

Effect of Accessing Supports on Higher Education Persistence of Students with Disabilities

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Abstract

This study examined the effect of accessing supports available to the general student body and disability-related supports on college perseverance for students with disabilities. This secondary analysis of a nationally-representative longitudinal dataset included a sample of approximately 2,330 college students with disabilities who had been identified as having a disability in secondary school. Students were included in the sample independent of their decision to disclose their disability to their college. Evidence from propensity analyses indicated that students with disabilities who had accessed universally-available and/or disability-related supports were significantly more likely to persist in their 2- or 4-year college programs. Additionally, retention rates were higher for those who had accessed universally-available supports only, such as writing and math centers, which don't require disclosure of a disability. Implications for higher education institutions are discussed, including the need for professional development for all administrators and staff to better understand how to respond to the needs of students with disabilities, with an emphasis on the fact that the majority of students with disabilities on a campus do not self-disclose.

Keywords:

College students with disabilities

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Data from the National Center for Education Statistics indicate that higher education enrollment rates of students with disabilities climbed from 10.9% of all students in 2007-2008 to 19.5% in 2015-2016 (National Center for Education Statistics, 2015; 2019). However, data on degree completion for students with disabilities remain troubling. Comparing data from the National Longitudinal Transition Study (NLTS) and the National Longitudinal Study-2 (NLTS2), Newman et al. (2010) found no significant difference in completion rates of students with disabilities between 1990 and 2005. Data from other large-scale studies also indicate that students with disabilities are less likely to persist in and successfully complete a higher education program than their peers without disabilities (Lee, Rojewski, Gregg, & Jeong, 2015; Newman et al., 2011). As a result, students with disabilities may not fully reap the myriad benefits associated with higher education, including increased employment and earnings (Bureau of Labor Statistics, 2014; Newman et al., 2011), healthier lifestyles (Cutler & Lleras-Muney, 2010; Ma, Pender, & Welch, 2016), more engaged citizenship (Ma et al., 2016; Richard, Keen, Hatcher, & Pease, 2016), and increased openness to diversity (Bowman, 2014).

The gap in higher education persistence between students with and without disabilities suggests this student population is in need of additional attention from college and university administrators. This need for increased attention has been echoed by the federal government (U.S. Government Accountability Office, 2009) and researchers focusing on students with disabilities (e.g., Evans, Assadi, & Herriott, 2005; Myers, 2008). Most research on college students with disabilities is based on the students who have self-disclosed their disability; however, for a range of reasons, including concerns about stigma, lack of knowledge about legal rights, available services, and their specific disability and its impact on learning (e.g., Denhart,

2008; Walker & Test, 2011), only 35% of students who received special education services in high school disclosed their disability to their college or university (Newman & Madaus, 2015a). As a result, the majority of students with disabilities are not known by college and university disability services offices, much less university administrators; yet they are enrolled and using student and academic support services. In fact, students with disabilities have indicated that several college services, including academic advising, counseling services, and tutoring centers have been beneficial to their educational attainment (Thompson-Ebanks, 2014). Herbert et al. (2014) reported that there was no difference in the graduation rate of students with disabilities who received disability-related services and those with disabilities who registered for services but did not receive them at a mid-Atlantic university. The authors called for further research into other campus supports used by students with disabilities and their impact on graduation rates.

Given this information, it is not surprising researchers (e.g., Evans, Herriott, & Myers, 2009; Kimball, Vaccaro, & Vargas, 2016; Vaccaro, Daly-Cano, & Newman, 2015) have called for all university administrators and professionals to be prepared with knowledge to develop programs and policies to serve students with disabilities. However, as others have pointed out, most professional journals related to higher education do not publish widely on students with disabilities (Peña, 2014; Madaus et al., 2018), and training in issues related to students with disabilities is limited in graduate training programs that prepare higher education professionals (Evans et al., 2017).

It is therefore critical to better understand how to provide effective support to *all* students with disabilities on campus, including those who choose not to formally disclose their disability (Burgstahler & Moore, 2008). Despite choosing not to self-disclose, disability-related issues do not disappear with college enrollment, and the need exists to study the effect of specific factors,

characteristics, and interventions that can influence the success of the broader population of college students with disabilities, based on longitudinal studies that are not reliant on disability self-disclosure, but instead where disability is identified by secondary school districts (Madaus et al., 2018; DaDeppo, 2009). This paper examines the impact of accessing supports on the postsecondary perseverance of a nationally representative sample of the broader population of students with disabilities on college campuses. With a better understanding of the interventions that can influence the success of all students with disabilities, college administrators and professionals can more confidently take action to better serve this population of students.

