary school outcomes than those who did not. Furthermore, in a series of analyses, Newman and Madaus (2015b) examined National Longitudinal Transition Study 2 (NLTS2) data regarding rates of self-disclosure and accommodation receipt, factors that affected receipt of postsecondary supports, and the impact of high school transition planning on receiving supports. They reported that only 35% of high school students who received special education services disclosed their disability in postsecondary school. Moreover, although 98% of students received accommodations in high school, only 24% did in college. Student- and school-specific variables that influenced receipt of accommodations were explored (Newman & Madaus, 2015a). Key findings were that several nonalterable variables impacted receipt, including disability type. For example, students with less apparent disabilities, such as LD, were less likely to access accommodations and services than students with more visible disabilities. Newman and Madaus (2015a) also found several alterable variables that affected accommodation receipt. Specifically, students who received transition planning education in high school were more likely to access accommodations in 2-year colleges, as were those who had a secondary transition plan that specified postsecondary accommodations and supports. These findings were further tested through propensity analyses and supported by Newman, Madaus, and Javitz (2016), who found that these secondary transition planning variables also increased the likelihood that students would access supports available to the general student body (e.g., tutoring, writing centers) at 2-year institutions and CTE programs. Moreover, Newman et al. (under review) found that students with disabilities at 2-year or 4-year colleges who accessed supports available to the general student body were more likely to experience positive postsecondary education outcomes.

Research conducted by DuPaul, Dahlstrom-Hakki et al. (2017) also indicated that universally available supports are beneficial to students with disabilities. A study of 1,782 students with attention deficit hyperactivity disorder (ADHD) and LD examined the impact of academic advising, coaching, and tutoring services on grade point average (GPA). Results showed that students benefited differently from these support services, with students with ADHD benefiting more from coaching, whereas students with LD benefited more from tutoring. Such results point to the importance of examining the needs of students in specific disability categories rather than only those of students with disabilities as a whole.

McGregor et al. (2016) examined results from the Student Experience in the Research University Survey, whose respondents represented 63,802 students, 6% of whom reported having a LD. Thirty-three percent of students with LD indicated using disability-specific accommodations. Those who used accommodations reported more interaction with faculty and less difficulty of assignments than those who did not use them.

Pingry O'Neil et al. (2012) used a hierarchical logistic regression framework to compare models predicting graduation among postsecondary students with disabilities in three public universities. They identified several disability-specific supports as being associated with a higher likelihood of graduating, including receipt of distraction-reduced testing and learning strategies and study skills assistance. In addition, Troiano et al. (2010), in their examination of 5 years of learning support center attendance data and graduation rates of college students with LD, found that students with LD who regularly accessed learning center support were more likely to graduate from college.

Yu, Novak, Lavery, Vostal, and Matuga (2018) examined the role of high school academic preparation and achievement and the receipt of postsecondary academic supports in 2-year or 4-year postsecondary schools on outcomes in a sample of 150 students with LD from the NLTS2 database. The sample was limited to students with LD who had expressed a high school transition goal of graduating from a 2-year or 4-year institution. Sixty percent of the students had enrolled in college, with 33% completing college within 5 to 6 years of finishing high school. Results indicated that students who completed a college preparatory curriculum in high school were 5 times more likely to complete college; however, there was no significant relationship between high school GPA and college completion. Results further indicated that students who completed a college preparatory curriculum in high school and who received academic support services in college were nearly 16 times more likely to complete college than those who received such supports but did not complete a college prep curriculum in high school, and 7 times more likely to complete than a student who completed a college prep curriculum but did not receive support services. The authors noted that the finding that neither high school GPA nor accessing academic support services in college impacts college completion is inconsistent with other studies.

