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## Predicting College Completion Among Students with Learning Disabilities

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This article is based on the first author's master's thesis, which was chaired by the second author. Trailing co-authors were thesis committee members who contributed to the work reported herein.

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### Abstract

The authors analyzed National Longitudinal Transition Study-2 (NLTS2) data to examine the role of high school academic preparation and receipt of postsecondary academic support services (PASS) in predicting college completion among students with learning disabilities. Logistic regression analyses revealed that students who earned a 3.0 GPA in a college prep curriculum were more than twice as likely to complete college than those with a similar GPA who did not complete a college prep curriculum. Furthermore, among students who completed a college prep curriculum, earning a higher GPA and accessing PASS both dramatically increased the likelihood that they would complete college. Results underscore the importance of incorporating a college prep curriculum into transition planning for college-bound students with learning disabilities.

*Keywords:* NLTS2, learning disabilities, college preparatory curriculum, degree attainment, support services

### Predicting College Completion Among Students with Learning Disabilities

Students with learning disabilities (LD) constitute 35% of all students with disabilities enrolled in K-12 public schools (U.S. Department of Education, 2016) but represent 67% of the students with disabilities enrolled in postsecondary education (Newman et al., 2011). The National Longitudinal Transition Study-2 (NLTS2; Newman et al., 2011) reveals that 66.8% of students with LD attended postsecondary education within 8 years of leaving high school, nearly mirroring postsecondary enrollment for students without disabilities (67.4%). These data suggest the gap between students with LD and peers without disabilities in postsecondary enrollment is closing (Joshi & Bouck, 2017), but there remains a gap in postsecondary completion rates. NLTS2 data indicate that 41% of postsecondary students with learning disabilities completed their most recent postsecondary program, compared to a completion rate of 52% for postsecondary students without disabilities (Newman et al., 2011). In order to prepare students with LD to be successful in college, it is important to understand secondary and postsecondary school experiences that predict college completion among this population of students.

Previous research on predictors of postsecondary education outcomes for students with disabilities has focused primarily on factors associated with *enrollment* rather than *completion*. For example, secondary school experiences such as inclusion in general education, paid work experiences, vocational education, and goal setting training have been found to predict postsecondary school enrollment for students with disabilities (Joshi & Bouck, 2017; Mazzotti, et al., 2016; Test et al., 2009). Fleming and Fairweather (2012) found that traditional predictors of postsecondary enrollment, such as minority status, socioeconomic background, and academic achievement in high school, are also important determinants of postsecondary enrollment among students with disabilities. Since individuals who enroll in, but do not complete, a postsecondary

program fail to realize the full employment and earnings benefits of being a college graduate (Ma, Pender, & Welch, 2016), further research into school experiences and disability-related and traditional factors predictive of college completion is needed. Two areas ripe for exploration are the role of academic preparation and receipt of postsecondary academic support services in supporting youth with LD to successfully complete postsecondary education.

### **Academic Preparation**

Students with LD are more likely to complete a postsecondary education program if they develop the knowledge and skills in high school needed to successfully complete rigorous academic courses (Milsom & Hartley, 2005). Two indicators that students have developed knowledge and skills to complete college-level coursework include: (a) taking a college preparatory curriculum in high school and (b) completing this curriculum successfully as measured by high school GPA.

**College preparatory curriculum.** Students' completion of a college preparatory curriculum during high school may influence postsecondary success. Guidelines from American College Testing (ACT, 2016) recommend a core college preparatory curriculum consisting of four years of English and three years each of math, science, and social studies. Hitchings, Retish, and Horvath (2005) studied the academic preparation of high school graduates with LD who had expressed an interest in attending a postsecondary institution. Only 4 of the 79 students had academic plans that included coursework recommended for attending state universities. Of the four students, only one remained in college prep classes through the end of junior year.

Wilson, Hoffman, and McLaughlin's (2009) review of nationally representative, longitudinal studies revealed that students with disabilities are less likely than students without disabilities to complete a college preparatory curriculum. Among students who had a goal of

attending college, students with disabilities were less likely than peers without disabilities to take college preparatory coursework and to complete advanced mathematics courses. These results suggest that 4-year college preparatory plans of study are not widely developed or implemented for students with disabilities who plan to attend college. Therefore, it may be useful to examine whether students with LD who complete a college preparatory curriculum experience greater postsecondary success than those who do not.