Accessing Disability-Related Supports

Postsecondary students are covered by the civil rights mandates of Section 504 of the Rehabilitation Act of 1973 and the Americans with Disabilities Act Amendments Act of 2008 (Grossman & Smith, 2015). These laws place the responsibility on a student to self-disclose a disability to their higher education institution in order to receive disability-related services and supports. Findings based on NLTS2 data indicate that only 35% of students identified as having disabilities in secondary education self-disclose in college and then only 24% of students with disabilities accessed disability-related supports in college. In comparison, 98% of these students received these types of supports in high school (Newman and Madaus, 2015a).

Mamisheishvili and Koch (2011) analyzed data from the Beginning Postsecondary Students Longitudinal Study regarding the persistence of students with disabilities from year 1 to year 2 of college and reported that a few disability-related supports specifically influenced persistence, notably course substitutions or waivers, and readers, note takers, or scribes. Echoing prior research on student engagement (e.g., Kuh, 2009), chi square analysis indicated students who engaged in social and academic activities were more likely to persist; however, neither these

social and academic integration variables nor disability support variables were statistically significant in a final logistical regression model.

Accessing Universally-Available Supports

Postsecondary institutions offer a range of academic supports to enhance student learning outside of the classroom, and as Higbee and Eaton (2008) noted, students have a range of preparedness and skills that impact their learning. Support programs can include, but are not limited to, specific content areas such as math, writing, and reading; technological support; the development of learning skills and time management; and supplemental or basic skills development (Higbee & Eaton, 2008; Optitz & Block, 2008). Research has demonstrated college supports designed to help students in the general population are associated with improvements in college persistence and completion (e.g., Deacon, Tucker, Bergey, Laroche, & Parilla, 2017; Reinheimer & McKenzie, 2011; Zeidenberg, Jenkins, & Calcagno, 2007). Patterns of accessing supports also differ by type of institution. For example, Newman and Madaus (2015a) and Newman, Madaus, and Javitz (2016) reported approximately 49% of students with disabilities had accessed the types of supports universally available to the full student body (e.g., tutoring, learning assistance centers) at 2- and 4-year colleges, as compared with 36% at career and technical education schools. Less is known about the relationship between universally-available supports and postsecondary education outcomes for students with disabilities. Studying these relationships may provide important insights into factors impacting student persistence.

Conceptual Framework

Studying the effect of accessing supports for those with disabilities may provide important insights into factors impacting student persistence. Tinto's (1975, 1993) theoretical model depicts the processes of longitudinal interactions between the student and the institution

that affect a student's decision to withdraw from college; however, the model has been used also to determine other student outcomes (Pascarella & Terenzini, 2005), including factors that lead to persistence and graduation. Tinto theorizes that students enter college with a range of personal, family, prior schooling attributes, goals, and commitments, which are modified through ongoing interactions with the academic and social structures and communities within a college. The existence of a disability can lead to stigmatizing attitudes and biases, and being assigned to a minority status that can negatively impact belonging in college and persistence (Kim & Lee, 2016; McGregor, Langenfeld, Van Horne, Oleson, Anson, & Jacobson, 2016; Vaccaro, Kimball, Newman, Moore, & Troiano, 2018); however, positive encounters with formal and informal academic systems within an institution may lead to greater integration, and in turn, to persistence (Pascarella & Terenzini, 2015).

Tinto's model, which identifies and links the main student and institutional factors related to postsecondary persistence (Pascarella & Terenzini, 1980, 1983; 2005), provided guidance on variable selection for this research seeking to understand the effect of college programs and experiences on students' perseverance. This interplay between student and college is particularly salient to the current study's focus on the effect of accessing supports on college persistence for students with disabilities because accessing supports occurs only to the extent the student actively seeks help. Some researchers consider Tinto's conceptualization, particularly his concept of social integration, as being inappropriate for use with underrepresented groups of students or students at commuter and community colleges (e.g., Braxton, Hirschy, & McClendon, 2004; French, 2017; Guiffrida, 2006; Merriweather Hunn, 2008; Murgula, Padilla, & Pavel, 1991; Pascarella & Terenzini, 2005). However, Tinto's model has been used by many researchers investigating the experiences and outcomes of college students with a range of

disabilities and from a range of institutional types (e.g., Duquette, 2000; Kim & Lee, 2016; McGregor et al., 2016; Mamiseishvili & Koch, 2012; Wessel, Jones, Markel & Westfall, 2009).

