


Mediating Role of Self-Determination Constructs in Explaining the Relationship Between School Factors and Postschool Outcomes

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Abstract

Secondary data analysis using the National Longitudinal Transition Study-2 data set was conducted to examine the degree to which autonomy, psychological empowerment, and self-realization (3 of 4 essential characteristics of self-determination) play a mediating role in the relationship between school-based factors and postschool outcomes. The results suggest that autonomy, psychological empowerment, and self-realization play a large and significant role in mediating the relationship between school-based factors and postschool outcomes. With over 50% of the indirect effects (i.e., the aggregated effects of the school-based factors on the outcome constructs through the self-determination constructs) significant, this provides support for the essential role of self-determination in secondary transition services and supports. Implications for research and practice are discussed.

Researchers have identified school-based factors that affect the attainment of postschool outcomes for youth and young adults with disabilities. For example, Test, Mazzotti, et al. (2009) identified a range of school-based transition practices that had varying degrees of evidence supporting their impact on postschool outcomes related to employment, independent living, and further education, including secondary inclusion, vocational education, work experiences, and transition planning. Further, research syntheses have identified the importance of instruction targeting student and family factors, particularly, instruction related to social and communication skills, self-advocacy skills, and parent knowledge and involvement in transition (Test, Fowler, et al., 2009).

Recent research studies have also suggested that student self-determination affects both school and postschool outcomes, including

access to the general education curriculum (Lee, Wehmeyer, Palmer, Soukup, & Little, 2008), postschool employment and community access (Shogren, Wehmeyer, Palmer, Rifenshark, & Little, 2015), and quality of life (Wehmeyer & Schwartz, 1998). Meta-analytic reviews have shown that across studies, when students with disabilities are provided with instruction, they can learn to engage in self-determined behavior (Algozzine, Browder, Karvonen, Test, & Wood, 2001; Cobb, Lehmann, Newman-Gonchar, & Alwell, 2009). In

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assessing and implementing instruction to enhance self-determination, one of the most commonly adopted theoretical models to guide interventions to promote self-determination is the functional model of self-determination (Wehmeyer, 2003). The functional model defines self-determination as “volitional actions that enable one to act as the primary causal agent in one’s life and to maintain or improve one’s quality of life” (Wehmeyer, 2005, p. 117). The model further describes four essential characteristics of self-determined behavior: (a) *autonomy* (i.e., a person acts according to his or her own preferences, interests, and abilities without undue external influence), (b) *self-regulation* (i.e., a person is able to make decision about what skills are needed to complete a task at hand, examine his or her repertoire of skills, and enact and evaluate a plan of action to complete the task), (c) *psychological empowerment* (i.e., a person believes he or she has the capacity to preform behaviors that will influence the environment, leading to desired outcomes), and (d) *self-realization* (i.e., a person uses knowledge of himself or herself to act in a beneficial way).

Exploring the role of self-determination in mediating the relationship between school-based supports and services and adult outcomes has the potential to further explicate the impact of self-determination on outcomes, in school and postschool, targeted by secondary transition services and supports.

Given the relationship between self-determination and in-school and postschool outcomes, researchers have suggested that self-determination—and more specifically, student autonomy, self-regulation, psychological empowerment, and self-realization—potentially mediates the relationship between school-based factors (e.g., student factors, family involvement, and transition practices) and outcomes. Studies have suggested that

personal, family, and school factors influence self-determination and postschool outcomes (Shogren, 2013b), independently and in combination. For example, research has suggested that self-determination predicts and is predicted by various student and student characteristics (Shogren et al., 2007), teacher attitudes (Carter, Lane, Pierson, & Glaeser, 2006; Carter, Lane, Pierson, & Stang, 2008), and inclusion and access to the general education curriculum (Lee et al., 2008; Lee, Soukup, Little, & Wehmeyer, 2009). However, the mediational role of self-determination has never been directly tested.

With longitudinal data, it is possible to test the relationship between school-based factors, self-determination, and outcomes. Exploring the role of self-determination in mediating the relationship between school-based supports and services and adult outcomes has the potential to further explicate the impact of self-determination on outcomes, in school and postschool, targeted by secondary transition services and supports. Thus, the purpose of this study was to use longitudinal data on the secondary school and postschool experiences of a nationally representative sample of youth with disabilities available from the federally funded National Longitudinal Transition Study-2 (NLTS2) to examine the role of student self-determination in mediating the relationship between school-based factors and outcomes.