**High school academic achievement.** High school GPA is an indicator of achievement that has been used to predict success in postsecondary education. Researchers have found that high school GPA predicts college GPA for the general population (e.g., Komarraju, Ramsey, & Rinella, 2013; Sanchez, 2013). DaDeppo (2009) studied college completion among students with LD and found that high school GPA was positively correlated with both college GPA and intent to persist in college. These findings suggest that high school GPA may be appropriate for inclusion in a model predicting the postsecondary success of students with LD.

### **Postsecondary Academic Support Services (PASS)**

Academic preparation and achievement in high school may serve as predictors of postsecondary success, but reliance solely on these factors may be insufficient for understanding college completion among students with LD (DaDeppo, 2009). Examining whether receiving academic support services from a postsecondary institution increases the likelihood that students with LD will graduate from college may also be instructive. Federal law requires college students to provide documentation of their disability and need for academic adjustments in order to receive disability-related services from postsecondary institutions (USDE, Office of Civil Rights, 2011). However, Newman et al. (2011) reported that only 28% of college students who received special education services in high school self-disclosed their disabilities to

postsecondary institutions. Students with LD were less likely to receive disability-specific services in 2-year and 4-year institutions than students with other disabilities (Newman & Madaus, 2015). Instead students with LD tended to take advantage of academic supports, such as tutoring, that did not require disability disclosure (Cameto, Knokey, & Sanford, 2011). PASS may include extra support beyond classroom instruction, such as course-specific tutoring through mathematics laboratories, writing centers, and organized study groups. These services are available to all students, so students with disabilities can access them without informing the college or university of their disability (Walker, 2016).

Several studies have examined the impact of PASS on the postsecondary success of students with disabilities. Through an examination of records of students with disabilities from three public universities, Pingry O'Neill, Markward, and French (2012) found that students who received learning strategies or study skills instruction were more likely to graduate than other students in the sample. Troiano, Liefeld, and Trachtenberg (2010) tracked attendance at an academic support center at a 4-year college among students with LD over a five-year period; students who came to the support center more regularly had higher overall GPAs and higher rates of graduation. Similarly, Lock and Layton (2008) found that college students with LD who attended tutoring services with four or fewer absences in nine semesters achieved higher GPAs than students with five or more absences during this same period. Comparing the graduation and academic failure rates of students with LD and students without disabilities, Vogel and Adelman (1992) found that students with LD who received supports focused on course-specific tutoring, improving basic academic skills, and developing learning strategies for at least one semester had similar academic failure rates and graduation rates to peers without disabilities. Combined, these studies suggest that PASS may be a predictor of college completion for students with LD.

### **Current Study**

The purpose of this study was to explore the role of academic preparation and achievement during high school and receipt of PASS in predicting completion of a 2- or 4-year postsecondary program among students with LD. Because there are likely complex interrelationships between student demographic characteristics, academic experiences in high school, and receipt of PASS in the prediction of college completion, student demographic characteristics including gender, ethnicity, and household income level were controlled in the current study. The following research questions guided the present investigation:

1. After controlling for demographic characteristics, do academic preparation and achievement in high school predict college completion?
2. After controlling for demographic characteristics and high school academic preparation and achievement, does receipt of PASS predict college completion?
3. Does receipt of PASS interact with high school academic preparation or achievement to predict college completion?

Factors were examined individually, and then the interactions between PASS and academic preparation and achievement were further investigated. It was hypothesized that academic preparation (i.e., completing a college prep curriculum) and academic achievement in high school (i.e., GPA) would predict college completion among students with LD. Receipt of PASS was also hypothesized to increase the likelihood of college completion among students with LD. Finally, because academic support in college might be insufficient to overcome deficiencies in academic preparation during high school, it was hypothesized that the interactions between PASS and academic preparation and achievement would moderate the relationship between PASS and college completion among students with LD.



### Methods

This study is a secondary analysis of data from NLTS2. Funded by the U.S. Department of Education, NLTS2 is a nationally representative dataset comprising data on secondary and postsecondary experiences and outcomes of students who received special education services in 2000. Data were collected every 2 years from 2001 to 2009 in 5 waves of data collection. Over 11,000 youth 13-16 years of age began the study in 2001 and by 2009 (Wave 5) the sample participants ranged in age from 21 to 25 years old. Access to the NLTS2 dataset used in this study was granted through an Institute of Education Sciences (IES) Restricted-use Data License.

NLTS2 employed a two-stage sampling plan (SRI International, 2000). First, local school districts and state-supported special schools stratified by geographic area, student enrollment, and community wealth were randomly sampled. Second, students from selected school districts and special schools were stratified by the federally recognized disability categories and then study participants were randomly selected from each disability category. Responses were weighted based on district and student characteristics to ensure findings would be representative of the population of students who received special education services in 2000. For example, participants with LD constituted 60% of the unweighted sample but 88% of the weighted sample.

