Running Head: NLTS2 OUTCOMES

Measuring the Early Adulthood Outcomes of Young Adults with Disabilities: Developing Constructs using NLTS2 Data

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Abstract

Secondary data analysis was used to develop and examine disability-related differences in outcome constructs from the National Longitudinal Transition Study-2 (NLTS2). Findings suggest that outcome constructs could be created that represented key elements of quality of life domains including social relationships, financial independence, financial supports, employment, emotional well-being, postsecondary education, independent living, health status, access to services, and advocating for needs. The constructs could be measured equivalently across disability groups, but young adults with high incidence disabilities, generally, experienced more positive outcomes than those with more severe disabilities, despite the finding that those with more severe disabilities have greater access to services and financial supports. Implications for future research and practice are discussed.

Measuring the Early Adulthood Outcomes of Young Adults with Disabilities: Developing Constructs using NLTS2 Data

Measuring the outcomes achieved by young adults with disabilities as they transition from the school system to the adult world is important for multiple reasons, most notably that it creates opportunities for the systematic examination of the impact of contextual factors on outcomes (Shogren, Luckasson, & Schalock, 2014). Researchers have identified the need to better understand the impact of personal (e.g., disability label, self-determination status when exiting high school) and environmental (e.g., transition services and supports) factors on outcomes so that the impact of these factors can be considered in building systems of support (Schalock et al., 2010; Shogren, 2013; Shogren et al., 2014). Further, such analyses can assist in documenting evidence-based practices that promote the transition from school to adult life, which recent reviews of the literature have suggested are lacking (Cobb et al., 2013). Additionally, researchers interested in the developmental stages of adulthood (e.g., early adulthood, middle adulthood, and late adulthood) have suggested the importance of early adulthood experiences for shaping experiences later in life (Settersten, Furstenberg, & Rumbaut, 2005), and a need for more explicit analysis of the experiences of young adults with disabilities.

However, representative data on early adult outcomes for people with disabilities, particularly data that can be directly linked to information on personal and environmental factors is not readily accessible. Several national surveys given insight into experiences in key adult outcome domains such as employment (Kessler Foundation/National Organization on Disability, 2010) and community living (Braddock et al., 2013), but such data are often aggregated and do not allow for analyses of personal and environmental factors that impact outcomes.

In the disability field, researchers are increasingly turning to constructs like quality of life to define valued outcomes. Schalock and colleagues (Schalock, Bonham, & Verdugo, 2008; Schalock et al., 2005) have established eight domains of quality of life (emotional well-being, interpersonal relations, material well-being, personal development, physical well-being, self-determination, social inclusion, and rights) and indicators that have cross-cultural validity. The quality of life construct and its eight domains have had significant influence over how outcomes are defined and measured, particularly within the intellectual and developmental disability service system (Schalock, Gardner, & Bradley, 2007). For example, projects like the National Core Indicators (Bradley & Moseley, 2007) survey adults with intellectual and developmental disability to provide information on self-reported quality of life outcomes. However, measurement of quality of life has primarily occurred with adults and has not been explicitly linked with data on school-based experiences. Further research is needed, across disability populations, to compare outcomes in early adulthood as well as to example the impact of contextual factors on quality of life.

The National Longitudinal Transition Study-2 (NLTS2) was funded by the U.S. Department of Education to collect longitudinal data from 2000 to 2010 on the secondary and postschool experiences of a nationally representative cohort of students with disabilities. NLTS2 was designed to be a companion study to the original National Longitudinal Transition Study (NLTS) conducted from 1985 to 1990. NLTS was a seminal study that first documented, in a nationally representative sample, the poor early adulthood outcomes of youth with disabilities across multiple domains (Blackorby & Wagner, 1996). NLTS2 was designed to update data from NLTS on the early adult outcomes of youth with disabilities and to explore the impact of school-based transition services that were authorized in the 1997 Amendments to the Individuals with Disabilities Education Act (IDEA). NLTS2 was structured to generate a representative sample of each of the 12 federally recognized disability classifications under IDEA at the secondary level (autism, deaf-blindness, emotional disturbances, hearing impairments, intellectual disability, learning disabilities, multiple disabilities, orthopedic impairments, other health impairments, speech or language impairments, traumatic brain injury, visual impairment), creating an opportunity for comparisons across students with diverse disability classifications.

