Vocational Education Course Taking and Post–High School Employment of Youth With Emotional Disturbances

Mary M. Wagner, PhD[1], Lynn A. Newman, EdD[1], and Harold S. Javitz, PhD[1]

Abstract

Data from the National Longitudinal Transition Study–2 (NLTS2) were used to examine the patterns of career and technical education (CTE) course taking in high school by students receiving special education services for emotional disturbances (ED). Descriptive analyses indicate the extent of such course taking by students with ED and their engagement in a concentrated program of occupationally specific general education CTE, a level of CTE course taking that early research has linked to improved post–high school employment outcomes. Propensity scoring methods were used to determine the extent to which either type of CTE course taking was related to higher odds of full-time employment after high school and whether results differed with the length of time post high school. There was a significant positive effect for participating in a concentration of occupationally specific CTE in the first 2 post–high school years, but effects were non-significant for later years. Results showed no benefits of CTE course taking overall. The implications for high school programming and transition planning are discussed.

Keywords

career and technical education, behavioral/emotional disabilities, employment

The Role of Career and Technical Education (CTE) in Improving the Odds of Post–High School Employment for Youth With Emotional Disturbances (ED)

The post–high school outcomes of youth with ED have been described as "bleak" (Woolsey & Katz-Leavy, 2008, p. 1), "appalling" (Davis, 2003, p. 495), and "particularly troubling" (Wagner, 1995, p. 92). Given the critical role of employment in setting youth with and without disabilities on a trajectory toward economic and social self-sufficiency and becoming productive members of society, the generally poor employment record of youth with ED is a particular cause for alarm.

For example, in 1992, the first national data on employment experiences of youth with disabilities showed that the rate of competitive employment among youth with ED who had been out of high school 3 to 5 years was significantly lower than that of youth in the general population (47.4% vs. 69.4%; D'Amico & Blackorby, 1992). Moreover, the significant increase in employment over time that had occurred for youth in the general population and youth with disabilities as a whole did not accrue to youth with ED (D'Amico & Blackorby, 1992). Fast forward almost two decades, and the picture had not changed greatly. Nationally, the competitive employment rate of youth with ED who had been out of high school up to 4 years still lagged significantly behind that of youth in the general population (42.3% vs. 66.4%; Newman, Wagner, Cameto, & Knokey, 2009).

Furthermore, the sizable gap between the percentage of youth with ED who were employed at the time they were interviewed and the percentage who had been employed at some time since leaving high school points to a challenge experienced more by youth with ED than youth in other disability categories—the difficulty of keeping a job once one is found. The average duration of the jobs held since high school by youth with ED was 7.6 months, significantly shorter than the average for youth in the general population and youth with disabilities as a whole (14.7 and 10.01 months, respectively; Newman et al., 2009). Some of the relatively higher job turnover of youth with ED may relate to the importance employers put on "employability skills,"

[1]SRI International, Menlo Park, CA, USA

Corresponding Author:
Mary M. Wagner, SRI International, 333 Ravenswood Ave., Menlo Park, CA 94025, USA.
Email: mary.wagner@sri.com

such as the ability to get along with others (Casner-Lotto & Barrington, 2006; Ju, Zhang, & Pacha, 2012); the social skills of youth with ED were significantly more likely to be rated as poor by their parents than were those of youth with disabilities as a whole (25.2% vs. 17.9%; Cameto, Marder, Cadwallader, & Wagner, 2003).

When they had been out of high school up to 8 years, there was no significant difference between the employment rate of youth with disabilities as a whole and youth in the general population (60.2% and 66.2%; Newman et al., 2011), but youth with ED lagged significantly behind both groups (49.6%; $p < .05$ and $p < .001$). This employment gap also was found in other studies (e.g., Vander Stoep, Beresford, Weiss, McKnight, & Cauce, 2000).

Successful early employment experiences are critical for setting youth with disabilities on a path toward economic and social self-sufficiency and helping them become productive adults. The failure to successfully transition from high school to the working world can put them on a path of dependence, underemployment, and lack of meaningful contribution to the economic well-being of their families. In addition, employment can offer people a sense of purpose and personal meaning (e.g., fostering pride and self-esteem) and help define who they are and how they fit in to the community, important intangible benefits that do not accrue to those who cannot find or keep quality jobs. Research also has found that employment benefits people with disabilities in particular ways, as in the support it can provide to people recovering from mental illness (Dunn, Wewiorski, & Rogers, 2008). These potential benefits are lost to young adults with disabilities who are not successful in entering the workforce.