NLTS2 data were collected from students, parents, and schools through telephone interviews and/or surveys across the 5 waves of data collection. Assessment of students' academic achievement and self-determination skills, high school transcripts, and school staff surveys about school characteristics and individual education programs of students in the sample were included in the data set. Most key items were answered by the students themselves. If an eligible student did not complete a survey or if parents reported a student unable to respond to

questions, parents provided responses on their behalf. Details of the weighting strategy and additional information about data sources are described in Newman et al. (2011).

### **Sample**

The sample for the present study included students from the larger NLTS2 database who (a) were identified on the school district roster as having a learning disability as their primary disability category; (b) had a goal of graduating from a 2- or 4-year college; (c) were enrolled in secondary school in 2001 (Wave 1) and/or 2003 (Wave 2); and (d) had a valid value on the dependent measure (i.e., college completion) for the wave in which they had been out of high school for 5-6 years (Wave 4 or 5). The decision to limit the sample to students who intended to pursue a college degree was intended to focus the analysis on tracking the progress of college-bound students with LD over the 5-6 years following high school. Students were asked, “How likely do you think it is that you will graduate from a 2-year [4-year] college?” with four response choices: *definitely will*, *probably will*, *probably won't*, and *definitely won't*. Students who responded that they *definitely will* or *probably will* graduate from either a 2-year or a 4-year postsecondary institution were included in the study sample. If student responses were not available, parents' responses were used. The final sample for this study was 150 students with LD who intended to complete 2- or 4-year college. Unweighted sample sizes are rounded to the nearest 10 throughout this report in compliance with IES rules for using restricted datasets.

### **Measures**

**Dependent variable.** Completion of a 2- or 4-year postsecondary program within 5-6 years of high school was the dependent variable in the analyses. Parent and youth interviews/surveys were data sources for this variable. Participants were asked, “Have you gotten a diploma, certificate, or license from a 2-year or community college?” and, “Have you gotten a

diploma, certificate, or license from a 4-year college or university?” Students who answered *yes* to one or both questions were dichotomously coded as having attained a postsecondary degree (1 = *yes*). Table 1 displays the NLTS2 variable names and data sources used.

**Independent variables.** Two measures of academic preparation during high school were investigated: completion of a college preparatory curriculum and GPA for academic coursework completed in general education settings. Both variables came from high school transcripts. Students were dichotomously coded as having completed a college prep curriculum (1 = *yes*) if they received passing grades in a minimum number of credits of core academic coursework in general education settings: 4 credits in English, 3 in math, 3 in social studies, and 3 in science (Newman & Madaus, 2015). High school GPA was calculated on a 4-point scale based on students’ overall GPA in core academic coursework and foreign language courses in general education settings. For those students who had missing data on this variable, GPA was supplemented by averaging the student’s GPA for each grade for which data was available. Receipt of PASS, drawn from parent/youth surveys, served as the final independent variable. The 90 members of the study sample who enrolled in a 2-year and/or 4-year postsecondary institution were asked, “Did you ever get help with school work from this school, like going to a tutor, a study center, or writing center?” A student’s affirmative response to this question for one or both types of postsecondary institutions in any wave was coded 1 = *yes*; the response of all other students was coded 0 = *no*.

**Control variables.** Three student demographic characteristics were included as control variables in the present study: gender, ethnicity, and household income level. These variables were included in analyses on the basis of the NLTS2 conceptual model (Wagner, et al., 2003) and prior research related to student and family characteristics that influence postsecondary

outcomes (e.g., Baer et al., 2011; Fairweather & Shaver, 1990). Data on these variables were collected primarily from the Wave 1 parent survey and were supplemented by parent data from subsequent waves. Gender was coded as 1 = *male* and 2 = *female*. Ethnicity was dichotomously recoded into two categories: 1 = *White*, 0 = *Non-white*. Household income level was coded based on three response categories in the parent survey: 1 = *\$25,000 or less*; 2 = *\$25,001-50,000*; 3 = *more than \$50,000*.

### **Data Analysis**

Less than 5% of values for high school GPA were missing from this sample and, as recommended by Newman (2014), missing data for high school GPA were imputed using the Expectation Maximization (EM) method. No data were imputed for descriptive statistics.