An increasing number of studies have used large, nationally representative datasets to examine the interaction of student-specific variables on accommodation receipt and persistence in postsecondary education. Such datasets, and more rigorous methodology, are necessary to increase generalizability. However, only Newman et al. (under review) used a large, nationally representative database with analyses other than correlation or regression to explore the interaction of alterable variables on perseverance and graduation rates of students with disabilities. The study by Newman et al. analyzed the full range of disabilities in aggregate form as opposed to examining implications for students with specific disabilities; research indicates that student experiences, as well as their preparation for, access to, and

persistence in college, can vary widely by disability type (DaDeppo, 2009; Flexer, Daviso, Baer, Queen, & Meindl, 2011; Hitchings, Retish, & Horvath, 2005; Lee, Rojewski, Gregg, & Jeong, 2015; McGregor et al., 2016; Newman et al., 2011). Given (a) the importance of completing college, (b) the low rate of college completion for students with LD, (c) research suggesting that supports benefit college outcomes for students with disabilities, and (d) the impact of support use varying by disability type, it is imperative to understand the link between support use and achieving positive postsecondary outcomes for students who comprise the largest proportion of students with disabilities, those with LD (Raue & Lewis, 2011). Moreover, the recent findings by Yu et al. (2018) regarding predictors of college completion represented by 150 students with LD in the NLTS2 sample contradicts prior findings in the literature regarding the role of accessing academic supports. As noted by Joshi and Bouck (2017) in their examination of high school factors that impact postsecondary access for students with LD, "researchers need to assess the supports required by students with learning disabilities to systematically prepare them to not only attend but also complete the postsecondary education of their choice" (p. 11).

Thus, the objective of the present study was to examine the effect of support use on the college persistence and completion of students with LD, who comprise the largest proportion of postsecondary students with disabilities, but who complete college at a significantly lower rate than their peers (DuPaul, Pinho, Pollack, Gormley, & Laracy, 2017). These students also enter college with lower levels of engagement and self-evaluation of academic and psychosocial functioning than their peers (DuPaul, Pinho et al., 2017). The present analysis employed propensity score modeling (PSM), a quasi-experimental method, and data from the large, nationally representative NLTS2 database. Such rigorous analysis can enable the field to draw conclusions about the use of supports as interventions for students with LD, which may lead to improved college outcomes. An important benefit of the longitudinal NLTS2 dataset is that it provides an understanding of the experiences of the larger population of 2-year or 4-year college students with LD, independent of their decisions to disclose a disability, because NLTS2 disability status had been identified by secondary school districts. In contrast, most studies of college students with LD are limited to the 24% who self-identify, nearly completely overlooking the 76% of students with LD who choose not to disclose their disability (Newman et al., 2011).

Based on the hypothesis that support receipt improves the postsecondary perseverance and completion of students with LD, the current study addressed the following questions:

Research Question 1: To what extent did students with LD access support services at their 2-year or 4-year colleges and how did that rate of receipt compare with receipt during high school?

Research Question 2: What was the effect of support receipt on postsecondary persistence and completion for students with LD at 2-year or 4-year colleges?

Method

NLTS2 Overview and Sample

The findings reported here are based on secondary analyses of data from NLTS2, a nationally representative study of secondary-school students and young adults with disabilities. NLTS2 sampling procedures involved first drawing a random sample of 540 school districts and special schools that served students in the eligible age range, stratified by region, student enrollment, and wealth. The second sampling stage entailed randomly selecting from the rosters of participating districts or schools students who as of December 2000 were ages 13 to 17, in Grades 7 to 12, and receiving special education in each of the 12 special education disability categories, resulting in a sample of 11,270 students. Sample selection, sample attrition, and representativeness were more fully described by SRI International (2000) and Javitz and Wagner (2005). NLTS2 included five waves of data collection from parent and youth telephone interviews and mail surveys conducted in alternate years between 2001 and 2009. By the final data collection in 2009, youth were 21 to 25 years old. Survey response rates for parent/youth interview/surveys ranged from 82% in Wave 1 to 48% in Wave 5.