In light of the high economic and social costs of an unsuccessful transition to employment, researchers have worked to document programs that increase the odds of youth employment after high school. One such program is high school CTE. Research has long documented an association between participation in high school CTE and higher post–high school employment rates and, for some youth, higher wages (Catterall & Stern, 1986). In fact, an analysis of variations in months worked and earnings, as they related to the number of academic and CTE courses taken, showed that "the effects of vocational education are all positive" (Kang & Bishop, 1988, p. 9).

Those positive effects also have been demonstrated for students with disabilities (Hasazi, Gordan, & Roe, 1985; Mithaug, Horiuchi, & Fanning, 1985). For example, analyses of data from the National Longitudinal Transition Study (NLTS) found that taking occupationally specific CTE courses conferred an advantage of 40 percentage points for students with "mild" disabilities, including ED (Wagner, Blackorby, Cameto, & Newman, 1993). Two decades later, the final report to Congress from the National Assessment of Vocational Education reported a positive relationship between CTE course taking and higher earnings (Silverberg, Warner, Fong, & Goodwin, 2004), and a single-state study associated CTE course taking with higher rates of post–high school full-time employment for students with disabilities ($B = .546$, $p < .001$; Flexer, Daviso, Baer, Queen, & Meindl, 2011). Reflecting this and other research, several reviews of factors that promote positive transitions for students with disabilities (e.g., Landmark, Ju, & Zhang, 2010; Test, Mazzotti, Mustian, & Fowler, 2009) have affirmed that CTE constitutes "best practices" or "evidence-based practices" for a successful transition to employment after high school. Yet, no recent large-scale study has examined the potential employment-related benefits of CTE specifically for youth with ED, an important gap in the knowledge base given their often difficult employment experiences.

To address this gap, this study first considers two descriptive questions:

> **Research Question 1:** To what extent did high school students with ED participate in CTE?
> **Research Question 2:** What were their post–high school employment experiences?

With that background, we then hypothesized that participating in high school CTE courses would increase the odds of youth with ED finding full-time employment in the early years after high school. We also have addressed the sustainment of employment in the later post–high school years, hypothesizing that the impact of high school experiences, including CTE course taking, would have a greater impact on outcomes soon after high school rather than later, when post–high school experiences, such as college or postsecondary CTE course taking, might exert their influence.

Method

Sample

NLTS2 is currently the only data set that generalizes nationally to youth with disabilities transitioning from high school to early adulthood. NLTS2's two-stage sampling strategy first randomly sampled local educational agencies (LEAs) and state-supported special schools that had been stratified by geographic region, district enrollment, and wealth (i.e., Orshansky percentile). Students receiving special education services were randomly selected from rosters of LEAs/ special schools. A student's receipt of special education services and his or her disability category were reported by the entity that provided the student roster. (For details of the sampling strategy for NLTS2, see Wagner, Kutash, Duchnowski, & Epstein, 2005). Analysis results used the cross-wave, cross-instrument weight wt_AnyPYPHSSch (Valdes et al., 2013), appropriate for analyzing multiple waves of NLTS2 data, to make findings generalizable to

students with ED in the NLTS2 age range. Weights took into account both various youth and LEA characteristics used as sampling stratifying variables and strata nonresponse at each wave and across waves.

Participants

The NLTS2 sample initially included more than 11,000 high school students aged 13 through 16 who were receiving special education services on December 1, 2000. This study included youth who (a) were identified as receiving special education services in the ED category, (b) were among the 85.7% of youth with ED who attended regular secondary schools (not schools serving only students with disabilities; NLTS2, 2001), and (c) had at least one parent or youth interview/survey after leaving high school, from which data on post–high school outcomes could be assessed, and a high school transcript, from which CTE course taking could be determined. About 350 youth met these criteria. (Unweighted sample sizes are rounded to the nearest 10, as required for restricted-use data by the U.S. Department of Education.) Approximately three fourths of youth were male (76.0%), 59.4% were White, about the same percentage (60.4%) had heads of household with a high school diploma or less education, and 44.0% lived in households with incomes ≥US$25,000.