The SPSS 24.0 Complex Samples Module was used to perform statistical analyses to obtain point estimates representative of the national population of youth with LD in the NLTS2 age range and time frame (SRI International, 2000). The complex samples module accounts for the NLTS2 stratified/clustered sampling design using Taylor linearization to produce weighted standard errors. Data were weighted by using the cross-wave, multi-source weight (Wt\_Any) as recommended by Valdes et al. (2013).

Descriptive statistics, such as frequency distributions and means, were calculated for variables included in the analyses. Bivariate relationships, or simple correlations, among each pair of variables were also examined. Logistic regression analysis was used to examine the ability of high school academic preparation (i.e., completion of college prep curriculum), academic achievement (i.e., GPA), and receipt of PASS to predict the likelihood of degree attainment for students with LD. Three models were tested. In all models, gender, ethnicity, and

family income level were entered as control variables and college completion was entered as the dependent variable. The lower value (0 = *did not attain degree*) was set as the reference category.

In the first model, completion of a college preparatory curriculum and high school GPA were entered as independent variables. This model provided a test of whether better academic preparation in high school increases the likelihood that students with LD will complete college (Research Question 1). In the second model, receipt of PASS as well as interaction terms between PASS and each of the two academic preparation variables (i.e., college preparatory curriculum and high school GPA) were added as independent variables in the regression equation. This model provided a test of whether receiving PASS alone or in combination with better academic preparation and achievement in high school increases the likelihood that students with LD will complete college (Research Questions 2 & 3). In a third, posthoc model, the interaction term between College Prep Curriculum and GPA was added to the regression equation to test whether these two variables interact in the prediction of college completion. To facilitate interpretation of regression results, pseudo  $R^2$ s for each model were calculated and coefficients, standard errors, exponentiated coefficients, significance levels, and 95% confidence intervals were computed for each variable in the models.

Model assumptions were evaluated prior to running logistic regression models (Hosmer, Lameshow, & Sturdivant, 2013). Linearity of the logit was assessed by examining Nagelkerke  $R^2$  in both models. Statistically significant Nagelkerke  $R^2$ s for the models suggested that this assumption was met. To assess multicollinearity between predictors in the regression models, a correlation matrix was created. No coefficient in the matrix was higher than .8 suggesting that multicollinearity was also not an issue. Moreover, an examination of *Cook's distances* revealed

that no distance values exceeded 1 suggesting that no cases were unduly influencing the models. Therefore, no major issues were identified while running the model diagnostics.

### **Results**

The sample for this NLTS2 secondary analysis was 150 students with LD who intended to pursue a college degree. Students in the sample were more likely to be male (64%; female 36%) and White (70%; non-White 30%). Over half of the students in this sample were from households with incomes exceeding \$50,000 (54%), while slightly less than a quarter of the students in the sample were from households with incomes of \$25,001-\$50,000 (24%) and \$25,000 or less (23%). Only 24% completed the core curriculum in English, math, social studies, and science during high school and their mean GPA in academic coursework in general education settings was 2.09 ( $SE = .06$ ).

Sixty percent of students with LD who intended to pursue a college degree had enrolled in college at some point during the 5-6 years following high school. Of those who enrolled in college, 57% received some form of academic support (e.g., tutoring, assistance from a study or writing center, etc.) from their postsecondary institution. In total, one-third (33%) of those who intended to pursue a college degree achieved this goal by completing college within the 5-6 years following high school. Newman et al. (2011) provide more comprehensive information about the postsecondary school experiences and outcomes of the larger NLTS2 sample.

Table 1 presents the bivariate relationships among study variables. A review of the simple correlations reveals that gender was not significantly related to the independent or dependent variables, and ethnicity was significantly related only to high school GPA. However, household income level was positively related to all independent and dependent variables including completing a college prep curriculum, high school GPA, receipt of PASS, and college

completion. Completing a college prep curriculum was also positively related to high school GPA, receipt of PASS, and college completion. Table 2 presents results of logistic regression analyses relating students' demographic characteristics, high school academic preparation, and receipt of PASS to college completion.

### **High School Academic Preparation**

The first research question examined whether academic preparation and achievement in high school predicts college completion among students with LD after controlling for gender, ethnicity, and household income level. Results presented in Model 1 of Table 2 reveal that completion of a college preparatory curriculum in high school was significantly related to college completion. Students with LD who completed a college prep curriculum were over five times more likely to complete college ( $OR = 5.31, p < .001$ ). No significant relationship was found between high school achievement (i.e., GPA) and postsecondary completion. Household income level was the only control variable that predicted college completion. Specifically, students whose household income was \$25,001-50,000 were significantly less likely to complete college than students from households with incomes greater than \$50,000 ( $OR = .16, p = .002$ ).