The present study includes a sample of 220 youth who had been identified by their school district as receiving special education services for a LD, who were out of high school, and who had at least one parent or youth interview/survey that reported the youth's attendance at a 2-year or 4-year college (44% of young adults with LD). Results are weighted so that findings are nationally representative of all young adults with LD who were out of high school in the NLTS2 age and time frame, using a cross-wave weight (Wt_AnyPYPHS) appropriate for analyzing multiple waves of data (Valdes et al., 2013). Unweighted sample size numbers are rounded to the nearest 10, as required by the Institute of Education Sciences use agreement for restricted datasets.

Data Sources/Measures

Receipt of postsecondary supports. Postsecondary support data came from Waves 2 through 5 of post-high school parent/youth telephone interviews. The interview/survey included a series of items related to both disability-specific supports (e.g., a note taker or more time to take tests because of a disability) and receipt of universally available supports

(i.e., supports available to the full student body, such as tutoring and writing and study centers). Students with LD who ever were reported in data collection Waves 2 through 5 as having received a specific type of support at a 2-year or 4-year college were coded as a *yes* for that type of support. A combined *any school work support* variable was created and included in the analyses, with a *yes* response being based on a *yes* to one or both of the two types of support variables. In addition, *received only disability-specific supports* and *received only universally available supports* variables were created, with students who had received both types of supports excluded, to permit focusing on the effect of a single type of support. The *received only disability specific supports* measure was included in the descriptive analyses; however, too few students with LD received only disability supports to include this variable in the propensity modeling. In addition, the series of items related to disability-specific supports were categorized based on McLaughlin's (2012) classification of supports and included in the descriptive analyses as accommodations (supports that do not change the content being taught or reduce learning or achievement expectations), academically focused or other services, and modifications (supports that change the core content standard or the performance expectation). Comparison data for support receipt during high school came from the 2002 and 2004 high school program surveys, which were completed by the staff member most knowledgeable about the student's high school experiences.

Persistence or completion of postsecondary education: Propensity model outcome. The outcome measure in the propensity analyses was persistence or completion at 2-year or 4-year colleges. Persistence/completion data came from Waves 2 through 5 of post-high school parent/youth telephone interviews and mail surveys. Young adults who were reported ever to have attended a 2-year or 4-year college and either still attended or completed their program were coded as 1 = *postsecondary persister/completer.* Those who reported having left their postsecondary school before completion were coded as 0 = *noncompleter*.

Covariates. Covariate selection is critical to propensity modeling. A primary purpose of propensity scoring is to achieve the optimal balance between comparison groups on prominent covariates that influence participation in the treatment—receipt of supports—and the outcome—perseverance/completion (Caliendo & Kopeing, 2008; Cuong, 2013; McCaffrey, Ridgeway, & Morral, 2004; Rubin & Thomas, 1996). Covariate selection was guided by Tinto's interactional theory of student departure from postsecondary school (Tinto, 1975, 1993) and by the NLTS2 conceptual framework (Wagner & Marder, 2003). Tinto's model posited that departure decisions were shaped by the characteristics of students, their households, their prior schooling experiences, and their intentions. The NLTS2 conceptual framework posited that students' experiences in secondary and postsecondary school were shaped not only by their immutable characteristics (e.g., gender, race/ethnicity, disability-related characteristics) and their households (e.g., household income, head of household's education level), but also by factors that occurred in their past (e.g., academic preparation and performance, course taking). These covariates, included in Table 1, are described below.