Data Sources and Measures

Intervention variables. Measures of CTE course taking came from high school transcripts. Eight waves of transcript requests for NLTS2 sample members were sent to all NLTS2 special schools and LEA offices from March 2002 to September 2009. A returned transcript was considered complete if it indicated that a student had graduated, completed his or her high school program, aged out, or dropped out, and included complete transcript information for all the grading periods the student had been in high school. For "partial" transcripts, an updated transcript was requested in the following data collection period (Newman et al., 2012).

This study focused on two measures of CTE course taking. The first was the broadest measure of that construct—a dichotomous variable coded 1 for students who earned high school credits in any general education CTE course. General education courses accounted for 79.7% of all CTE credits earned by students with ED. We also focused on a CTE construct identified in the original NLTS as predictive of post-school employment outcomes for youth with "mild" disabilities, including ED (Wagner, 1991; Wagner et al., 1993)—a dichotomous variable indicating whether youth had earned four or more credits (i.e., a "concentration") of occupationally specific courses (e.g., courses in business, trades) in a general education setting.

Post–high school outcomes. Employment outcome data came from the parent/youth telephone interviews and/or mail surveys conducted biannually from 2001 to 2009. Interviews, conducted in English and Spanish, used computer-assisted telephone interviewing techniques. Abbreviated questionnaires were mailed to parents and youth who could not be reached by phone. Response rates ranged from 81.9% in Wave 1 to 55.1% in Wave 5. Each wave's weights were adjusted so all waves represented the initial study population. Data for about two thirds of youth across the post–high school time points came from youth themselves. Parent data were obtained for youth who were said not to be able to respond for themselves, who could not be reached, or who refused to participate. Analyses indicate high reliability across respondents (Newman et al., 2011). The measure of employment since high school encompassed all data collection waves at which youth were out of high school. The first post–high school wave for each sample member was the source of employment data in the first 2 post–high school years.

The dichotomous employment outcome indicated whether youth were reported to have held a full-time competitive job (i.e., worked 35 hr or more per week) at a paid job that was not supported or sheltered employment. This measure was chosen over a broader measure of any employment because by the last wave of NLTS2 data collection, 91.2% of young adults with ED had at some time since high school been employed (Newman et al., 2011). Full-time competitive work also is the most likely to enable youth to become self-supporting and, thus, may be the clearest measure of employment success. This employment outcome was examined within the first 2 years of leaving high school and at any time after that in the post–high school period covered by NLTS2 (from 2 to 8 years) to test for both the short- and longer-term effects of CTE on finding full-time employment.

Covariates. Covariates were taken primarily from Wave 1 parent/youth interviews/surveys. The NLTS2 conceptual framework (Wagner & Marder, 2003), which guided covariate selection, posits that youth outcomes are shaped not only by the characteristics of youth and their households that are immutable (e.g., demographics) but also by factors that have occurred in their past (e.g., high school graduation) and those that are fluid and can change over time (e.g., parents' expectations for their children's futures). Research has shown that demographic factors, such as gender and household income, are significantly related to variations in post–high school employment for youth with disabilities (Cameto, 2005; Shattuck et al., 2012). In addition, parents' expectations for their children's futures have been linked to outcomes of several kinds (Doren, Gau, & Lindstrom, 2012), as have differences in the nature and severity of youth's disabilities (Carter, Austin, & Trainor, 2011). Academic performance also has been

significantly related to post–high school employment (ACT, 2009). Factors reflecting this research are identified in Table 3 and have been included as covariates in the analyses reported here.

Demographic covariates included youth's age in years at the first data collection; gender, coded 1 for male; race/ethnicity, coded as dichotomous variables for African American and Hispanic (results compare with youth in all other categories of race/ethnicity combined); family income, coded as two dichotomous variables for incomes ≤US$25,000 and US$25,000 to US$50,000 (compared with incomes >US$50,000); and mother's education level, coded as 1 = less than high school, 2 = high school graduate or General Education Development (GED) degree holder, 3 = some college, or 4 = BA/BS degree or higher. A dichotomous variable indicating that a youth lived in a two-parent household also was included. Such factors have been shown in research to be significantly related to variations in post–high school employment for youth with disabilities (Cameto, 2005; Shattuck et al., 2012).