In addition to Tinto's model, this work was guided by the NLTSS2 conceptual framework (Wagner & Marder, 2003), which posited that youth's experiences in secondary and postsecondary school are shaped not only by the immutable characteristics of students (e.g., disability category, race/ethnicity) and their households (e.g., household income, mother's education level), but also by factors that have occurred in their past (e.g., academic preparation and performance), and factors that are fluid and can change over time (e.g., seeking supports in postsecondary school). Rather than focus on Tinto's concept of social integration—the extent to which the student “shares the normative attitudes and values of peers and faculty” (Pascarella & Terenzini, 2005, p. 54), — we used the NLTSS2 framework and aspects of Tinto's model depicting the range of personal, family, prior schooling attributes, experiences, and performance, as well as his focus on the importance of academic engagement to help guide the selection of covariates in the propensity models examining the effect of accessing academic support on persistence of postsecondary students with disabilities.

Current Study

Given the importance of completing college, the low college graduation rate for students with disabilities, and the impact of support services on students in the general population's ability to complete college, it is imperative to understand the link between accessing supports and achieving positive postsecondary education outcomes for the broad population of college students with disabilities. The objective of the present study was to examine the effect of accessing supports on the college success of *all* students with disabilities, both those who have and have not self-disclosed their disability. Based on the hypothesis that accessing academic-

focused supports improves postsecondary students with disabilities' perseverance, the present study addressed the following question, using quasi-experimental propensity score modeling methodology: What was the effect of accessing universally-available and/or disability-related supports on postsecondary persistence for students with disabilities at 2- and 4-year colleges, independent of a student's decision to disclose their disability? Rigorous propensity-score analysis should enable the field to move beyond description and draw conclusions about interventions, a needed component of research that supports identification of evidence-based practices that may lead to improved college outcomes for students with disabilities (Test, Mazzotti, Mustian, & Fowler, 2009).

Method

Sample

The findings in this paper were based on secondary analyses of data from NLTS2, funded by the U.S. Department of Education. We selected this dataset because it was the only data currently available that generalizes to college students with disabilities nationally and where students were identified by their school district as having a disability when they were in secondary school. In contrast, all other large-scale national studies of postsecondary students with disabilities have been limited to the 35% of college students with disabilities who self-identify in college, overlooking at least 65% of college students with disabilities identified in secondary settings (Avellone & Scott, 2017; Leake, 2015; Newman & Madaus, 2015a). The NLTS2 two-stage sampling strategy first randomly sampled school districts and state-supported special schools stratified by geographic region, district enrollment, and wealth. Students ages 13 to 16 as of December 1, 2000, in grade 7 or above, and receiving special education services were randomly selected from rosters of 500 school districts and 40 state-supported special schools.

The initial NLTS2 sample comprised more than 11,000 students and included students in each of the 12 federally recognized disability categories. NLTS2 included five waves of data collection, conducted every other year, beginning in 2001, when the sample was 13 to 17 years old and ending in 2009, when they were 21 to 25 years. Sample selection, attrition, representativeness, and weighting were more fully described by SRI International (2000), Javitz and Wagner (2005), and Newman et al. (2011).

The sample of approximately 2,330 students for the present study included youth who had at least one parent or youth interview/survey that reported the youth's attendance at a 2-year and/or a 4-year college and had responses to the interview items focused on accessing college support. Approximately 560 youth had reported attending both types of institutions since leaving high school. They were included in the analyses for each type of college separately; however, their responses only were included once in the combined 2-or 4-year college analyses. The 2-year college sample included approximately 1,890 students and the 4-year college sample included approximately 1,000 students. Students who by their final data collection wave still were attending college or had left college by completing their program were considered to be persisters in the current analyses. Of the 2-year sample, by their final wave of data collection, 1,240 were persisters (820 had completed college and 420 still were attending) and 650 had left prior to completing college. Approximately 680 were considered persisters in the 4-year college sample (360 had completed their 4-year college program and 320 still were attending) and 320 had left prior to completing.

The sample included students across a range of types of disabilities. Students with learning disabilities constituted approximately two-thirds (67%) of the population of students with disabilities in postsecondary schools. Those in four other disability categories accounted for

approximately 25% of that population: students with emotional disturbances, 9%; intellectual disabilities, 5%; other health impairments, 6%; and speech/language impairments, 5%. Students in the seven remaining federal disability categories represented less than 9% of those who attended a postsecondary school. Thirty-five percent of postsecondary students with disabilities were reported by parents to have attention deficit disorder in addition to their other disability.