### **Postsecondary Academic Support Services (PASS)**

The second research question examined whether receipt of PASS predicts college completion over and above what is explained by demographic characteristics and high school academic preparation and achievement. A final research question examined relationships between PASS and high school academic preparation and achievement in predicting degree attainment in the model. Specifically, the third research question investigated whether the interaction between PASS and completion of a college prep curriculum and/or the interaction

between PASS and high school achievement (i.e., GPA) predicts college completion. Regression results related to Research Questions 2 and 3 are presented in Model 2 of Table 2.

Analysis revealed that receipt of PASS did not make a significant independent contribution to the prediction of college completion for students with LD ( $OR = .49, p = .644$ ) and the  $PASS \times GPA$  interaction was not significant ( $OR = 1.14, p = .852$ ). However, the  $PASS \times College\ Prep\ Curriculum$  interaction was a significant predictor in the model ( $OR = 13.90, p = .038$ ). Notably, College Prep Curriculum did not remain significant in Model 2 ( $OR = 1.14, p = .881$ ), indicating that completing a college preparatory curriculum by itself is insufficient to increase the odds of postsecondary completion. The interaction between college prep curriculum and receipt of PASS is significant, however ( $OR = 13.90, p = .038$ ). To interpret the interaction between College Prep Curriculum and PASS, one must add the logit parameter estimates which apply to each of two hypothetical students with LD being compared and exponentiate the difference between these sums to find the odds ratio (James, 2001). Thus, a student with LD who completes a college prep curriculum in high school and who receives PASS is nearly 16 times more likely to complete college than a student who receives PASS but did not complete a college prep curriculum ( $OR = 15.8$ ), is nearly 7 times more likely to graduate than a student with LD who completed a college prep curriculum but did not receive PASS ( $OR = 6.8$ ), and is nearly 8 times more likely to complete college than a student with LD who received neither intervention ( $OR = 7.7$ ). This finding suggests that college completion for students with LD begins in high school with a college prep curriculum and continues in college with academic support. Neither intervention alone increases the odds that a student with LD will complete college.



### Post-Hoc Analysis

One finding of the analyses described prior seemed counter-intuitive and prompted us to conduct a follow-up analysis. Since high school GPA has consistently been found to predict college success (e.g., Cohn, Cohn, Balch, & Bradley, 2004; Mattson, 2007), it seemed unlikely that GPA made no difference in postsecondary completion for students with LD. Thus, we ran a final logistic regression model (Model 3 in Table 3), which tested for an interaction between College Prep Curriculum and GPA in the prediction of college completion.

Inspection of the pseudo  $R^2$  values indicates that Model 3 explains more of the variance in postsecondary outcomes for students with LD than either of the first two models. This final model revealed that, holding other variables constant, students from households with incomes under \$25,000 and between \$25,001 and \$50,000 are less likely to complete college than students from households with incomes over \$50,000 (OR = .30,  $p = .044$  and OR = .07;  $p = .003$ , respectively). While this finding raises questions of equity and social justice that are worth exploring, such questions are beyond the scope of this paper and will be saved for future research.

Although College Prep Curriculum regained a significant main effect in Model 3 (OR = .001,  $p = .003$ ), the interpretation of this finding is not straightforward. To simplify interpretation of the remaining significant effects in Model 3, we propose considering four hypothetical students with LD, all of whom earned a high school GPA of 3.0:

- *Student A* completed a college prep curriculum in high school and received PASS;
- *Student B* did not complete a college prep curriculum in college, but received PASS;
- *Student C* completed a college prep curriculum, but did not receive PASS; while
- *Student D* did not complete a college prep curriculum and also did not receive PASS.

Among these four students with LD, Student A has the best odds of completing college. Specifically, Student A is about 78 times more likely to complete college than Student B (OR = 78.26), about 24 times more likely to complete college than Student C (OR = 24.29), and about 50 times more likely to complete college than Student D (OR = 50.40). The only difference between Student B and Student D is receipt of PASS, which does not have a significant main effect in Model 3. Since neither of these students completed a college prep curriculum, Student B and Student D are equally likely to complete college. When compared to Student D, who did not complete a college prep curriculum, Student C is about twice as likely to complete postsecondary education (OR = 2.08). The interaction between PASS and GPA is not significant (OR = 1.06,  $p = .934$ ), but the interaction between college prep and GPA (OR = 12.91,  $p = .001$ ) is significant. As a result, getting a higher GPA in high school would not improve the odds of college completion for Student B or Student D. However, for both Student A and Student C, increasing their GPAs from a 3.0 to a 3.5 more than doubles their odds for completing college (OR = 2.52 and OR = 2.45, respectively).