NLTS2 data collection, like many national surveys of its kind, was primarily comprised of individual survey items rather than scales with established reliability and validity. For example, no established scales were used to measure quality of life although a number of individual survey items and sections were included that could, conceptually, be linked with quality of life domains. Specifically, during the last waves of data collection, when the sample had largely moved from school-based services and supports to the adult world, a number of questions related to early adult outcomes were asked of parents and young adults with disabilities, including questions about housing (e.g., type of residential arrangement), education (e.g., participation and progress in postsecondary education), employment (e.g., duration of employment, access to benefits and promotion opportunities), health (e.g., general health, engagement in risky health behaviors) and recreation/leisure (e.g., participation in hobbies and social activities). Questions were also included about formal and informal supports and services received, requested, or needed.

Researchers interested in exploring early adult outcomes using NLTS2 data can either look at single items (e.g., employment or not employed) as outcome variables, or engage in a systematic process to identify individual items that are conceptually-related and build latent constructs from these conceptually related items. As we have suggested in other work (Shogren, Wehmeyer, Palmer, Rifenbark, & Little, in press), from a research perspective, generating latent constructs allows us to move beyond simple yes/no indicators (e.g., are you employed or not employed) to defining more complex representations of outcomes that address the multi-faceted ways that quality of life dimensions are defined (e.g., are you employed, are you satisfied with your job, do you have access to benefits and opportunities for advancement at your job). Defining constructs in this manner also creates opportunities, in practice, to better understand and target the most robust elements of key outcome domains (i.e., key features of meaningful employment outcomes), as well as more systematically examine the impact of interventions on these multi-faceted outcome domains.

Building latent outcome constructs involves identifying conceptually-related individual survey items using a strong theoretical basis, and investigating measurement properties using analytical approaches, such as structural equation modeling (Little, 2013). Structural equation modeling allows for the integration of measurement models, which specify the relationships among latent and observed variables, with structural models, which specify the relationship between latent factors. Previous work with NLTS2 data has suggested that latent constructs reflecting key school-based predictors of post-school outcomes can be created using this approach (Shogren & Garnier Villarreal, in press).

The purpose of the present study, therefore, was to explore whether individual survey items from NLTS2 reflective of early adult outcomes could be used to create latent outcome constructs representative of the eight broad quality of life domains defined by Schalock and colleagues (2005) - emotional well-being, interpersonal relations, material well-being, personal development, physical well-being, self-determination, social inclusion, and rights. Further, if such constructs could be created, we were interested in exploring the impact of disability label on the measurement of these constructs (e.g., can the constructs be measured in the same way across groups). We hypothesized that measurement equivalence could be established, but we also hypothesized there would be differences in the latent means, variances, and correlations associated with disability label, with young adults with disabilities with less significant support needs (i.e., those with high incidence disabilities) scoring more adaptively than those with more significant support needs (i.e., intellectual and developmental disabilities). We had three specific research questions.

1. Can latent adult outcome constructs representative of the eight domains of quality of life be generated from NLTS2 data?
2. Can the latent outcome constructs be measured equivalently across disability groups?
3. Are there differences in the latent means, variances, and correlations across disability groups?

Methods

Sample

As mentioned previously, the National Longitudinal Transition Study-2 (NLTS2) was funded by the U.S. Department of Education to be a companion study to the original NLTS. SRI International was contracted to conduct NLTS and NLTS2. NLTS2 data was collected over a 10 year period (2000-2010) in five waves (each wave equals a two year period of data collection). The NLTS2 sampling plan was designed to generalize to the population of students receiving special education services in the United States in each of the 12 federally recognized disability classifications at the secondary level. A two-stage sampling process was used. First, a stratified (geographic region, size, community wealth) random sample of districts serving students aged 13-16 were selected from the universe of districts. Approximately 500 local education agencies (LEAs) ultimately contributed students to NLTS2. In the second stage, students were selected from each LEA. The appropriate number of students to be sampled from each LEA within each disability category was calculated based on the size of the district and the number of students with disabilities. Students were randomly selected within each LEA until a sufficient sample was reached (with the exception of the categories of traumatic brain injury and deaf-blindness where all available students in a LEA were sampled because of the low incidence of these conditions). Approximately 1,250 students per disability category were sampled in Wave 1, which was projected to lead to a sufficient sample in Wave 5 of data collection (SRI International, 2000).