Handling Missing Data

Rates for missing data for most variables ranged from 0 to 5%. Exceptions were rates of approximately 25% for Woodcock Johnson III academic assessment and course-taking variables. Missing data were imputed 20 times using Stata's Imputation by Chained Equations procedure (Royston, Carlin, & White, 2009). All analyses variables were imputed; however, as recommended (White, Royston, & Wood, 2011), we did not use imputed values for the outcome or treatment in the analyses.

Propensity Score Methodology

We used propensity score modeling (PSM) to address the hypothesis that accessing coursework supports improves college students with disabilities' perseverance. In observational studies such as NLTS2, we often want to compare the outcomes of a group of students who have received a treatment with those who have not. However, because the two groups were not randomly assigned, the treated and non-treated groups may differ in more ways than whether they received the treatment. Any factor that influences both the likelihood of receiving the treatment and the outcome being examined can bias examination of the treatment effect. PSM is designed to reduce, and ideally eliminate, such biases by creating "statistical twins"—students who are similar on the specified variables (known as covariates) included in the models. In this

way, PSMs simulate, to the extent possible, analyses of data from a randomized control trial (Rosenbaum & Rubin, 1983, 1985).

The analyses presented here estimated the average treatment effect (i.e., the effect of accessing college support) on students who experienced the support. The treatment group were students who had accessed universal and/or disability-related supports during college (treatment measures described more fully below) and the control group in all models were those who had not accessed any supports. We used the “weighting by the odds” analysis approach for complex surveys recommended by DuGoff, Schuler, and Stuart (2014) to balance the treatment and control groups. We used logistic regressions on multiply imputed data, as implemented in Stata proc logistic to generate scores on the likelihood (propensity) of each student being assigned to the treatment group, based on the variables (covariates) related to the treatment. The dependent variable was one of the postsecondary support treatments, and the independent variables were the covariates. Logistic regressions were based on weighted data using the NLTS2 cross-wave, cross-instrument weight (Valdes et al., 2013). Survey weights for control students were adjusted 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. 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 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 data set, flexibility with the distribution of the data, ability to deal with time-dependent covariates and censored data, and because it retains all subjects in the analysis.

Propensity scores then were used to adjust the weights of the control students so that these students were similar to the treatment group on the characteristics included in the analyses. We ran separate logistic regressions on multiply imputed data, where the dependent variable was the college perseverance outcome and the independent variable was one of the three support treatment variables. These models included the propensity weights as well as all covariates. Regression results then were combined across imputates using the Stata `mim` procedure, which generated odds ratios. These odds ratios can be interpreted as measures of relative odds of persistence or completion by the treatment group and comparison group, controlling for the estimated propensity to have experienced treatment. Effect size for the odds ratios (*ORs*) can be calculated using the Cox Index $LOR_{Cox} = \ln(OR)/1.65$ (Cox, 1970).

Data Sources/Measures

Treatment: postsecondary supports. We created three across-wave analysis variables based on two support variables from the Waves 2 through 5 post-high school parent/youth telephone interviews/mail surveys— disability-related supports (e.g., a note taker or more time to take tests because of a disability; see Newman and Madaus [2015a] for more information on specific types of supports) and universally-available supports (e.g., tutoring, writing and study centers). We created a combined *any school work support* variable, with a *yes* response based on a *yes* to one or both types of support variables, as well as *received only disability-related supports* and *received only universally-available supports* variables, where students who had received both types of supports were not included in the analyses, to permit examining the impact of each type of support, independent of the other.

Outcome: persistence. The outcome variable was persistence at 2- or 4-year colleges. Persistence data came from the Waves 2 through 5 post-high school parent/youth telephone

interviews/surveys. Young adults who were reported ever to have attended a 2- or 4-year college and either still attended or completed their program were coded as 1 = *postsecondary persister*. Those who reported having left their postsecondary school before completion were coded as 0 = *nonpersister*.

Covariates. Covariate selection is critical to propensity modeling. The primary purpose of propensity methods is to achieve the optimal balance on specified variables, so that the students who had received the treatment and those who had not were similar on factors that were related to the treatment and the outcome (Caliendo & Kopeing, 2008; Cuong, 2013; Rubin & Thomas, 1996). Based on Tinto's (1975, 1993) interactional theory of student departure from postsecondary school, the NLTS2 conceptual framework (Wagner & Marder, 2003), and other research, we identified several factors linked to accessing college supports and college perseverance. Both frameworks suggest that students' experiences in postsecondary school are shaped by the characteristics of students (e.g., gender, race/ethnicity, disability-related characteristics), their households (e.g., household income, head of household's education level), as well as their prior schooling experiences (e.g., academic preparation and performance, course taking). These covariates are described below.