Demographic covariates came from the Wave 1 parent interview/surveys and included youth's gender, race/ethnicity, household income, and head of household's education. *Disability-related indicators* included whether the student with LD also had attention deficit disorder (ADD)/ADHD, *in addition* to LD, based on parent report during the Wave 1 interview/survey, with the ADD/ADHD variable included as a dichotomous variable. Of this nationally representative sample of postsecondary students with LD, approximately one third were reported by their parents as also having ADD/ADHD. *Academic achievement* was based on two subtests from the research edition of the Woodcock–Johnson III (WJ III) (Woodcock, McGrew, & Mather, 2001)—passage comprehension and math calculations—administered when youth were 16 to 18 years old. Standard scores were centered around a mean of 100 with a range of 0 to 200. Performance also was measured on the basis of students' high school transcript GPA in general education academic coursework, as indicated on their final high school transcripts, collected between 2002 and 2009. *Academic preparation* was measured by the percentage of overall credits earned in general education academic courses. *Academic learning–related behaviors* came from high school teachers' report of how often a student did the following in a general education academic course: complete homework on time, take part in group discussions, stay focused on work, and work up to ability. Responses (*rarely, sometimes, usually, almost always*) were coded from 1 to 4 and summed to create a scale ranging from 4 to 16.

Handling Missing Data

Rates for missing data for most variables ranged from 0% to 5%. Exceptions were rates of approximately 29% for WJ III and course-taking variables. Descriptive data were not imputed. For propensity modeling, missing data were imputed 20 times using Stata's ICE (Imputation by Chained Equations) procedure (Royston, Carlin, & White, 2009). Imputations were performed on all analysis variables to avoid bias associated with listwise deletion and to capture the information contained in the correlation between covariates and the outcome and treatment variables. However, as recommended (White, Royston, & Wood, 2011), the propensity analyses did not use imputed values for the outcome or treatment in the analyses.

Table 1. Treatment and Control Balance Statistics on Covariates Before and After PSW for Receipt of Any Schoolwork Supports by Students With Learning Disabilities at 2-Year or 4-Year Colleges.

Covariates	M^a	SMD[b]	
		Pre-PSW	Post-PSW
Male	64.88	0.07	0.01
Race/ethnicity (not White)	37.84	0.21	−0.04
Household income < US$50,000	79.84	0.25[c]	0.09
Head of household education (⩽high school graduate)	38.43	−0.36[c]	0.07
Also has ADD/ADHD	34.54	0.19	−0.06
Math calculation	91.57	−0.43[c]	0.00
Passage comprehension	85.39	−0.22	0.01
GPA in academic general education courses	2.19	0.11	0.07
Academic general education credits (% total credits)	46.72	−0.11	0.0
Teacher rating of focused classroom behavior	11.86	0.05	0.06
Sample size	220		

Note. PSW = Propensity Score Weighting; SMD = standardized mean difference; ADD = attention deficit disorder; ADHD = attention deficit/hyperactivity disorder; GPA = grade point average; WWC = What Works Clearinghouse.
[a]Post-PSW treatment mean. [b]Pre-PSW SMD is calculated as the treatment mean minus the control mean (both means calculated using survey weights), with the difference divided by the pooled standard deviation. The Post-PSW SMD is calculated as the treatment mean (calculated using survey weights) minus the control mean (calculated using PSW-adjusted survey weights), with the difference divided by the pooled standard deviation. [c]Pre-PSW SMD at or above the WWC (2017) established 0.25 cutoff for baseline equivalence for quasi-experimental studies. All Post-PSW SMDs were below the WWC cutoff.

Descriptive Methodology

Descriptive analyses of support receipt were conducted for students with LD who attended 2-year or 4-year colleges. A standard error is presented for each mean and percentage. All statistics were weighted to be representative of a larger population of postsecondary students with LD; no imputation of missing values was conducted. Comparisons between support receipt in high school and postsecondary school were conducted using paired *t* tests.

Propensity Score Methodology

This study used PSM to address the hypothesis related to the effects of support receipt on college success. PSM is increasingly used in observational studies with cohort designs to reduce selection bias in estimating treatment effects when randomized controlled trials are not feasible (Rosenbaum & Rubin, 1983, 1985). PSM strives to create balance on observed covariates between treatment and comparison groups using statistical methods instead of randomization. The goal is to achieve a valid test of the treatment effect while statistically balancing treatment participants and nonparticipants on covariates that might be confounders, thus disentangling confounding effects from treatment effects.