Outcomes of several kinds also have been linked to parents' involvement in, and support for, their children's educations at school and at home (e.g., Catsambis, 2002; Jeynes, 2007). Two parent involvement measures are included in the analyses. One is a measure of school-related support provided to youth by an adult at home that summed responses to question about the frequency an adult spoke to the student about his or her school experiences and helped with homework, creating a scale that ranged from 2 (*very low*) to 8 (*high*). A second scale measured the frequency of family involvement in activities at school, including attending general school meetings (e.g., Parent–Teacher Association [PTA]), attending school or class events (e.g., a play), volunteering at school, and going to a parent/teacher conference, creating a scale that ranged from 1 (*very low*) to 4 (*high*).

The nature and severity of youths' disabilities also can have a powerful influence on their outcomes (e.g., Cameto, 2005; Carter, Austin, & Trainor, 2012; Newman, 2005). Analyses included the following disability indicators: (a) A measure of students' functional cognitive skills summed parents' responses indicating a youth's ability to read common signs, tell time on an analog clock, count change, and look up telephone numbers and use the phone (1 = *not at all*, 2 = *not very well*, 3 = *pretty well*, 4 = *very well*). Scores ranged from 4 to 16, with internal consistency reliability of .93. (b) Social skills were measured by summing the responses (0 = *never*, 1 = *sometimes*, 2 = *very often*) to questions from the Social Skills Rating System (SSRS)–Parent version (Gresham & Elliott, 1990), organized into three subscales. Social assertion was measured with items assessing the ability to join group activities without being told, make friends easily, seem confident in social situations, and start conversations. The self-control subscale involved assessing the ability to end disagreements calmly, stay out of situations that could end in trouble, receive criticism well, and control one's temper when arguing with peers. Social cooperation was measured with items involving the ability to keep working at something until finished, speak in an appropriate tone at home, and cooperate with family members by behaving at home. (c) Parents also reported whether youth had any problems seeing, speaking, conversing, understanding language, appendage use, and health. The sum of the number of problem domains mentioned ranged from 0 to 6. (d) Parents reported (yes/no) whether youth had attention deficit disorder or attention deficit/hyperactivity disorder (ADD/ADHD).

Other covariates describe the stability of youths' schooling (i.e., the number of school changes experienced, as reported by parents), their school performance (i.e., grade point average [GPA] in general education classes as indicated on transcripts and whether they had ever been held back a grade, as reported by parents), and the extent to which they had exhibited behavior problems in school (reported by school staff) and in the community (reported by parents). Frequent moves to new schools and poor academic performance and behavior may suggest a tenuous relationship with academic learning that could attract students to CTE course taking in high school, a covariance that is controlled for by the inclusion of these factors in the analyses. Experiencing behavior problems at school and in the community that lead to disciplinary actions (reported by school staff) and arrest (reported by parents) may further threaten a student's tenuous relationship with school. CTE course taking has been promulgated as a strategy to engage such students in school and reduce drop-out rates (Association for Career and Technical Education, 2007; Chappell, O'Connor, Withington, & Stegelin, 2015).

Propensity Score Method (PSM)

PSMs were used to address the hypothesis related to the CTE–employment link. They have been used increasingly in observational studies with cohort or case-control designs to reduce selection bias in estimating intervention effects when randomized controlled trials (RCTs) are not feasible or ethical (Rosenbaum & Rubin, 1983, 1984, 1985). We used PSM to test the effects of taking any general education high school CTE courses and of earning a "concentration" of four or more credits in occupationally specific general education CTE courses on the odds of obtaining full-time competitive employment after high school and the odds of obtaining such employment in the first 2 years after high school versus 2 to 8 years after high school.

The propensity score is the predicted probability of taking such courses based on a set of potentially confounding covariates using logistic regression. This method strives to create balance on covariates between treatment and comparison groups using statistical methods instead of randomization,

with a goal of achieving a valid test of the treatment effect while statistically balancing intervention participants and non-participants on measured covariates, thus disentangling confounding effects from treatment effects. The extent to which this is achieved is indicated by identifying antecedent variables that might be expected to relate to outcomes and comparing their distribution in the treatment and comparison groups. If they are relatively similar, one can use the antecedent variables as covariates and allow the regression to adjust for the relatively modest differences in them between the groups. This approach simulates to the extent possible with observational data analyses of RCT-derived data (Becker & Ichino, 2002).