Research has highlighted the often dramatic differences in the experiences of students with *different primary disabilities* (e.g., Newman et al., 2011; Newman et al., 2012) and has demonstrated that severity of disability can shape the kinds of programs and services in which young adults participate (Levine, Marder, & Wagner, 2004) and their postsecondary school outcomes (Rojewski, Lee, & Gregg, 2015). *Primary disability category* was provided by secondary school districts, based on the 12 federally-defined disability categories in the Individuals with Disabilities Education Act (IDEA) in place when NLTS2 youth were sampled.

As another measure of *disability severity*, parents reported whether youth also had attention deficit/hyperactivity disorder in addition to their primary disability.

Individual and household demographic factors have been associated with differences in postsecondary outcomes and related programs, supports, and services for young adults with disabilities (Joshi, & Bouck, 2015; Wagner, Newman, & Javitz, 2014). *Demographic covariates*, from the Wave 1 parent interview/surveys, were the following: youth's gender, race/ethnicity, household income, and head of household's education. Research also points to the importance of *personal attributes* of young adults in seeking supports and services, including their *self-determination* (Denhart, 2008; Goldberg, Higgins, Raskind, & Herman, 2003). Self-determination skills in the three domains of personal autonomy, psychological empowerment, and self-realization were included as covariates and measured using items from the Arc's Self-Determination Scale (Wehmeyer, 2000), conducted when youth were 16 to 18 years old.

High school preparation and performance can be important influences for postsecondary success (Moore & Shulock, 2009, Long Conger, & Iatarola, 2012). *Academic achievement* was based on four subtests from the research edition of the Woodcock-Johnson III (Woodcock, McGrew, & Mather, 2001)—reading comprehension, synonyms/antonyms, math calculation, and applied math problems—administered when youth were 16 to 18 years old. *Academic preparation* was measured on the basis of students' high school transcripts, as indicated by the number of credits earned in academic-general education courses, calculated as a percentage of overall credits.

Balanced groups. To ensure that PSM created balanced treatment and comparison groups, standardized mean differences (SMDs) between the two groups on each covariate were compared 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). Before PSM, four covariates in the model comparing accessing any postsecondary accommodations or support with no receipt for those in the 2-year or 4-year college sample were above this cutoff (Table 1), as were eight covariates in the models focused on accessing only generally available or disability-specific supports. In addition, 17 covariates across models for the 2-year sample, and 21 variables across models for the 4-year sample were above the 0.25 cutoff. (tables available on request). After propensity score weighting, all SMDs were below the WWC cutoff for all models, with one exception, indicating treatment and comparison groups were balanced on the covariates in almost all of the other models and propensity modeling was warranted. In addition, we included all covariates in subsequent models to further account for any possible differences between treatment and comparison groups. The one exception was the model focused on accessing only disability-specific supports at 4-year colleges. Due partially to the relatively large number of covariates (24) and the small sample accessing only this treatment, four covariates remained unbalanced after PSM, with SMDs ranging from .29 to .66. Because the treatment and control groups remained unbalanced after PSM, we have not reported the findings at 4-year college for this variable separately and instead have included the combined 2- or 4-year college variable.

< Table 1 >

Results

Approximately 60% of 2- and 4-year college students with disabilities had accessed universally-available and/or disability-related supports (Table 2). More than two in five (43%)

had solely accessed universally-available supports and had not also accessed disability-related supports. Only slightly more than one in ten (11%) had accessed only disability-related supports and had not also accessed universally-available supports. Rates of accessing the various types and combinations of support were relatively similar across the 2-year and 4-year postsecondary institutions.

< **Table 2** >

Propensity-adjusted results support the hypothesis that accessing supports affects college students with disabilities' perseverance (Table 3). Analyses confirm that students at 2-year and 4-year colleges who had received any schoolwork support were significantly more likely to persist in their college programs ($OR = 2.41, p < .01$ at 2- and 4-year colleges combined; $OR = 1.81, p < .05$ at 2- year colleges; and $OR = 2.45, p < .05$ at 4-year colleges). That is, as a means of interpreting the *OR*, for example in 2- or 4-year colleges combined, 75% of students who had accessed supports had persisted in their programs, as compared with a propensity-adjusted perseverance/ rate of 56% for those who had not accessed supports. Students who accessed only supports available to the general student body (e.g., tutors, writing centers) also were more likely to be successful in their programs across institution type; for example., 79% of students who had accessed only universally-available supports had persisted in college, as compared with a propensity-adjusted persistence rate of 51% for those who had not accessed supports. Receipt of only disability-related supports was not significantly related to perseverance at 2- or 4-year institutions combined or individually.