The findings of the present study suggest that increasing the odds of college completion for students with LD begins with completing a college preparatory curriculum in high school. Without a college prep curriculum, none of the other independent variables significantly affect the odds of postsecondary completion. The benefits of a rigorous curriculum can be drastically increased, however, by supporting students' success on that curriculum in high school and by provision of PASS in college.

### **Discussion**

The purpose of current study was to identify predictors of college completion for students with LD, while controlling for student demographic characteristics. This study may be the first to

explore interactions between high school academic preparation and achievement and receipt of PASS in predicting college completion. Completing a college prep curriculum in the current study was defined as taking at least 4 credits in English, 3 in math, 3 in social studies, and 3 in science in the general education setting. High school academic achievement in this study referred to GPA in core academic coursework and foreign language courses in general education settings.

Three main findings emerged from the data. First, students with LD who completed a college prep curriculum were more likely to complete postsecondary education, even after controlling for gender, ethnicity, and household income level. This finding mirrors previous research demonstrating a relationship between completing a college prep curriculum and postsecondary academic success (Hicks-Coolick & Kurtz, 1997; Milsom & Hartley, 2005). Completing a college prep curriculum appears to be an important factor in predicting college completion. Kirst and Venezia (2001) theorize that traditional high school curriculum is not rigorous enough to prepare youth for college coursework. This seems particularly true for students with LD who are less likely to complete advanced coursework (Wilson et al., 2009) and more likely to take remedial coursework (Horn & Berktold, 1999) than their peers without disabilities. In the current study, the development of content knowledge, study skills, and self-regulation skills gained from completing a college prep curriculum (ACT, 2005; Hitchings et al., 2005) appear to have contributed to postsecondary completion for students with LD.

Unexpectedly, having a higher high school GPA did not increase the likelihood of college completion for students with LD. The bivariate correlation between GPA and degree attainment was not significant, and GPA was not a significant predictor of degree attainment in either Model 1 or Model 2. Previous research has found that high school GPA is positively related to college GPA and intent to persist in college (McConnell, Martin, & Hennessey, 2015; Sanchez, 2013;

Vogel & Adelman, 1992). The inconsistency between findings of this study and previous studies might have several explanations. For example, unlike previous research that calculated GPA based on all coursework taken in high school, GPA in the current study referred more narrowly to GPA in core academic coursework and foreign language courses. There might be differences in GPA when including other coursework such as art, music, and career-technical classes. In addition, the outcome variable examined in this study (i.e. college completion) differs from the outcome variables examined in previous research (i.e. college GPA, intent to persist in college), precluding direct comparison of study results.

Second, after controlling for student demographic characteristics and high school academic preparation and achievement, PASS by itself did not improve the likelihood of college completion for students with LD. The bivariate correlation between PASS and college completion was also not significant. These findings appear to be inconsistent with previous research demonstrating a positive relationship between frequency of receiving academic support services and college graduation for students with LD (Lock & Layton, 2008; Troiano et al., 2010). A plausible explanation for this apparent inconsistency may relate to the nature of the survey question in the current study. Participants were asked, “Did you ever get help with school work from this school, like going to a tutor, a study center, or writing center?” Responses indicated only whether students received support services, not the frequency or the quality of those services. Therefore, it is plausible that students with LD in the current study who reported receiving PASS did not receive sufficiently frequent or intense academic support services to increase their likelihood of graduating from college. Further, only three services were mentioned in the survey question, so it is possible that students with LD who received other types of PASS (e.g., reading comprehension or learning skills instruction) responded *no* to the question.

Third, the effect of receiving PASS on college completion was moderated by the completion of a college preparatory curriculum in high school. Specifically, among students with LD who completed a college preparatory curriculum, receipt of academic support services in college increased the likelihood they would complete college. However, among those who did not complete a college preparatory curriculum, the receipt of academic support services did not significantly increase their likelihood of completion. In other words, receiving academic support services in college was only helpful to students with LD who had the foundation of a college prep curriculum. This is a unique finding in the current study.