The NLTS2 was a nationally representative, longitudinal study of the transition experiences and outcomes of youth with disabilities (ages 13 to 16 at the start of the study) as they moved from school to adult life. NLTS2 collected data over a 10-year period, beginning in 2000, with funding from the U.S. Department of Education (Wagner, Newman, Cameto, & Levine, 2006b). NLTS2 was a follow-up to the original National Longitudinal Transition Study, conducted from 1987 to 1993 (Wagner, 1992) that provided data that shaped the emphasis in the 1997 Amendments to the Individuals With Disabilities Act (IDEA) mandating transition services for students with disabilities (Blackorby & Wagner, 1996). The contractor,

SRI International, designed NLTS2 data collection to ensure a nationally representative sample of students in the 12 disability categories recognized in IDEA at the secondary level. Data were collected in multiple forms (e.g., direct assessment, interviews, surveys, transcript review) from multiple sources, including students, family members, teachers, school administrators, and school records with the intent of documenting the characteristics, school-based experiences, and outcomes of youth with disabilities.

A number of researchers have conducted secondary analyses of NLTS2 data (Hicks & Knollman, 2015; Mazzotti et al., in press) examining a variety of factors related to student characteristics, experiences, and outcomes. We have conducted a series of studies exploring student self-determination, using direct assessment data collected as part of NLTS2. NLTS2 collected data on student self-determination using a subset of items from The Arc's Self-Determination Scale (SDS; Wehmeyer & Kelchner, 1995) in a one-time direct assessment of students while they were in school. The subset of items measured three of the four essential characteristics of self-determined behavior (Wehmeyer, Kelchner, & Richards, 1996): autonomy, psychological empowerment, and self-realization (Shogren, Kennedy, Dowsett, & Little, 2014). We have found that multiple school-based factors (e.g., student disability label, inclusion, vocational experiences, etc.) predicted student autonomy, psychological empowerment, and self-realization (Shogren, Garnier Villarreal, Dowsett, & Little, 2016). Further, student autonomy, psychological empowerment, and self-realization in school predicted post-school outcomes, although the pattern of relationships was complex and influenced by disability label (Shogren & Shaw, 2016). To define school-based factors and postschool outcome constructs in this line of work, we engaged in systematic review and analysis of available NLTS2 data from all data sources, identifying questions across the data sources that could be grouped together to define predictors and outcomes constructs based on existing literature on school-based predictors

(Test, Fowler, et al., 2009; Test, Mazzotti, et al., 2009) and outcome constructs (Schallock et al., 2005; Schallock, Bonham, & Verdugo, 2008; Wehmeyer & Palmer, 2003). These indicators of predictor and outcome constructs were then empirically evaluated using confirmatory factor analysis procedures to determine the degree to which the theoretical predictor and outcome constructs were empirically viable (i.e., whether the identified NLTS2 items for each construct hang together). This resulted in 16 school-based predictors (Shogren & Garnier Villarreal, 2015) and 10 quality-of-life-related post-school outcome constructs (Shogren, Shaw, & Little, in press), which are described in Tables 1 and 2.

The relationships between school-based factors, student autonomy, psychological empowerment, and self-realization and postschool outcomes have never been explored, with a specific focus on the intermediary or mediating role of autonomy, psychological empowerment, and self-realization.

Although research has documented the effect of school-based factors on student autonomy, psychological empowerment, and self-realization (Shogren et al., 2016) as well as the impact of student autonomy, psychological empowerment, and self-realization on post-school outcomes (Shogren, Shaw, et al., in press); the relationships between school-based factors, student autonomy, psychological empowerment, and self-realization and post-school outcomes have never been explored, with a specific focus on the intermediary or mediating role of autonomy, psychological empowerment, and self-realization. Thus, the present analyses built on the models developed in previous research but specifically focused on testing the degree to which autonomy, psychological empowerment, and self-realization explained some portion of the relationship between school-based factors and postschool

Table 1. School-Based Predictor Constructs.

| Predictor constructs | Description |
|---|---|
| Student constructs | |
| Grades | Student grade point average across academic, vocational, and other classes |
| Classroom behavior | Student use of appropriate classroom behavior in vocational domain (e.g., asking for help, staying focused) |
| Functional skills | Student performance of tasks related to basic mental skills, community and daily living skills |
| Self-concept | Self-reported confidence in academics and social areas |
| Social and communication skills | Student skills in social interactions and communication |
| Family constructs | |
| General parent involvement | Parent involvement in general school activities (e.g., volunteering, parent–teacher conferences) and engagement with youth around school activities |
| Home independence | Student performance of chores in the household |
| Parent involvement in special education planning | Parent attendance at most recent IEP meeting |
| Parent outcome expectations | Parent ratings of likelihood of the attainment of postschool outcomes (e.g., employment, independent living) |
| School constructs | |
| Access to the general curriculum—academics | Student access to core academic subject areas |
| Access to the general curriculum—accommodations and modifications | Student access to accommodations and modifications in core academic subject areas |
| Inclusion | Percentage of time in general education classroom for academic classes |
| Social networks | Student participation in school, social, and volunteer or community activities |
| Supports | Availability of emotional and formal supports for student |
| Student involvement in education planning | Level of student participation in transition planning |
| Vocational experiences | Access to vocational goals, job development, and work experiences |