The analyses presented here estimated the average treatment effect on students in the treatment condition in the population represented by NLTS2 students—that is, the effect of college support on students who experienced the support. The "weighting by the odds" analysis approach for complex surveys recommended by DuGoff, Schuler, and Stuart (2014) was used to adjust for potential confounding (i.e., differences between the treated and untreated students other than the treatment itself that might have affected the outcome).

First, logistic regressions to generate propensity scores were performed on multiply imputed data, as implemented in Stata proc logistic. Data were weighted using the NLTS2 cross-wave weight. The dependent variable was one of the college support treatments and the independent variables were the covariates. Survey weights were adjusted for control students by multiplying the NLTS2 weight by the quantity, $p / (1 - p)$ where p is the propensity score. Generated propensity scores were truncated at 0.99 to avoid excessively large adjustment factors. Treatment students' survey weights were not adjusted. Then, separate weighted logistic regressions were conducted for each of the 20 implicates using the adjusted survey weights where the dependent variable was the outcome variable and the independent variables included one of the three support receipt treatment variables and all covariates. Regression results then were combined across implicates using the Stata mim procedure, which generated odds ratios (ORs), which can be interpreted as measures of relative odds of persistence or completion by the treatment and comparison groups, controlling for the estimated propensity to have experienced treatment. Effect size for the ORs can be calculated using the Cox Index: $\mathrm{LOR}_{\mathrm{Cox}} = \ln(\mathrm{OR}) / 1.65$ (Cox, 1970).

PSM weighted the treatment group to the national population and the control group to the distribution of the treatment group in the population. This approach essentially

weighted the comparison group to create balance with the treatment group on observed covariates and thus facilitated estimation of the effect of support receipt for participants. Weighting was selected over other approaches such as matching because of its good performance in this dataset, flexibility with the distribution of the data, and ability to deal with time-dependent covariates and censored data, and because it retains all subjects in the analysis.

Balanced groups. To ensure that PSM created balanced treatment and comparison groups, the standardized mean differences (SMDs) between the two groups were compared for each covariate using survey weights and the propensity score-adjusted survey weights, respectively, before and after propensity score weighting. The SMD is the difference in means between the groups, divided by their pooled standard deviation. What Works Clearinghouse (WWC; 2017) established a 0.25 cutoff for baseline equivalence for quasi-experimental studies, a standard also supported by other analysts (e.g., Ho, Imai, King, & Stuart, 2007). Baseline equivalence of the treatment and comparison group SMDs was compared using the 0.25 criterion. Before propensity score weighting, the SMDs for three covariates in the model comparing receipt of any support and no receipt for those in 2-year or 4-year college were above this cutoff (see Table 1). In addition, four model covariates comparing receipt of only universally available supports were above this cutoff (table available upon request). After propensity score weighting, all SMDs were below the WWC cutoff, indicating the two groups were balanced on the covariates in all the models and that propensity modeling was warranted. All covariates also were included in all later models to further account for any possible covariate differences between treatment and comparison groups.

Sensitivity analysis. A sensitivity analysis (Lin, Psaty, & Kronmal, 1988) was conducted to determine how strongly a single unmeasured variable would need to be associated with both perserverance/completion and receipt of supports, if that variable had been included as a covariate in the propensity score analysis, to render the effect of the support receipt statistically nonsignificant. Such a variable would need to have an OR of 2.6 with both the dependent and treatment variable in the model exploring the effect of any help with school work and an OR of 4.10 in the model exploring the effect of receipt of universally available support only, both of which are relatively high hurdles. This suggests that the unobserved confounder would need to be very powerful before it would render the support receipt treatment not statistically significant.

Results

Approximately two out of five (44%) young adults with LD had attended a 2-year or 4-year college within 8 years of leaving high school. Almost two thirds were male, and an equal proportion were White (see Table 1). Approximately one third were reported to have ADD/ADHD in addition to their LD. Almost 80% were from households with incomes of less than US$50,000/year, and the parents of 38% of postsecondary students with LD had not continued their education after high school.