One challenge students face in postsecondary education is that college instructors often do not teach the same way high school teachers teach (Shaw, Madaus, & Dukes, 2010). Instructors in college tend to rely on lecture to impart more information and abstract concepts in a limited amount of time. Students who take a college prep curriculum may be better prepared for these challenges. Through experiences in college preparatory courses, they may also gain confidence and skills required to be successful in postsecondary settings (Hitching et al., 2005). If students with LD do not take college preparatory coursework in high school, academic support services in college may be insufficient to make up for this lack in preparation. This provides a plausible explanation for why the receipt of college academic support services alone was not a significant predictor of college completion of students with LD.

### **Implications**

The finding that completing a college preparatory curriculum in high school improves the likelihood of students with LD completing college suggests that taking a college preparatory curriculum should be incorporated into transition planning for students who have postsecondary education as a transition goal. Unfortunately, few students with disabilities whose career goals

require postsecondary education have Individualized Education Programs (IEPs) that support such goals (Hitching et al., 2005). The findings of this study reinforce the importance of beginning transition planning early for high school students with LD who intend to attend college. This will require students and their IEP teams to lay out a high school course of study prior to age 16, the age currently mandated by the Individuals with Disabilities Education Act.

The unique finding that the effect of receiving PASS on college completion is moderated by completion of a college preparatory curriculum further underscores the need for college-bound students with LD to complete a college preparatory curriculum in high school. In addition, students with LD who enter college academically prepared should be encouraged to take full advantage of the academic support services provided by their postsecondary institutions. With the strong base of a college preparatory curriculum and access to PASS, students with LD will be better equipped to be successful in college. Furthermore, study findings support the recommendation by DeLee (2015) and Walker (2016) that postsecondary institutions provide inclusive academic support services that are widely available to students.

### **Limitations**

There are several limitations in this study. First, the study was limited due to the design, instruments (i.e., surveys, analysis of transcripts, interview questions, etc.), and methodology used to collect data for NLTS2. Some survey questions, for example, did not fully explore the constructs of interest in this study. The survey question about PASS did not indicate frequency or quality of academic support services received. Therefore, it is difficult to compare results of this study with results of previous research regarding the relationship between PASS and college completion among students with LD. Also, the data set indicated the number of courses taken in each core academic area (English, math, science, social studies) in general education settings but

did not identify specific course titles or whether modifications were made to the general education curriculum. Therefore, a student who completed the standard grade-level curriculum for Algebra 2, Geometry, and Pre-calculus and a student who took three remedial math classes with curricular modifications would both have a response of 3 for “number of mathematics courses taken.” This broad operationalization of College Prep Curriculum would be expected to weaken rather than strengthen the observed relationship between taking college preparatory courses and completing college. Although this precludes direct comparison to studies that define College Prep Curriculum more narrowly, the validity of study findings is not threatened.

Second, the results of this study cannot be used to imply causal relationships among study variables. It is possible that other factors, not measured or collected for NTL2, impacted both independent and dependent variables. For example, it is possible that students with LD with higher academic aptitudes are both more likely to take college preparatory courses and more likely to complete college. In this example, aptitude may be a causal variable that accounts for the relationship between the independent variable and dependent variable. Finally, the study sample was limited to students with LD who had a postsecondary education goal while they were still in high school. Therefore, the results of the study cannot be generalized to the population of all high school students with LD in the United States.

### **Recommendations for Future Research**

Given the findings of the current study, future research is warranted. First, future studies should examine whether predictors of college completion for students with LD are applicable to students with other disabilities. This research would expand the generalizability of the current study findings. Second, to further explore the relationship found between college preparatory curriculum and postsecondary program completion, researchers should explore interactions

between college preparatory curriculum and other factors such as high school achievement (i.e., GPA) and household income level in predicting college completion. Finally, based on the limitations stated earlier, additional research is needed to examine the role of PASS in predicting college completion. For example, sample selection might be expanded to include all youth with disabilities in the NLTS2 dataset who intended to pursue a postsecondary degree. Or, researchers might investigate the frequency, quality, and usefulness of PASS received by students with LD in college. An example of a question in NLTS2 that may provide relevant data is “How useful have all the services, accommodations, and help with school work been in helping you stay in school and do you best there?”

### **Conclusion**

Students with LD are less likely to graduate from college than their peers without disabilities. We sought to address this gap in postsecondary education outcomes by identifying predictors of college completion among youth with LD. Results of a secondary analysis of NLTS2 data suggest that taking a college preparatory curriculum paves the way for degree completion for students with LD, and postsecondary academic support services play an additive role in supporting college success for those students who take a college preparatory curriculum. Therefore, students with LD can be supported in their plans to go to college through transition planning that incorporates college preparatory coursework and encouragement to take advantage of academic support services provided by their postsecondary institutions. Although additional research is needed to assess the generalizability of study findings to students with other disabilities and to elucidate causal relationships among study variables, this study takes an important step toward understanding how to support the college success of students with disabilities.