Note. IEP = individualized education program. Shogren and Garnier Villarreal (2015); Shogren, Shaw, and Little (in press).

outcomes. Such analyses have potential to provide insight into the role of self-determination in promoting postschool outcomes, informing future research as well as practice. That is, if autonomy, psychological empowerment, and self-realization are important mediators, further work is needed to develop, test, and implement self-determination as a means to enhance the impact of school-based practices on outcomes.

Given the number and range of school-based factors, self-determination constructs, and postschool outcomes, our primary research question in the present analysis focused on examining the general or macrolevel pattern of intermediary effects rather than specific relationships between individual constructs. Specifically, we wanted to examine if autonomy, psychological empowerment, and self-realization play a role

Table 2. Postschool Outcome Constructs.

| Outcome constructs | Description |
|-------------------------|--|
| Social relationships | Participation in community, volunteer, and group activities; invited to social activities, talks on phone, engages in social activities with friends and family, feels supported and cared about by friends and family |
| Independent living | Type and inclusiveness of current residential arrangement (e.g., independent or supported living arrangements vs. congregate or segregated settings) |
| Emotional well-being | Students' ratings of the degree to which they enjoy life, are happy, feel good about themselves, and feel useful and able to get things done |
| Access to services | Reports needing services beyond what is currently available |
| Health status | Rating of general health status |
| Postsecondary education | Enrollment in any form of postsecondary education, duration and continuity of attendance, graduation status |
| Financial supports | Receives financial support from Supplemental Security Income, food stamps, or any government program |
| Financial independence | Has checking, savings, and charge account |
| Employment | Employment status, duration, and consistency of employment, number of hours worked; access to benefits; if promoted at current job; perceptions of treatment, compensation, and opportunities for advancement at current job |
| Advocating for needs | Communicating needed accommodations to employer |

Note. Adapted from Shogren and Garnier Villarreal (2015); Shogren, Shaw, and Little (in press).

in the relationship (i.e., is there a significant indirect or intermediary effect?) between school-based factors and postschool outcomes. After exploring the macrolevel patterns, future research can address microlevel relationships between specific practices, aspects of self-determination, and outcomes (e.g., exploring the role of self-determination in mediating the relationship between inclusion in school and advocacy outcomes in adulthood). To inform future microlevel research, we also examined the pattern of indirect effects across disability groups, self-determination constructs (autonomy, psychological empowerment, and self-realization), and postschool outcomes to determine if the patterns were similar or different within each of these domains.

Methods

This study built on previous research (Shogren & Garnier Villarreal, 2015; Shogren, Kennedy, Dowsett, & Little, 2014; Shogren, Shaw, et al., in press) to explore the intermediary or indirect

effects of three of the four essential characteristics of self-determination. Self-determination was assessed during Wave 1 or Wave 2 of NLTS2 data collection (data collection occurred in five waves, each of which occurred over a 2-year period). Students in older age cohorts were sampled in Wave 1 and in younger age cohorts in Wave 2 (Wagner, Newman, Cameto, & Levine, 2006a). The items used to measure three of the four essential characteristics of self-determination were sampled from the SDS (Wehmeyer & Kelchner, 1995) and were administered directly to students. Because the items required direct responses from students on a Likert-type rating scale, a small subset of students (approximately 17%) was determined by teachers to be unable to participate in a direct testing situation or meaningfully respond to the questions. Thus, the sample for the present analysis includes all those youth (83%) who participated in the direct assessment. The number of students who participated in the direct assessment varied based on student characteristics, specifically by disability label, with a high of

98% of students with learning disabilities and speech-language impairments participating to a low of 58% of students with autism participating (Shogren, Kennedy, Dowsett, & Little, 2014).