Research Question 1: To What Extent Did Students With LD Receive Support Services?

More than half (56%) of 2-year and 4-year college students with LD had accessed any school work supports—either those that were available to the full student body (i.e., universally available supports) and/or disability-specific supports (see Table 2). With only approximately one quarter of students with LD choosing to disclose a disability to their postsecondary school, it is not surprising that they were more than twice as likely to access universally available supports (e.g., tutors, writing or study centers) than disability-specific supports (53% vs. 26%, $p < .001$). Of those who had received disability-specific supports, most also had accessed the type of help available to the full student body; only 11% of students with LD at 2-year or 4-year colleges had received disability-specific supports independent of also having received universally available supports. In stark contrast to their rate of receipt of supports in college, when these same students were in high school, 98% ($p < .001$) had received some type of support from their school because of their LD.

Approximately 24% of postsecondary students with LD received accommodations (supports that do not change the content being taught or reduce learning or achievement expectations), 14% accessed academically focused services, and 2% received modifications (supports that change the core content standard or the performance expectation). Again, in contrast to so few receiving modifications in college, more than half (58%, $p < .001$) had received this type of support in high school.

The most frequently received disability-specific support was extended time on tests, with 22% at 2-year or 4-year colleges receiving this support. Other types of disability-specific supports received by more than 5% of students with LD were tutoring, the special use of a calculator during tests, and a different setting for test taking.

Research Question 2: What Was the Effect of Support Receipt on 2-Year or 4-Year College Success?

Propensity-adjusted results support the hypothesis that receipt of help with coursework affects perseverance and completion of students with LD (see Table 3). Students at 2-year or 4-year colleges who had received any support

Table 2. Receipt of Supports and Accommodations in High School and 2-Year and 4-Year College by Students With Learning Disabilities.

	High school		2/4-year college	
Support/accommodation received	%	*SE*	%	*SE*
Received any school work supports			56.21	6.35
Received universally available supports				
Overall			52.88	5.73
Only[a]			43.13	7.29
Received disability-specific supports				
Overall	98.03	1.373	25.63	5.58
Only[a]			10.55	6.10
Types of disability-specific supports				
At least one accommodation	88.35	3.245	23.98	5.51
At least one academically focused or other service	70.91	4.651	14.13	4.23
At least one modification	57.73	5.438	1.95	1.04
Unweighted *N*	220[b]		220	

Note. 2/4 year college = 2-year or 4-year college.
[a]Those who received both types of support were deleted from measure. [b]High school sample limited to students who later attended postsecondary school. Sample sizes rounded to nearest 10, as required by the Institute of Education Sciences, U.S. Department of Education, for restricted-use datasets.

Table 3. PATT Effect of Support Receipt on Postsecondary Perseverance or Completion for Students With Learning Disabilities in 2-Year or 4-Year Colleges.

	Persevered or completed		
Treatment	Treatment group[a] (%)	Adjusted control group[b] (%)	Propensity adjusted OR[c] *p* [95% CI]
Received any school work supports	76.68	49.60	3.34* 0.017 [1.25, 8.94]
Received universally available supports only	80.15	45.6	4.81** 0.007 [1.58, 14.67]

Note. PATT= population average treatment effect on the treated; OR = odds ratio; CI = confidence interval.
[a]Treatment group percentage, using survey weights. [b]Percentage positive for a control group that would yield the propensity adjusted OR if it matched the treatment group on all covariate means; calculated 100 × Pt / (OR [1 − Pt] + Pt), where Pt is the survey-weighted percentage of the treatment group with a positive outcome and OR is the propensity and covariate adjusted OR. [c]Effect size for dichotomous outcomes can be calculated using the Cox Index: LOR_{Cox} = ln(OR) / 1.65, where *LOR* is the logged odds ratio, ln is the natural logarithm function (D. R. Cox, 1970).
*$p < .05$. **$p < .01$.