Study analyses estimated the average treatment effect on the treated (ATT) in the population represented by NLTS2 students with ED, adjusting for confounding using the "weighting by the odds" approach for complex surveys recommended by DuGoff, Schuler, and Stuart (2014). Specifically, the weight for treated students was their survey weight, and the weight for comparison students was equal to their survey weight times their propensity score transformed to an odds scale (i.e., $p / [1 - p]$ where p is the propensity score). The average ATTs of taking a high school general education CTE course and a concentration of such courses at the two study time periods were estimated using a weighted logistic regression model as implemented in Stata proc logistic. The odds ratio (OR) from a model can be interpreted as a measure of the relative probabilities of treatment and comparison groups achieving full-time competitive employment, controlling for the estimated propensity of taking the two forms of CTE. This approach weighted the comparison group to balance with the treatment group on observed covariates, thus facilitating estimation of the effect of the intervention 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. A weighting approach also made the fullest use of the observations on treated and untreated individuals, was a natural extension of survey weighting, and has been shown to perform well in simulated complex surveys relative to other propensity scoring approaches. A limitation of the weighting approach is that very large weights can reduce the precision of the treatment effect. We trimmed the top 1% of weights to be equal to the 99th percentile of weights and verified that such trimming did not adversely affect balancing on the covariates.

Missing Data

Missing rates ranged from no missing to 31.6%, with the exceptions of missing rates of 56.5% for both youth being diagnosed with ADD/ADHD and the number of disciplinary actions experienced at school. The Stata ICE (imputation by chained equations) procedure (Royston, 2004, 2005a, 2005b, 2007, 2009) was used to impute missing data on covariates for 20 implicates. Missing data for all variables were imputed to avoid bias associated with listwise deletion and to take advantage of the information contained in the correlation between covariates and the outcome and treatment variables. However, as recommended (Little, 1992; Little & Rubin, 2002; White, Royston, & Wood, 2011), imputed values for the outcomes or interventions were not used in analyses. Separate analyses were conducted for all imputed data sets and combined using Rubin's method. Analyses using the imputed data were aggregated using the Stata mim procedure, a command for analyzing multiply imputed data sets that combines regression results across implicates and adjusts the standard error estimates to reflect uncertainty due to missing values.

Results

Research Question 1: CTE Course Taking

Table 1 shows that CTE course taking was ubiquitous among high school students with ED; nine in 10 took one or more such courses. Overall, they accounted for almost one fifth of high school credits earned. However, only one fourth of students with ED took a concentration—that is, four or more credits of general education occupationally specific CTE; the mean of occupationally specific courses earned was 2.6. Prevocational and work study or cooperative education courses were taken by 30.6% and 23.1% of students with ED, respectively. Eighty percent of CTE credits (an average of 2.8) were earned in general education classes, as were 88.5% of occupationally specific credits (2.3 credits). Credits earned in prevocational classes were evenly split between general and special education settings, whereas work study/cooperative education credits were more commonly earned in general than special education classes.

Research Question 2: Employment Experiences

Although 84.1% of youth with ED had worked at some time during their first 2 years after high school (see Table 2), significantly fewer had worked full-time during that period (57.5%, $p < .001$). A smaller, but statistically significant, difference existed in youth with ED working at all and working full-time over the post–high school time period covered in NLTS2 (86.0% vs. 74.8%, $p < .05$). On average, employed youth with ED worked full-time during both time periods (34.6 and 37.2 hr per week, respectively) and earned wages (averages of US$8.01 and US$10.25) that were higher than the national minimum wage over the NLTS2 time period (US$5.15–US$7.25; U.S. Department of Education, 2010). About four in 10

Table 1. CTE Course Taking of Students With ED While in High School (*N* = 350).

CTE course taking	%/n	SE
Percent of students who took		
Any CTE	90.1	2.12
Occupationally specific CTE	86.1	2.79
A concentration of occupationally specific general education CTE	25.6	3.63
Prevocational education	30.6	3.88
Work study or cooperative education	23.1	3.61
CTE credits as percent of total credits earned	19.3	1.50
M number of credits earned in		
Any CTE courses	3.5	0.28
General education setting	2.8	0.27
Special education setting	0.7	0.17
Occupationally specific CTE courses	2.6	0.26
General education setting	2.3	0.23
Special education setting	0.3	0.12
Prevocational education	0.4	0.06
General education setting	0.2	0.04
Special education setting	0.2	0.04
Work study or cooperative education	0.5	0.09
General education setting	0.3	0.08
Special education setting	0.2	0.08

Note. Sample size has been rounded to the nearest 10 in compliance with Institute of Education Sciences's rules for access to restricted-use data. CTE = career and technical education; ED = emotional disturbances.