NLTS2 Data Sources

Self-determination constructs. Self-determination data were collected directly from students; 26 of 72 items from the SDS (Wehmeyer & Kelchner, 1995) were included in the NLTS2 data collection. The SDS is based on the functional theory of self-determination (Wehmeyer, 2005), and the full scale measures overall self-determination through assessment of the four essential characteristics of self-determined behavior: autonomy, self-regulation, psychological empowerment, and self-realization. The 26 NLTS2 items included only a sample of items from three of the four subscales (Autonomy, Self-Realization, Psychological Empowerment). In previous work (Shogren, Kennedy, Dowsett, & Little, 2014), we found a three-construct representation of self-determination was conceptually and psychometrically sound, but an overall self-determination construct could not be created from the existing data because the Self-Regulation subscale was excluded due to its response format (i.e., open-ended responses). In addition, Shogren, Kennedy, Dowsett, and Little (2014) tested the degree to which the 12 disability groups sampled in NLTS2 could be collapsed based on similarities and differences in their latent means and variances on the three latent self-determination constructs. The researchers found that the 12 disability groups could be collapsed into three groups: high-incidence disabilities (i.e., learning disabilities, emotional disturbances, speech or language impairments, other health impairments), sensory disabilities (i.e., visual and hearing impairments), and cognitive disabilities (i.e., autism, multiple disabilities, deaf-blindness). Students with intellectual disability, traumatic brain injury, and orthopedic impairments could not be collapsed. Thus, six disability groups were used in the present analysis, consistent with Shogren, Kennedy, Dowsett, and Little (2014).

School-based constructs. Shogren and Garnier Villarreal (2015) developed 16 student, family, and school-based constructs from NLTS2 based on a comprehensive review of the literature on school-based factors (Shogren, 2013b) that affect self-determination and a review of the NLTS2 data to determine what indicators of the identified factors could be constructed from available data sources. The identified NLTS2 indicators and associated constructs were then subjected to extensive empirical analysis described in Shogren and Garnier Villarreal (2015). We adopted the constructs developed by Shogren and Garnier Villarreal to define 16 school-based factors, including student, family, and school factors (see Table 1 for a description). The specific NLTS2 variables used to build the 16 predictor constructs are described in Shogren and Garnier Villarreal and were collected during Wave 1 or during the student's ninth-grade year (for transcript records), with the exception of data collected concurrently with the self-determination data (i.e., direct assessment of social and academic skills) that were collected during Wave 1 or 2 based on student age, as described previously.

Adult outcome constructs. Separately, Shogren, Shaw, et al. (in press) defined 10 quality-of-life-related early adult outcome constructs using data from Wave 5 of NLTS2 (Years 8–10 of the overall project), when students were ages 23 to 26, depending on their age at the start of the project. The specific NLTS2 variables used to build the 10 quality-of-life-related early adult outcome constructs are described in detail in Shogren, Shaw, et al. (in press). We adopted the same outcome constructs in our analyses, which are described in Table 2.

Missing data. Across the waves of NLTS2 data collection and across data sources, there were missing data for multiple reasons, including that the student exited data collection or that a specific question did not have relevance to the student and was skipped (e.g., the student was not employed). Missing data were addressed by using full information maximum likelihood

(FIML) to estimate the factor-analytic models that produced the factor scores. FIML partitions the missing information out of the likelihood function during maximum likelihood estimation of the measurement model parameters so that the model estimates are based on only the observed information (Enders, 2010; Little, Jorgenson, Lang, & Moore, 2014). Under an assumption of missing-at-random data (i.e., wherein the propensity to respond is predicted entirely by the observed portions of the data), FIML will produce unbiased and optimally efficient parameter estimates (Enders, 2010; Schafer & Graham, 2002).

Analytic Procedures

To examine the degree to which the school-based constructs (Table 1) had an indirect effect on the postschool outcome constructs (Table 2) through the autonomy, psychological empowerment, and self-realization constructs, we used multiple-group structural equation modeling (Brown, 2015; Kline, 2011; Little, 2013). We were interested in testing the pattern and nature of the intermediary or indirect effects of autonomy, psychological empowerment, and self-realization on the relationship between school-based factors and postschool outcomes. We used the six disability groups established in previous work (see Shogren & Garnier Villarreal, 2015; Shogren, Kennedy, Dowsett, & Little, 2014; Shogren, Shaw, et al., in press).

Given that previous research established measurement invariance across the disability groups, the measurement model for the present analyses included all of the strong invariance constraints established by Shogren and Garnier Villarreal (2015) and Shogren, Shaw, et al. (in press). In testing the models in the present analyses, we considered acceptable model fit to be a root mean square error of approximation (RMSEA) of less than .08 and standardized root mean square residual (SRMR) of less than .1 (West, Taylor, & Wu, 2012). Non-normed fit index (NNFI) and comparative fit index (CFI) are presented, but they are not used to infer fit because of the low correlations among indicators in the NLTS2 data, which leads to lower-than-expected

NNFI and CFI values (Taylor, 2008). Mplus, Version 6.12 (Muthén & Muthén, 1998–2012) with the “type=complex” option and the “wt_na” sampling weight, stratum, and cluster variables for the complex sampling design was used for all analyses.