with their school work (i.e., support that was universally available and/or disability-specific) were significantly more likely to persevere and/or complete their college programs (OR = 3.34, $p < .05$). That is, 77% of students who had received any support had continued or completed their programs, compared with a propensity-adjusted perseverance/completion rate of 50% for those who had not accessed supports. When the effect of receipt of only universally available supports (e.g., tutors or writing centers) was examined, results clearly demonstrated the positive effect of these types of supports. Students with LD receiving only universally available supports were more likely to be successful in their 2-year or 4-year college programs than other students (OR = 4.81, $p < .01$).

As previously indicated, the *received only disability specific supports* measure was included in the descriptive analyses. However, too few students with LD received only disability-specific supports to enable including this variable in the propensity modeling.

Discussion

College students with LD comprise the largest proportion of students with disabilities (Newman et al., 2011); however,

as a group, they also exhibit lower college completion rates than their peers. Much of the postsecondary education literature to date about students with learning disabilities has focused on enrollment (Mazzotti et al., 2016; Test et al., 2009). Thus, it is important to understand what factors influence their postsecondary education success. The present study's objective was to examine the effect of support use—both disability-related support and supports available to the full student body—on the college persistence and completion of students with LD, using PSM and data from the NLTS2 nationally representative dataset.

The current study's examination of a nationally representative sample of college students with LD at 2-year and 4-year colleges confirms the importance of students accessing available academic supports, both disability-related and those that are universally available to all students. Consistent with so few students with LD disclosing their disability to their college, students with LD were more than twice as likely to access universally available supports (53%) than disability supports (26%). In fact, only 11% of college students with LD reported receiving disability-specific supports only. The importance of using available academic supports is abundantly evident in that 77% of students who had received supports continued in, or completed their postsecondary programs, compared with 50% of those who did not receive supports. The postsecondary success rate increased to 80% for students with LD who accessed universally available supports only; this is a critically important finding, given the overall low rate of student self-disclosure and disability-specific support use.

These findings are inconsistent with those of Yu et al. (2018), who had not found a significant relationship between support receipt and postsecondary completion. However, their analyses did find that college students who had completed a college prep curriculum in high school and had received college supports were almost 7 times more likely to graduate than were students who had not received supports. Both the current study and the Yu et al. study were based on secondary analysis of NLTS2 data; however, there were several important differences between the studies, including the samples that were the basis of the outcome variables. The Yu et al. logistic regression analyses examined the effect of support receipt on college graduates as compared with perserverers and/or dropouts. In contrast, the current study compared the effect of receipt on graduates and preserverers compared with college dropouts. If support receipt increases the likelihood of a student persevering in postsecondary school, then comparing the effect of support receipt on those who persevere with those who graduate may mask the positive effect of support receipt if they are included in the comparison group, to the extent to which preserverers later graduate.

The current study's findings mirror those of Pingrey, Marward, and French (2012) and Troiano et al. (2010) in linking support receipt to a higher likelihood of college completion for students with LD. However, these prior studies focused solely on the effect of disability-specific supports, not taking into account the other types of academic supports students may have received. The present study extended this earlier work by broadening the research focus to include examining the effect on postsecondary success of receipt of supports available to the general student body.

Consistent with the current study, research conducted by DuPaul, Dahlstrom-Hakki et al. (2017) also indicated that students with LD benefit from the use of some universally available supports. Moreover, the current findings extend those of DuPaul et al. by establishing that students with LD benefit from universally available services in terms of not only GPA but also college completion. Given the generally low and stagnant college completion rates of students with LD, this is of particular importance.

Limitations

This study has provided evidence of the benefits of receiving supports, particularly universally available supports, from 2-year or 4-year colleges for students with LD. Nonetheless, it has the following limitations. Too few students with LD attended 4-year colleges and too few received disability-specific supports at 2-year or 4-year colleges to enable analyzing the effect of support receipt on perseverance/completion at each type of institution separately or the effect of solely receiving disability-specific supports from 2-year or 4-year colleges. In addition, other than disability category, all measures were self-reported data and could not be independently verified. As a secondary analysis, this study was constrained by the NLTS2 design and the items available in the dataset.