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Table 1

*Simple Correlations Among Study Variables*

	Student demographics			Academic preparation		PASS	Degree
	1	2	3	4	5	6	7
1. Gender (female)	1						
2. Ethnicity (white)	-.20**	1					
3. Household income level	-.17	.14	1				
4. College prep curriculum	-.03	.11	.27*	1			
5. HS GPA	-.09	.28***	.27***	.32***	1		
6. PASS (received) <sup>a</sup>	.15	-.11	.22*	.24**	.01	1	
7. Degree (attained)	.05	.08	.33***	.41***	.23	.13	1

*Note.* Sample size for all correlations = 150, unless otherwise noted. Unweighted sample size numbers were rounded to the nearest 10 as required by the Institute of Education Sciences. HS GPA = high school grade point average in academic courses in general education settings; PASS = postsecondary academic support services.

<sup>a</sup>Sample size for PASS correlations = 90.

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

Table 2

*Logistic Regression Analyses Examining Predictors of College Completion*

Variable	Model 1				Model 2			
	B	SE	Exp(B)	95% CI	B	SE	Exp(B)	95% CI
Constant	-1.05	.69	.35	[.09, 1.38]	1.37	.79	3.93	[.79, 19.60]
Student demographics								
Gender (male v. female)	.18	.39	1.19	[.55, 2.59]	.39	.48	1.47	[.55, 3.91]
Ethnicity (non-white v. white)	-.04	.42	.96	[.42, 2.22]	-.35	.52	.71	[.25, 2.03]
Household income level (compared to >\$50,000)								
≤\$25,000	-1.17	.61	.31	[.09, 1.04]	-1.05	.55	.35	[.12, 1.06]
\$25,001-50,000	-1.86	.58	.16**	[.05, .50]	-2.33	.73	.10**	[.02, .43]
HS academic preparation								
College prep curriculum	1.67	.41	5.31***	[2.35, 11.98]	.13	.85	1.14	[.20, 6.37]
GPA	.15	.24	1.17	[.73, 1.87]	-.47	.35	.62	[.31, 1.26]
Receipt of PASS								
PASS * college prep curriculum					2.63	1.23	13.90*	[1.16, 166.39]
PASS * GPA					-.13	.68	1.14	[.29, 4.49]
<i>N</i>			150				90	
<i>R</i> <sup>2</sup>								
Cox and Snell			.23				.28	
Nagelkerke			.32				.37	
McFadden			.21				.24	

*Note.* Unweighted sample size numbers were rounded to the nearest 10 as required by IES. HS = high school; GPA = grade point average in academic courses in general education settings; PASS = postsecondary academic support services; OR = odds ratio; CI = confidence interval.

\* $p < .05$ . \*\* $p < .01$ . \*\*\* $p < .001$ .

Table 3

*Post Hoc Analysis of Predictors of College Completion with Interaction between College Prep Curriculum and Grade Point Average (GPA)*

Variable	Model 3			
	B	SE	Exp(B)	95% CI
Constant	2.11	.86	8.22*	[1.43, 47.30]
Student demographics				
Gender (male v. female)	.43	.52	1.53	[.54, 4.38]
Ethnicity (non-white v. white)	-.44	.55	.65	[.21, 1.95]
Household income level (compared to >\$50,000)				
≤\$25,000	-1.20	.58	.30*	[.09, .97]
\$25,001-50,000	-2.61	.81	.07**	[.01, .38]
HS academic preparation				
College prep curriculum	-6.95	2.18	< .01**	[< .01, .08]
GPA	-.77	.38	.46	[.21, 1.00]
Receipt of PASS	-.62	1.65	.54	[.02, 15.20]
PASS * college prep curriculum	3.63	1.25	37.71**	[3.02, 471.27]
PASS * GPA	.06	.75	1.06	[.23, 4.87]
College prep curriculum * GPA	2.56	.71	12.91***	[3.04, 54.90]
<i>N</i>			90	
<i>R</i> <sup>2</sup>				
Cox and Snell			.31	
Nagelkerke			.42	
McFadden			.27	

*Note.* Unweighted sample size numbers were rounded to the nearest 10 as required by IES.

HS = high school; GPA = grade point average in academic courses in general education settings;

PASS = postsecondary academic support services; OR = odds ratio; CI = confidence interval.

\* $p < .05$ . \*\* $p < .001$