Our original intent was to build on the strong measurement invariance model that included the 16 school-based constructs, the three essential characteristics of self-determination constructs, and the 10 adult outcome constructs and estimate a full latent regression model. However, issues were encountered in estimating this model in Mplus. This likely arose because of the large number of regression paths and the low correlations between the predictor constructs and outcome constructs (see Shogren & Garnier Villarreal, 2015; Shogren, Shaw, et al., in press). With this limitation, we implemented an alternative plan, where we estimated factor scores (i.e., each participant’s model-implied values of the latent constructs) from our measurement model (strong invariance model) using Mplus and fit the regression models using these factor scores as predictors, mediators, and outcome variables. The factor scores represent the most likely score for each participant on each latent construct. We evaluated the representativeness of the factor scores using standard guidelines (Grice, 2001) and found that they adequately represented the data.

We developed regression models with the factor scores in the R platform using the lavaan package (Version 0.5-16). Separately, for each of the 10 quality-of-life-related postschool outcome constructs, an indirect-effects regression model was specified in which all school-based predictor constructs acted as input variables, the three self-determination constructs acted as mediators, and the single outcome construct acted as the dependent variable. Indirect effects models describe the mechanism by which one variable influences another, indirectly, through a number of intermediary variables (Selig & Preacher, 2009). To estimate the indirect effects, and test our primary research question, we used the products of the two classes of direct effects: (a) the effects of the predictors on the self-determination constructs

(autonomy, psychological empowerment, and self-realization; *a* paths) and (b) the effects of autonomy, psychological empowerment, and self-realization on each outcome (*b* paths). This approach to estimate the indirect effect takes into account the extent of the effect of the predictor on the mediators (*a*), while at the same time taking into account the extent of the effect of the mediators on the outcomes (*b*); thus, the indirect effect is the aggregated effect of the predictors on the outcomes through the mediator (MacKinnon, Fairchild, & Fritz, 2007). To correctly estimate the significance of these indirect effects, we used the nonparametric bootstrap, which has been shown to be the preferred method for creating confidence intervals for indirect effects (MacKinnon et al., 2007). To pare down the number of significant paths, we employed a 99.9% confidence interval from the bootstrapped results to determine significance, thereby controlling the Type I error inflation due to the large number of parameters being estimated. In reporting the results, it is important to note that we do not discuss the individual effects because of the large number of combinations of predictor, mediator, and outcome variables (i.e., total of 2,880 indirect effects). Extracting any clear pattern from this pool of results is not possible, which is why our research question focused on a general or macrolevel pattern of intermediary effects (e.g., what proportion of indirect effects are significant).

To address our secondary research question, we computed Pearson chi-square tests for independence and examined the standardized residuals (Agresti, 2007) to determine if there were differences in the patterns within or across (a) disability groups, (b) self-determination constructs, and (c) postschool outcomes. Essentially, this test assesses the extent to which some of the groups are accounting for an unusually large, or small, number of the significant indirect effects as opposed to the null hypothesis of a uniform distribution of significant indirect effects across groups. The chi-square test assesses only an omnibus hypothesis, however, so follow-up tests examining the within-cell residuals (i.e., the standardized differences between the observed cell counts and those expected

under the null hypothesis) were conducted to isolate the individual disability groups, self-determination constructs, and postschool outcomes that were most influential in the macropatterns of indirect effects. Such analysis provide direction for areas of focus for future microlevel analyses exploring specific relationships between a given predictor, self-determination construct, and outcome.

Results

The measurement model was the strong invariance model that included the constraints imposed by Shogren and Garnier Villarreal (2015) and Shogren, Shaw, et al. (in press). This measurement model exhibited acceptable model fit, $\chi^2(17566) = 53279.617$, RMSEA = 0.048, 90% CI for RMSEA = [0.048, 0.049], SRMR = 0.079, CFI = 0.674, NNFI = 0.630, per the RMSEA and SRMR. No residual correlations were included to improve the model. Factor loadings indicate high reliability of the constructs across the six groups, where the standardized factor loading had a mean of 0.60, standard deviation of 0.19, and median of 0.62. Space precludes presentation of full details of the factor loadings and correlations or a path diagram; please can contact the authors for additional technical information.