As our focus in the present analyses was developing adult outcome constructs, we restricted data to that collected during Wave 5 of NLTS2 (years 8-10 of the overall project) as this data was collected when members of the sample were in early adulthood (age ranges 23-26). Further, the present analyses are part of a larger project to build social-ecological models of contextual factors that impact the essential characteristics of self-determination measured in NLTS2 and post-school outcomes (see Shogren & Garnier Villarreal, in press; Shogren, Kennedy, Dowsett, & Little, 2013, for more information). As part of the overall project, the NLTS2 data used for the present analyses was confined to those students for whom self-determination data was available. This subset of students represented those who were able to participate in the NLTS2 Direct Student Assessment (SRI International, 2000). The criteria for participation included that the student: (a) had a consistent response mode, (b) was able to work with a stranger, and (c) was able to complete the first item of the Direct Assessment battery (Wagner, Newman, Cameto, & Levine, 2006). Thus, the finding are only generalizable those that were able to participate in a direct testing situation. This represented approximately 83% of the overall NLTS2 student sample.

Procedure

A systematic process was followed to identify NLTS2 items collected during Wave 5 that were conceptually associated with quality of life domains. First the research team reviewed operational definitions of the eight quality of life domains and indicators identified by Schalock and colleagues (Schalock, 2000; Schalock et al., 2002; Schalock et al., 2007; Schalock et al., 2005). Next, each survey items from NLTS2 Wave 5 data was reviewed to determine its fit within any of the quality of life domains. Specifically, using data dictionaries for the two NLTS2 data collection instruments used during Wave 5 data collection (Parent/Youth Interview) each NLTS2 variable described in the NLTS2 data dictionaries was independently reviewed by two members of the research team and linked with the most relevant quality of life domain. Essentially, the quality of life domains were used as a general organizing framework and NLTS2 items classified within the most relevant domain. After initial classifications were made, the entire research team reviewed the classification of each of the items and any disagreements were resolved. Because of the number of relevant NLTS2 items, subdomains were created within each quality of life domain to further organize the NLTS2 items to facilitate empirical analysis. A total of 26 subdomains across the 8 constructs were identified, with each construct having between one and five subdomains (see Table 1). Finally, the selected NLTS2 variables were reviewed with two researchers associated with NLTS2 design, data collection, and management and modifications made based on their recommendations.

Across the 8 quality of life domains, 26 subdomains with 151 relevant NLTS2 variables were identified. Each subdomain had between 1 and 15 indicators. The list of quality of life subdomains are provided in Table 1. Table 1 also indicates the number of NLTS2 items associated with each subdomain and a general description of the content of the associated NLTS2 items. Further information and examples of the Parent and Youth Interview can be found at http://www.nlts2.org/studymeth/#data_collection. The 8 constructs and their subdomains were then subjected to empirical analysis, as described below.

Data Analysis

As mentioned previously, this study is part of a larger project to build social-ecological models of contextual factors that impact essential characteristics of self-determination and post-school outcomes for young adults with disabilities. The present analysis of adult outcome constructs was part of this larger model development process. For this reason, we also included three self-determination constructs (autonomy, self-realization, psychological empowerment) established in previous research (Shogren et al., 2013) during model development, given that the models developed here will be used in future work to examine the degree to which these self-determination constructs predict adult outcomes. The self-determination constructs were used as "placeholders" to allow for these future research activities, but were not pertinent to the present analyses.