Furthermore, information about receipt of supports was provided by different respondents at the high school and postsecondary school levels. At the high school level, school staff provided information about receipt whereas postsecondary rates of receipt were based on parent and postsecondary student self-report. Thus, postsecondary rates may be underreported because parents and youth may be less aware of the types of postsecondary supports received. In addition, although the NLTS2 dataset is the only available dataset with postsecondary education outcomes for a nationally representative sample of students with LD, some of these data now are more than a decade old, having been collected between 2003 and 2009, and may no longer be fully reflective of the current postsecondary experiences of students with LD.

Finally, unobserved confounding is a concern in studies such as this, where receipt of postsecondary supports could

not be randomized. The propensity score approach adjusts for observed covariates but does not necessarily balance on unobserved factors. Bias may arise if an unmeasured factor was correlated with both receipt of postsecondary support and perseverance/completion. However, sensitivity analyses indicate that results were unlikely to overstate effects and that an unobserved confounder would need to be very powerful before it would render the receipt of supports treatment variable not statically significant.

Implications for Secondary Transition

These results have implications for secondary school students, their parents, and teachers who support them in transitioning to postsecondary education. Although 98% of high school students with LD received some sort of disability-related support, only 26% did so in college and only 56% received any schoolwork support in college, including supports that are available to the whole student body. As students with LD prepare to transition to college, one focus should certainly be on the self-disclosure process, including the differences in legislation that govern the accommodations and the skills of self-advocacy and self-determination that enable students to access this process. However, equal emphasis is needed on helping students to identify and access universally available supports on campus. Prior research (e.g., DuPaul, Dahlstrom-Hakki et al., 2017; Newman et al., under review) and the current study have demonstrated that such academic supports increase the likelihood of student persistence and/or completion. Clearly, transitioning students need not only to be aware of but be prepared to access such services once on campus. Other research has demonstrated that through transition planning activities, such as receiving transition planning education or having a transition plan that specified needed postsecondary accommodations, high school staff have the ability to increase the likelihood of students accessing both disability-specific and universally available supports in college (Newman et al., 2016). Secondary educators can help prepare students with LD for obtaining disability-specific and universally available supports. Lalor, Petcu, and Madaus (2018) suggested that educators can help students understand the nature of their disability, its impacts on achievement, and the supports effective in helping them succeed. Educators can then provide direct instruction on the various supports available at postsecondary institutions and help students match their needs to specific support services. However, even with this direct instruction, some students may have difficulty requesting support. Secondary educators are encouraged to use role-play to help students develop self-confidence in their ability to request supports, prior to graduating from high school and continuing their education at the postsecondary level (Roessler, Brown, & Rumrill, 1998; Walker & Test, 2011).

High school planning teams also need to understand that fewer than 2% of students with LD received modifications in college. As such, planning teams, in consultation with students and parents, should consider reducing the number of modifications offered to students with LD as they progress through their secondary education (Hamblet, 2014). Students may be better prepared for higher education by being provided with supports in high school that promote learning strategies and self-awareness rather than modifications. In addition, educators should discuss postsecondary supports that students can access to further develop their learning strategies and self-awareness. Taking such steps will better prepare students with LD for their transition to postsecondary education.

Suggestions for Future Research

This study provides a strong foundation for further exploring the linkages between support receipt and postsecondary success for students with LD. For example, it will be important to determine the effect of the specific type, duration, and intensity of supports. In addition, future research at the postsecondary level can usefully focus on how best to reach and serve the majority of students with LD at their colleges who have chosen not to disclose their disability. Further understanding also is needed of the types of supports and professional development that would best equip college faculty and administrators to respond to the needs of students with LD who access the college's universally available supports.

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