< **Table 3** >

Discussion

Although students with disabilities are pursuing higher education in greater numbers, they need to complete their programs to obtain full benefit, and only about two in five do so (Newman et al., 2011). Given the growing importance of higher education completion, it is particularly critical to identify factors related to higher probability of postsecondary success.

Thus, this study examined the effect of accessing universally-available and disability-related supports on college success of students with disabilities, both students who have and have not self-disclosed their disability, using propensity score modeling, a quasi-experimental method, and data from the large, nationally representative, longitudinal NLTS2 database. Results indicated that students with disabilities at 2- or 4-year colleges who accessed supports, particularly supports available to the full student body, such as tutoring and writing and study centers, were more likely to experience positive postsecondary outcomes. Almost 80% of students who had accessed these universally-available supports persisted in their 2- or 4-year college, as compared with a propensity-adjusted perseverance rate of 51% for those who had not accessed these types of supports. In comparison, accessing only disability-related supports from a 2- or 4-year institution did not significantly affect perseverance (54% compared to 57%).

Academic integration, a key aspect of Tinto's theory on student persistence, was described by Duquette (2000) and Wessel et al. (2009) as being clearly evident in successful profiles of university students with disabilities. Duquette (2000) reported that successful students reported accessing academic support systems and feeling comfortable in the academic environment. Although the present study did not measure such perceptions at the student level, the academic integration of the students into existing academic support structures and programs clearly leads to more positive outcomes.

Nearly two-thirds of postsecondary students who received special education services in high school do not disclose their disability when they attend college, resulting in most college higher education professionals being unaware of the large number of students with disabilities attending their institutions, enrolling in courses, participating in co-curricular programs, and using support services (Newman et al., 2011). Thus, the policies, programs, and services specifically directed toward students who have self-identified as having a disability, such as those provided by disability services, are not accessed by the majority of college students with disabilities. Instead, students not disclosing a disability, like their peers without disabilities, receive services and supports from professionals who are primarily focused on the broader student body. And as noted, accessing these universally-available supports (e.g., tutors, writing centers) was significantly related to the postsecondary success of students with disabilities.

Accessing disability-related services was not found to be related to college outcomes; however, despite these findings, it is premature to say that disability-related accommodations and services do not help. Student needs vary widely by type of disability and vary widely even within the same disability category. Additionally, the number and type of disability supports received also vary widely by disability type. For example, research has indicated that students with more visible disabilities (e.g., hearing, visual, orthopedic, autism, multiple disabilities, deaf-blindness) are more likely to receive disability-related supports than those with learning or psychiatric disabilities (Newman & Madaus, 2015b). These differences can also be profound by institutional type. Students with visual impairments are seven times more likely to receive accommodations at 2-year colleges than students with learning disabilities and 39 times more likely at 4-year colleges. To better understand the effect of disability supports on postsecondary completion rates, analyses would need to be conducted separately, by disability category.

Thus, these results do not diminish the importance of disability-related services, but they do strikingly demonstrate the importance of university administrators and professionals from across a range of programs and functional areas being aware of strategies to proactively create inclusive services, policies, and environments that promote access for *all* students and communicating to integrate services for a range of students (Dong & Lucas, 2016; Evans et al., 2017; Vaccaro et al., 2015). Some students using universally-available academic supports will have an undisclosed disability of some type, while others may be from other underrepresented groups, all of whom have unique and sometimes hidden learning needs (Korbel, Lucia, Wenzel, & Anderson, 2011).

This rich diversity in the student body lends itself to the use of universal design principles in student support programs, and literature exists to guide these efforts (Burgstahler, 2015; Burgstahler & Moore, 2008; Higbee, 2008; Higbee & Eaton, 2008; Optiz & Block, 2008). For example, Burgstahler and Moore (2008) and Burgstahler (2015) described several proactive student suggestions that could benefit students with and without disabilities, including accessible publications and websites, lowering the placement of wall postings so that they can be read from lower vantage points, and training for professional and student workers in issues related to diversity that might impact not only students with disabilities, but also students from other identity groups. Wessel et al. (2009) also described several services that can be used to proactively reach out to students, faculty, and staff to facilitate the academic integration of students with disabilities. Such efforts included proactively reaching out to all students, especially through orientation programs. Other methods might include first-year experience programs, first-year seminar courses, academic advising meetings, and residence hall meetings,

to make students aware of the availability of a range of academic and personal supports before they encounter difficulty in academics and/or in student life.