Table 2. Post–High School Employment Experiences of Youth With ED, by Time Period.

	Time period			
	Within 2 years of leaving high school		Ever since leaving high school	
Employment experiences	%/M	SE	%/M	SE
Percent of youth who had been				
Employed	84.1	2.92	86.0	2.23
Employed full-time	57.5	5.13	74.8	3.74
M hours worked per week	34.6	2.52	37.2	1.44
M hourly wage	US$8.01	US$0.38	US$10.25	US$0.40
Percent receiving any benefits	41.6	4.61	55.3	3.18
M months duration of current/most recent job	19.4	1.84	16.3	1.63
Sample sizes				
All youth	320		450	
Working youth	230–280		340–400	

Note. Sample sizes have been rounded to the nearest 10 in compliance with Institute of Education Sciences's rules for access to restricted-use data. ED = emotional disturbances.

youth (41.6%) who worked in the first 2 years after high school received employer-paid vacation, sick leave, or retirement benefits, a rate that increased to 55.3% over the full post–high school period (*p* > .05). In the first 2 years post high school, youth with ED had worked at their current or most recent job an average of 19.4 months, with no significant change in the average duration of the last job they held during the full NLTS2 time period (16.3 months).

It is unclear the extent to which the findings related to youths' employment experiences are intertwined with and affected by the frequency with which youth with ED also were pursuing some form of postsecondary education, usually 2-year or community college (Newman et al., 2011). Exiting such an institution more than 2 years post high school could result in the higher mean earnings observed in that time period, for example.

Table 3. Treatment/Control Covariate Balance Statistics Before and After Propensity Score Weighting.

Covariates	Took any CTE in a general education setting			Took a concentration of occupationally specific CTE in a general education setting		
	Treatment *M*	Pre-PSW standardized *M* difference	Post-PSW standardized *M* difference	Treatment *M*	Pre-PSW standardized *M* difference	Post-PSW standardized *M* difference
Demographics						
M age (2001)	15.52	0.15	−0.03	15.32	−0.19	0.01
Percent						
Male	80.02	0.27	−0.03	95.76	0.62	−0.02
African American	17.12	−0.18	0.12	14.76	−0.14	0.06
Hispanic	9.89	−0.02	−0.07	12.07	0.10	0.01
Household income						
≤US$25,000	35.94	−0.12	−0.04	34.32	−0.09	−0.04
US$25,001–US$50,000	32.33	0.08	0.05	38.93	0.22	−0.00
M mother's education level	2.38	0.14	−0.06	2.39	0.04	−0.05
Percent in two-parent household	54.99	−0.13	−0.04	58.15	−0.10	0.04
Disability/functioning						
Percent with ADD/ADHD	25.36	−0.13	−0.09	23.69	−0.11	−0.06
M scale score						
Functional cognitive skills	14.58	0.09	0.07	14.76	0.13	0.09
Social assertion skills	1.91	0.09	−0.00	1.87	−0.07	0.01
Self-control skills	2.23	0.04	0.03	2.34	0.17	−0.01
Social cooperation skills	3.34	0.27	0.14	3.61	0.29	0.06
Parent involvement/support						
M parent involvement scale score	1.52	−0.13	−0.01	1.53	−0.01	−0.03
M family support scale score	1.87	−0.18	0.04	1.77	−0.08	−0.05
Youth experiences						
M number of school changes other than for grade progression	1.58	−0.27	0.04	1.50	−0.22	−0.00
M GPA in general education classes	2.08	0.23	0.07	2.23	−0.33	−0.04
Percent ever repeated a grade	34.64	−0.04	0.01	30.62	−0.12	−0.01
M number of disciplinary actions most recent year in high school	1.82	−0.15	−0.02	1.79	−0.26	0.00
Percent ever arrested during high school	38.64	0.07	0.15	28.76	−0.23	0.01

Note. Sample sizes before imputation = 190–410. Treatment means are weighted using survey weights. Control means are weighted using survey weights or propensity-adjusted survey weights. The standardized mean difference is calculated using propensity-adjusted control means and equals the difference in means between the groups divided by the pooled standard deviation of both groups. CTE = career and technical education; PSW = propensity score weighting; ADD = attention deficit disorder; ADHD = attention deficit/hyperactivity disorder; GPA = grade point average.