As mentioned previously, the models were highly complex, and the total number of estimated parameters (i.e., indirect and total effects) was 5,760 (576 for each outcome). Of these 5,760 composed parameters, 3,527 (61.2%) were statistically significant. When looking specifically at the indirect effects (i.e., the aggregated effect of the predictors on the outcomes through the mediator), we found there were 2,880 indirect effects estimated across the models, with 1,543 (53.6%) demonstrating statistical significance even with the conservative alpha level (99.9% confidence interval; alpha level of .001) employed. This suggests a significant role of autonomy, self-realization, and psychology empowerment in shaping the relationship between school-based factors and postschool outcomes, supporting our hypothesis that

Table 3. Summary of Significant Indirect Effects by Disability Group.

| Disability group | Number of significant indirect effects | Standardized residuals | Different from expected? |
|-----------------------------|--|------------------------|--------------------------|
| Cognitive disabilities | 319 | 4.22 | Yes |
| High-incidence disabilities | 288 | 2.11 | Yes |
| Intellectual disability | 223 | -2.33 | Yes |
| Orthopedic impairments | 235 | -1.51 | No |
| Sensory disabilities | 302 | 3.06 | Yes |
| Traumatic brain injury | 176 | -5.54 | Yes |

Note. Standardized residuals greater than 2 (or -2) represent that more (or fewer) significant indirect effects exist than expected by chance.

self-determination is a statistically important intermediary factor that helps explain the relation between school-based factors and post-school outcomes for students with disabilities. The large proportion of significant indirect effects suggests that accounting for students' levels of autonomy, psychological empowerment, and self-realization allows for a better representation of the postschool transition process and that self-determination status when exiting school is central to this process.

Next, we examined if the pattern of indirect effects differed across disability groups, across specific school-based factors, or across post-school outcomes. Tables 3, 4, and 5 provide a count of the number of significant indirect effects broken down by disability group, self-determination constructs, and postschool outcomes, respectively. The omnibus tests for independence (i.e., Pearson chi-square tests) suggested significantly different proportions of significant indirect effects across disability groups, $\chi^2 = 58.45$, $df = 5$, $p < .001$; and self-determination constructs, $\chi^2 = 12.88$, $df = 2$, $p = .002$; but not across outcome measures, $\chi^2 = 16.475$, $df = 9$, $p = .058$). Thus, within the disability groups and self-determination constructs, there were different findings for the different constructs, and follow-up tests were conducted. For the outcome constructs, there were no differences across constructs, suggesting the same pattern of indirect effects for each of the outcome constructs. As shown in Table 3, follow-up tests for the disability groups indicated that there were statistically more significant indirect effects in the high-incidence,

cognitive, and sensory disability groups than expected by chance (standardized residuals >2), confirming that self-determination plays a significant intermediary role within these groups. There were, however, significantly fewer indirect effects in the intellectual disability and traumatic brain injury groups than expected by chance (standardized residuals <-2). When exploring follow-up tests for the self-determination constructs (see Table 4), the standardized residuals indicated that there were significantly more significant indirect effects involving psychological empowerment than expected by chance (standardized residuals >2) but significantly fewer involving self-realization (standardized residuals <-2), suggesting that psychological empowerment, and to a lesser degree, autonomy, provided significant explanatory power in understanding the relationship between school-based factors and outcomes.

Discussion

Overall, the findings of the present analyses suggest that autonomy, psychological empowerment, and self-realization (three of the four essential characteristics of self-determination) play a large and significant role in mediating the relationship between school-based student, family, and school factors (e.g., student skills, family involvement and expectations, and access and inclusion) and postschool outcomes (i.e., social relationships, access to services, financial supports, employment, advocacy). This provides support for the theoretical assertion in the field, that the

Table 4. Summary of Significant Indirect Effects by Self-Determination Construct.

| Self-determination construct | Number of significant indirect effects | Standardized residuals | Different from expected? |
|------------------------------|--|------------------------|--------------------------|
| Autonomy | 499 | -0.83 | No |
| Psychological empowerment | 578 | 3.44 | Yes |
| Self-realization | 466 | -2.61 | Yes |

Note. Standardized residuals greater than 2 (or -2) represent that more (or fewer) significant indirect effects exist than expected by chance.

relationship between self-determination instruction and student characteristics and secondary educational experiences (e.g., student skill development, instructional arrangements, access to inclusive opportunities, and expectations) affects postschool outcomes through the enhancement of autonomy, psychological empowerment, and self-realization (Shogren, 2013b). These findings also build on previous work that has examined these relationships in a piecemeal fashion by testing the relationship between school factors and self-determination (Carter et al., 2006; Lee et al., 2008; Shogren et al., 2007), self-determination and outcomes (Shogren et al., 2015; Wehmeyer & Schwartz, 1997), and school factors and outcomes (Test, Mazzotti, et al., 2009). Overall, the findings suggest the importance of ongoing research examining effective strategies to promote self-determination as both an outcome of transition services and supports as well as a means of enhancing postschool outcomes.

Promoting self-determination may further enhance the effect of other school-based factors, such as inclusive opportunities, promoting access to the general education curriculum, enhancing student social skills, and promoting family expectations on outcomes.