Additionally, administrators in offices that provide both disability-specific and universally-available student supports could reach out to faculty, teaching assistants, residence hall staff, and other administrators with high levels of student contact to encourage them to promote student access of supports, to infuse academic support programs into plans for students who are placed on academic probation, and to create and maintain effective collaboration among campus administrators (Alexandrin, Schreiber, & Henry, 2008). Given that a key finding of this investigation was that supports that are available to the entire student body impact the success of students with disabilities, ensuring that these supports are universally designed is especially important so that students with disabilities can readily access them and maximize their value.

This is especially important given that existing literature is clear that many campus administrators and staff do not receive disability-related knowledge in their graduate training and in their professional journals, and need additional professional development in order to support students with disabilities in their learning (Lalor, 2017; Murray, Flannery & Wren, 2008). There is a need for continued collaboration between disability services offices and the broader university milieu (Harbour, 2008; Korbel et al., 2011). Korbel et al. (2011) describe a range of collaboration initiatives and programs, both internal and external to the institution to meet the needs of students with disabilities, which includes offering professional development for all administrators and staff to better understand how to respond to the needs of students with disabilities, with an emphasis on the fact that the majority of students with disabilities on a campus do not self-disclose. Universally designed approaches to service delivery have the

potential to better address the needs of students with disabilities, both those who have and those who have not self-disclosed, as well as the needs of students in the general population.

Limitations

This study has provided evidence of the benefits of accessing supports, particularly universally-available supports from colleges for the full population of postsecondary students who had been identified with a disability in high school, independent of their disclosing their disability to their college. Nonetheless, it has the following limitations. Some analyses were based on self-reported data and could not be independently verified. Rates of receiving supports may have been underreported because parents and youth may have been unaware of the types of postsecondary supports received. As a secondary analysis, this study was constrained by the NLTS2 design and items; therefore, it does not include students who were first identified as having a disability when they were in college, nor students with disabilities who had not received special education services in secondary school (e.g., students with a 504 plan). Although the NLTS2 dataset is the only available dataset with postsecondary education outcomes for a nationally representative sample of students, some of these data now are more than a decade old and may no longer be fully reflective of the current postsecondary experiences of students with disabilities, particularly in light of the recent increased focus on retention efforts and making more supports available to all students. Additionally, too few students had accessed only disability-related supports at 4-year colleges to support analyzing the effect of this service on perseverance at 4-year colleges. Finally, the PSM approach balances the treatment and control groups on the covariates included in the model. However, bias may arise if there was a covariate that was correlated with both receipt of support and postsecondary perseverance/completion but not included in the model. We conducted a sensitivity analysis (Lin, Psaty, & Kronmal, 1988) to

determine how strongly a single unmeasured covariate would need to be associated with both receipt of supports and perserverance/completion to make the current findings statistically nonsignificant if that variable had been included as a covariate in the propensity score analysis. Results of sensitivity analyses indicate that an unmeasured covariate would need to be very powerful (i.e., doubling the college success rate) before it would render the current findings not statistically significant.

Areas for Future Research

As noted, the rate of accessing supports in higher education by students in different disability categories varies greatly. Additional research is needed to determine the effect of these supports, by disability category, on postsecondary completion rates. Learning more about the use of various disability-related and universally-available supports to determine their impact on retention and graduation also would be important, including studying the extent and timing of supports. Additionally, work is needed to examine the efficacy of communications and advertisements of the services offered by colleges and universities to determine if they are successfully reaching all students with disabilities. Issues related to the accessibility of the communications and advertisements and the inclusivity of the messages are worthy of consideration.

Serving students with disabilities on college campuses is not the sole purview of disability services offices—all college administrators and professionals should be aware that students with disabilities, like all other students, are utilizing the services that they offer, and research needs to continue in areas that increase the likelihood of student access and benefit.