The Contribution of CTE Course Taking to Full-Time Employment

To ensure that PSM produced treatment and comparison groups that were well balanced, we compared the standardized mean differences between the groups for each covariate before and after propensity score weighting. The standardized mean difference is the difference between the treatment and comparison group means, divided by the pooled standard deviation of both groups. Table 3 depicts the balance statistics for treatment and comparison groups

obtained after weighting. The average differences between groups on the model covariates related to taking any general education CTE courses ranged from −0.091 to 0.136. In the model related to taking a concentration of occupationally specific general education CTE courses, differences ranged from −0.061 to 0.085. Thus, all balance statistics were lower than the What Works Clearinghouse cutoff of 0.25 for baseline equivalence for quasi-experimental studies (What Works Clearinghouse, 2008), indicating that treatment and comparison groups were balanced on the covariates included in the analyses. To further control for group

Table 4. ATT Effect of Taking CTE Courses on Full-Time Employment for Youth With Emotional Disturbances, by Time Since Leaving High School.

| | A | | | B | | |
| | Up to 2 years after high school | | | 2–8 years after high school | | |
Intervention	Treatment	Control if matched perfectly[a]	Propensity-adjusted OR[b] [95% CI]	Treatment	Control if matched perfectly[a]	Propensity-adjusted OR[b] [95% CI]
Took any general education CTE	83.1%	71.6%	1.95 [0.77, 4.91]	80.4%	66.9%	2.03 [0.81, 5.09]
Earned ≥ 4 credits in occupationally specific general education CTE	37.7%	13.0%	4.07** [1.44, 11.45]	28.4%	18.0%	1.80 [0.57, 5.65]

Note. Effect size for dichotomous outcomes can be calculated using the Cox index: LOR_{Cox} = ln(OR) / 1.65 where LOR is the logged odds ratio, ln() is the natural logarithm function, and OR is the odds ratio (Cox, 1970). ATT = average treatment effect on the treated; CTE = career and technical education; CI = confidence interval.
[a]Percentage positive for a control group that would yield the propensity-adjusted OR if it matched the treatment group on all covariate means; calculated as 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. [b]Treatment group percentage, using survey weights.
**Statistically significant before adjustment for multiple comparisons at *p* < .008.

differences in determining outcomes, covariates used in PSM analyses also were included in the treatment effect models.

Impacts of CTE on the Odds of Obtaining Full-Time Employment Post High School

After adjusting for multiple comparisons (Benjamini & Hochberg, 1995), the PSM findings reported in Table 4 demonstrate that taking one or more general education CTE courses did not give students with ED a significant advantage in finding full-time employment in either of the time periods considered in the analyses (ORs = 1.95 and 2.03). However, significantly higher odds of obtaining full-time employment in the first 2 years after high school were conferred on youth with ED who had earned a concentration of four or more credits in occupationally specific general education CTE courses (OR = 4.07, *p* < .01). The impact of such course taking was not sustained in the later years after high school (OR = 1.80, *ns*).

Discussion

This study's findings both confirm and extend the results of several decades of work that demonstrate the positive relationship between CTE course taking in high school and post–high school employment for students with disabilities (Evers, 1996; Mithaug et al., 1985; Wagner, 1991). We also have gone beyond the findings of the existing, largely correlational research base (Test et al., 2009) by using a rigorous quasi-experimental analysis approach, PSM, which created well-balanced comparison groups to identify the average treatment effects of CTE course taking on the study

population. Finally, we have focused specifically on students with ED rather than those with "mild" disabilities (Wagner et al., 1993) to highlight the contributions of CTE course taking to the post–high school employment prospects of those young adults.

Findings show that nine out of 10 high school students with ED participated in general education CTE, similar to the 93.5% of youth in the general population (Newman et al., 2012). The two groups also were similar in the average CTE credits they earned in high school (3.2 credits vs. 3.1), but those constituted a higher percentage of all credits earned by students with ED than by the general population (16.1% vs. 13.9%, *p* < .05; Newman et al., 2012). Despite CTE course taking being common place among students with ED, only 25.6% took the concentration of occupationally specific general education CTE courses that was associated with a higher likelihood of full-time employment, a percentage that was virtually identical to that measured two decades ago (26.4%, Blackorby, 1993). In addition, analyses show that taking a concentration of such courses conferred benefits in the early post–high school years, thereby setting youth with ED on a path toward obtaining full-time competitive employment and the higher wages and employer-paid benefits that can accompany it.