The finding that over 50% of the indirect effects (i.e., the aggregated effect of the school-based factors on the postschool outcomes

through the self-determination constructs) were significant, particularly when considering the range of school-based factors (e.g., student functional skills, parent involvement, inclusion, vocational experiences) and outcome domains (i.e., social relationships, financial independence, employment) included in the models, shows the diffuse impact of self-determination on outcomes as well as the diverse opportunities to structure school-based supports and services to affect student self-determination. This suggests, as other researchers have asserted (Shogren, 2013b; Wehmeyer et al., 2012), that targeted efforts to promote self-determination are important but that creating opportunities throughout the environments where students live, learn, work, and play is crucial to enhancing self-determination. The results suggest that promoting self-determination may further enhance the effect of other school-based factors, such as inclusive opportunities, promoting access to the general education curriculum, enhancing student social skills, and promoting family expectations on outcomes, given the mediational role of self-determination. Specifically, for constructs like inclusion or student social and communication skills, which are often thought of as direct predictors of outcomes, there may be a mediating role of self-determination, perhaps with students who are able to act in a self-determined way better able to take advantage of opportunities, supports, and set goals related to these areas, thus experiencing enhanced outcomes (Carter et al., 2006; Carter, Owens, Trainor, Sun, & Swedeen, 2009). Future research is needed to explore these potential microlevel patterns of relationships.

Table 5. Summary of Significant Indirect Effects by Postschool Outcome Measure.

| Outcome measure | Number of significant indirect effects | Standardized residuals |
|-------------------------|--|------------------------|
| Financial independence | 146 | -0.70 |
| Financial support | 171 | 1.42 |
| Employment | 150 | -0.36 |
| Social relationships | 172 | 1.50 |
| Emotional well-being | 171 | 1.42 |
| Health | 154 | -0.03 |
| Independent living | 138 | -1.38 |
| Access to services | 172 | 1.50 |
| Postsecondary education | 145 | -0.79 |
| Advocacy | 124 | -2.57 |

Note. Standardized residuals greater than 2 (or -2) represent that more (or fewer) significant indirect effects exist than expected by chance.

The pattern of indirect effects through self-determination varies, however, based on the disability group and the self-determination construct. The focus of the present analyses was at the macrolevel, and more specific analyses are needed within the disability groups and predictor constructs to further refine our understanding of these differences to determine microlevel patterns and influences. However, the findings suggest that there were significantly more positive indirect effects than expected by chance in the cognitive disability, high-incidence disability, and sensory disability groups. This suggests the strong mediating role of autonomy, psychological empowerment, and self-realization in these three groups. It also highlights the need to focus on understanding ways to promote self-determination through school-based interventions and structures to enhance adult outcomes, particularly for those with sensory disabilities and cognitive disabilities (i.e., autism spectrum disorder, multiple disabilities, deaf-blindness; Agran, Hong, & Blankenship, 2007; Wehmeyer, Shogren, Zager, Smith, & Simpson, 2010), where research has not been as robust as for those with learning disabilities (Carter et al., 2006; Wehmeyer, Palmer, Shogren, Williams-Diehm, & Soukup, 2013). Fewer than the expected number of relationships were found in the intellectual disability and traumatic brain injury groups, but there were still large numbers of significant indirect effects, with 223

significant effects in the intellectual disability group and 176 in the traumatic brain injury group. This may have resulted from more limited sample sizes in these groups (as they were not collapsed with other disability groups) as well as more restricted postschool outcomes that these populations experienced, compared to other disability groups (see Shogren, Shaw, et al., in press), restricting the possibility for indirect effects. Overall, however, the difference in the number of indirect effects suggests that different processes may be occurring within disability groups and that multiple factors likely shape the self-determination status and postschool outcomes of youth and young adults with disabilities, indicating a need for further research and development of practice-based implications (Mazzotti, Rowe, Cameto, Test, & Morningstar, 2013).

Additionally, the findings suggest that psychological empowerment, across disability groups, plays a central role in explaining the relationship between school-based factors and adult outcomes. Specifically, psychological empowerment had significantly more indirect effects than expected by chance, unlike autonomy, which did not differ from expectations, and self-realization, which had slightly fewer significant indirect effects than expected by chance. This highlights the importance of emphasizing the development of psychological empowerment while students are in school as postulated by other researchers (Powers et al.,

2001; Saaltink, MacKinnon, Owen, & Tardif-Williams, 2012). It also suggests the need for future research exploring ways that interventions targeting specific aspects of self-determination, such as psychological empowerment, can lead to enhanced outcomes.