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Table 1

Treatment and Control Balance Statistics on Covariates Before and After Propensity Score Weighting (PSW) for Accessing Any Postsecondary Supports at 2-Year or 4-Year Colleges

Covariates	Mean ^a %	SMD ^b	
		Pre-PSW	Post-PSW
Gender: male	62.37	-0.03	0.01
Race/ethnicity - not White	36.10	0.18	-0.06
Household income < \$50,000	47.22	-0.36 ^c	-0.01
Head of household education (% ≤ high school graduate)	40.84	-0.29 ^c	0.05
Federal disability category			
Autism	0.62	0.05	-0.02
Emotional disturbances	8.55	-0.09	-0.05
Hearing impairment	2.69	0.12	-0.02
Intellectual disabilities	4.47	-0.00	-0.01
Learning disabilities	67.53	0.09	-0.08
Multiple disabilities	1.47	0.11	-0.03
Other health impairment	6.24	0.05	-0.02
Orthopedic impairment	2.39	0.08	-0.03
Speech impairment	4.89	-0.02	-0.01
Traumatic brain injury	0.42	0.04	-0.02
Visual impairment	1.23	0.10	-0.01
Also has ADD/ADHD	35.03	0.10	-0.04
Self Determination Scale Scores			
Autonomy	44.78	0.02	0.03

Psychol. Empowerment	5.35	0.00	-0.01
Self-realization	15.90	-0.13	0.01
WJII subscale scores			
Passage comprehension	85.65	-0.19	0.08
Synonyms/antonyms	93.00	-0.15	0.06
Math calculation	91.12	-0.32 ^c	0.07
Applied problems	90.27	-0.27 ^c	0.04
Academic general education credits %	47.14	-0.07	0.08
<hr/>			
Sample size	2330		

Note: Tables reporting treatment and control balance statistics on covariates for receipt of disability-specific supports and for universally-available supports are available on request. Sample size rounded to nearest 10, as required by the Institute of Education Sciences, U.S. Department of Education, for restricted-use data sets. ^aPost-PSW treatment mean. ^bPre-PSW standardized mean difference (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 SMD is above What Works Clearinghouse 0.25 cutoff for baseline equivalence for quasi-experimental studies.

Table 2

Accessing College Supports by Students with Disabilities

Support Receipt	Weighted Percent	Standard Error	Unweighted Total N
2- or 4-year college student had accessed:			
Any schoolwork support	57.4	4.64	2,330
Universally-available supports			
Any	53.4	4.09	2,300
Only ^a	43.3	4.55	1,350
Disability-related supports			
Any	27.0	3.96	2,300
Only ^a	11.4	4.27	940
2- year college student had accessed:			
Any schoolwork support	51.6	4.26	1,890
Universally-available supports			
Any	47.0	3.83	1,880
Only ^a	36.4	4.19	1,160
Disability-related supports			
Any	25.3	4.22	1,880
Only ^a	10.6	4.07	870
4-year college student had accessed:			
Any schoolwork support	52.9	8.40	1,000
Universally-available supports			
Any	49.8	7.48	990
Only ^a	42.6	8.94	550
Disability-related supports			
Any	22.5	5.04	990
Only ^a	11.5	4.90	400

^a. To enable analyzing the impact of each type of support, independent of receipt of the other type of support, propensity analyses for the disability-related and the universally-available support variables focused on the “only” variables, which excluded students who had received both types of supports ^b. Sample sizes rounded to nearest 10, as required by the Institute of Education Sciences, U.S. Department of Education, for restricted-use data sets.

Table 3

PATT Effect of Support Receipt on College Perseverance for Students with Disabilities

Treatment	Persistence Rates		Propensity adjusted <i>OR</i> ^c [95% CI]
	Treatment group ^a (%)	Adjusted control group ^b (%)	
2- or 4-year college student received:			
Any schoolwork supports	75.3	55.8	2.41** (1.35, 4.28)
Universally available supports only	79.0	51.4	3.55*** (1.80, 6.99)
Disability-related supports only	54.2	57.1	0.87 (0.35, 2.15)
2-year college student received:			
Any schoolwork supports	69.6	55.8	1.81* (0.99, 3.33)
Universally available supports only	73.2	52.9	2.43* (1.17, 5.04)
Disability-related supports only	50.4	58.2	0.73 (0.27, 1.97)
4-year college student received:			
Any schoolwork supports	72.8	52.2	2.45* (0.99, 6.09)
Universally available supports only	69.5	42.8	3.04* (1.04, 8.86)
Disability-related supports only	†	†	†

Note. PATT= population average treatment effect on the treated; *OR* = odds ratio; CI = confidence interval. ^aTreatment group percentage, using survey weights. ^bPercentage 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 ^codds ratio, $\ln()$ is the natural logarithm function,

and *OR* is the odds ratio. D. R. Cox, 1970, *Analysis of Binary Data*, New York, NY: Chapman &

Hall/CRC. † = results not reported; the treatment and control groups remained unbalanced after

PSM. ** $p < .01$. *** $p < .001$.