NLTS2 data show that obtaining competitive employment was a primary post–high school goal for 57.8% of students with ED (Cameto, Levine, & Wagner, 2004). The results reported here indicate that taking a concentration of CTE courses in a specific occupational area can help students with ED to achieve their employment goal in the first few post–high school years. In turn, this helps establish an employment history that may contribute to further

employment success in later years. However, students must enroll in a concentrated occupationally specific general education CTE program to reap its benefits; just over a quarter had done so.

Limitations

This study has described the CTE course taking and post–high school employment experiences of young adults with ED and presented evidence of the benefits of taking a concentration of occupationally specific high school general education CTE courses in obtaining full-time employment in the early years after high school. Nonetheless, the study has limitations. Self-reported data, such as income levels, outcomes, and employment characteristics, could not be independently verified. Similarly, data on functional/behavioral covariates came from parents' reports, which are not assumed to be as reliable as the results of professional evaluations. Finally, unobserved confounding is a concern in non-experimental studies such as this, where exposure to treatments could not be randomized. PSM adjusts for observed covariates but does not necessarily balance on unobserved factors. Bias may come into play if there is unobserved confounding; that is, if an unmeasured factor was correlated with both participation in CTE and later employment.

A sensitivity analysis (Lin, Psaty, & Kronmal, 1988) was conducted to determine how strongly a single unmeasured binary variable would need to be associated with both full-time employment up to 2 years after high school and receipt of four or more CTE credits to render the effect of the treatment statistically non-significant if that binary variable had been entered as a covariate into the propensity score analysis. Such a variable would need to have an OR of 3.5 with both the dependent variable and treatment, which is a relatively high hurdle.

Implications for Practice

The benefits of taking a concentration of occupationally specific general education CTE could more frequently be considered in the transition planning process for students with a post–high school employment goal so students, parents, school staff, and others can chart a course toward it. Special education law requires that a transition plan specify the transition services, including course of study, needed to help students achieve their goals (IDEA Partnership, 2004). Students with ED with a goal of obtaining full-time competitive employment can be encouraged to include in their transition plan a concentration of general education occupationally specific CTE courses. However, fitting such a concentration of courses into a student's schedule requires that the transition plan specify that course-taking path early in a student's high school career.

Early CTE course taking also would leverage the potential of such courses to ward off early high school dropout. Although some research raises concerns about CTE because a concentration of such courses has been associated with higher likelihood of students dropping out (Bozick & Dalton, 2013), this relationship largely reflects fewer academic credits earned by CTE concentrators because they often do not pass their academic courses. National data show that significantly more students with ED failed one or more high school academic courses than CTE courses (69.0% vs. 41.6%, $p < .001$; Newman et al., 2012). It would be helpful for transition planning and Individualized Education Program (IEP) meetings to include both general education academic and CTE teachers in considering the supports students with ED need to succeed academically and graduate as well as to prepare for a post–high school career. However, only 30.3% and 56.5% of students with ED had general education CTE and academic teachers, respectively, participate in their transition planning. The resulting transition program was reported by parents of only 37.4% of students with ED to be "very well suited" to helping them achieve their transition goals; school staff attending transition planning meetings for only 32.6% of students with ED made a similar judgment (Cameto et al., 2004). In addition, parents of only about one third of students reported that transition planning meetings were "very useful" in planning for their students' futures (Cameto et al., 2004). Clearly, more needs to be done to ensure that the potential benefits of transition planning are actually experienced by students with ED. More also can be done to ensure that the CTE courses they take are truly effective in helping them achieve their goals. Achieving that level of instructional effectiveness has been said to require a "transformation of career and technical education" (Office of Vocational and Adult Education, 2012) so that it is well aligned across secondary and postsecondary settings and with emerging labor market needs.

Suggestions for Future Research

This study is a solid foundation on which to further explore the links between high school CTE course taking and post–high school employment. For example, it would be useful to know whether there are specific occupational areas of CTE concentration that were more beneficial to youth in finding full-time competitive employment and the extent to which that employment and the occupational area studied were aligned. It also would be informative to determine the extent to which taking a concentration of occupationally specific high school CTE courses increases the likelihood of youth with ED pursuing postsecondary vocational training. Moreover, it would be important to determine whether the benefits identified here for youth with ED and in other analyses for youth with learning disabilities (Wagner, Newman,

& Javitz, 2015) generalize to youth with other types of disabilities or to youth with disabilities as a whole.

Authors' Note

Declaration of Conflicting Interests

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