Limitations

Secondary data analysis is constrained by the data available, and the degree to which it aligns with the research questions. NLTS2 was designed to primarily include individual survey items rather than validated scales that can be used to define latent constructs. Thus, our work focused on identifying latent constructs through examining individual survey items, post hoc, to determine the degree to which the individual survey items can be used to define latent constructs. This restricts the constructs, as well as the quality of the models, as additional error can be introduced into the models because some of the items and constructs may have lower correlations than if validated scales were used to measure a latent construct (Taylor, 2008). Thus, a major limitation of the present analysis is that the latent constructs were generated post hoc from individual items, not validated surveys. Although previous research has found these construct to be reliable (see Shogren & Garnier Villarreal, 2015; Shogren, Shaw, et al., in press), there are limitations in fully interpreting the pattern of relationships. Further, our focus was on macrolevel relationships rather than exploring specific patterns or microlevel relationships between specific predictor or outcome constructs. Overall, at the macrolevel, the findings provide important implications for research and practice and suggest that future research should consider the possibilities of setting up longitudinal data collection systems that include validated scales as well as more fine-grained analyses of specific school-based factors and outcome constructs.

Implications for Future Research

Further research and data collection is needed to move beyond the macrolevel of the present

analyses and to examine the pattern of relationships within specific disability groups and the specific relationships between predictors and outcomes that are most strongly mediated by self-determination constructs, given the limited work that has explored mediational effects. Such work could further inform the structure of school-based interventions to support self-determination directly and indirectly through supports provided in school, to families, and in light of students' personal characteristics. A wide array of research questions could be addressed related to school-based factors. For example, research could examine the degree to which students' psychological empowerment mediates the relationship between efforts to enhance social and communication skills in school and postschool social relationships or employment outcomes. Research could also examine the degree to which student autonomy affects family involvement while students and in school and the direct and indirect effects on postschool advocacy and independent living outcomes. Such analyses could provide direction for targeted intervention and support development.

Further work is also needed to address the complexity of analyses needed to examine the social-ecological perspective of self-determination, which assumes that multiple factors, across ecological systems, interact to influence the experiences and outcomes of youth with disabilities (Shogren, 2013b; Walker et al., 2011). For example, the interactive effects of school-based factors, such as student functional skills, home independence, and vocational experiences, on postschool outcomes and students' self-determination need to be examined. Further, the interactive nature of postschool outcomes must be examined; for example, are students who have more positive employment outcomes more likely to have better financial and independent living outcomes, and is this influenced by self-determination status? When looking across student, family, and school predictors and multiple outcome domains, the complexity of the analyses is increased, and to explore the mediational relationships of

self-determination constructs, there is a need to estimate and interpret multiple paths. Developing research designs that allow for these complex analyses will enhance our understanding of the mediational role of self-determination and other constructs.

Further research is also needed to examine the role of self-determination for those with severe disabilities. As mentioned previously, 17% of the NLTS2 sample did not provide data during the direct assessment as those students were deemed unable to reliably respond to Likert-type questions. This does not, however, suggest that self-determination is not important for these groups; instead it suggests that we do not have adequate measurement technologies (Shogren, Wehmeyer, et al., in press). Further work is needed to develop strategies to assess self-determination in this population and determine if it plays the same mediational role. Additionally, racial and ethnic differences have been found to affect mean levels of autonomy, psychological empowerment, and self-realization in other studies with the NLTS2 data (Shogren, Kennedy, Dowsett, Garnier Villarreal, & Little, 2014); however, because of the complexity of the models in the present analyses, we were not able to explore potential racial and ethnic differences in the mediational relationships. Further work is needed in this area, particularly given the acknowledged role of cultural values and beliefs in the expression of self-determined behavior and valued post-school outcomes (Leake & Boone, 2007; Trainor, 2008).

Implications for Practice

The results of this study, although focused at the macrolevel, provide important directions for practice. The results confirm the importance of self-determination, particularly of psychological empowerment and autonomy in mediating the relationship between school-based factors and postschool outcomes. The range of school-based factors included in the analyses suggested that there is a need to link the use of effective interventions to promote self-determination with

environmental arrangements (e.g., inclusion, access to the general education curriculum, social networks) and with supports for students to enhance personal characteristics (e.g., social and communication skills, functional skills, self-concept) as well as supports for family members with a particular focus on raising expectations and educating families about possibilities for postschool outcomes (Test, Mazzotti, et al., 2009). The results highlight that across diverse adult outcome domains, three of the four essential characteristics of self-determination play a central role of carrying the effect of school-based interventions and supports and services. This both justifies the emphasis placed on self-determination in research and policy and highlights the ongoing need to support the implementation of evidence-based strategies to promote self-determination in schools and classrooms as a component of transition supports and services (Mazzotti et al., 2013; Shogren, 2013a; Test, Fowler, et al., 2009).

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