The primary analytic framework used for model development was multiple-group confirmatory factor analysis based on the Means and Covariance Structures (MACS) model (Little, 1997). MACS models allow systematic analysis of the measurement properties of the adult outcome constructs. MACS modeling is used to test measurement invariance (i.e., are the same constructs are being measured across groups). Establishing that the same items (i.e., NLTS2 variables) can be used to define the construct in diverse groups is an essential condition for group comparisons (Little, 1997). Because of the number of constructs and disability groups represented in the NLTS2 data set, we used previous work (Shogren et al., 2013) to create the disability groups for invariance testing. Specifically, Shogren et al. (2013), in an analysis of the self-determination data from the NLTS2 Direct Assessment, empirically the examined the degree that the 12 disability groups represented in the NLTS2 data could be collapsed into a smaller number of groups based on similarities in latent means and variances for the essential characteristics of self-determination measured in NLTS2. A set of conceptual groupings of the 12 disability classifications were tested, and the groupings that were empirically supported included high incidence disabilities (HIN; learning disabilities, emotional disturbances, speech or language impairments, and other health impairments), sensory disabilities (SEN; visual and hearing impairments), and cognitive disabilities (COG; autism, multiple disabilities and deaf-blindness). Students with intellectual disability (INT), traumatic brain injury (TBI), and orthopedic impairments (ORT) could not be collapsed with any other group. In establishing these groups, multiple conceptual models were empirically examined to determine the groups that showed the most similar latent means and variances. For example, we tested if students with deaf-blindness fit with the sensory disability group or if students with intellectual disability fit with the cognitive disability or the high incidence disability group. Ultimately, the six grouping utilized in the present analysis showed the best fit to the data and these six groups were used in the MACS analyses described in the following sections for the development of the outcome constructs. Mplus 7.1 was used for all analyses (Muthén & Muthén, 1998-2010) with the "type=complex" option and the "wt_na" sampling weight, stratum, and cluster variables for the complex sampling design.

Research Question 1. After establishing the conceptual framework (i.e., the NLTS2 items conceptually associated with each quality of life domains and sub-domain), the conceptual construct subdomains were tested for their empirical viability (i.e., do the identified NLTS2 items for each sub-domain have shared variance). First, all NLTS2 items were screened to ensure their viability as indicators in the models, and some construct subdomains were adjusted and changed based on the screening. Next, each of the quality of life domains (*n* = 8) and subdomains (*n* = 26) was subjected to confirmatory factor analysis (CFA) of the covariance structures and no cross-group constraints. Individual CFAs were used so that issues within each construct subdomain could be identified and whether or not the data justified the creation of a latent construct subdomain could be examined. In order to reduce the number of indicators in the model yet retain information, parcels were created and tested as part of the process when there were more than 6 indicators for a construct (Little, Rhemtulla, Gibson, & Schoemann, 2013).

The individual CFA models were evaluated for acceptable fit. Three different indices were evaluated: a root mean square error of approximation (RMSEA) < 0.05, a comparative fit index (CFI) > 0.90 and a non-normed fit index (NNFI) > 0.90. Chi-square was not used because of its known sensitivity to the number of parameters being estimated (Little, 2013). After testing each construct individually, and determining if the construct was viable (several were not, as described subsequently), the constructs that demonstrated good fit were added one by one to an overall model. Acceptable fit index values for the model with all of the constructs was RMSEA < 0.05 with an upper bound on the 90% confidence interval < 0.08. It was not expected that the CFI and NNFI values would be > 0.90 based on fit indices from similar analyses of NLTS2 data (Shogren & Garnier Villarreal, in press). During this process, because a number of NLTS2 variables did not show significant loadings on constructs or failed to hang together to form a construct, the eight quality of life constructs and their 26 subdomains were significantly reduced and modified as described in the Results section.

Research Question 2. After empirically determining which conceptual constructs were (and were not) supported, we then examined measurement invariance of the empirically supported constructs across the six disability groups in an overall model. Measurement invariance was tested in three steps. First the configural model was specified, with all constructs that were empirically supported (Research Question 1). Next, the factor loadings were equated for the test of weak invariance. Finally, intercepts were equated for the test of strong invariance. A change in CFI of less than 0.01 was used as the cut-off value for establishing invariance. The rationale for a cut-off value of less than 0.01 was twofold. First, this level had been established in previous research with the NLTS2 data involving multiple groups (Shogren & Garnier Villarreal, in press) and second it is congruent with established criteria in the field for standard two group comparisons (Cheung & Rensvold, 2002; Little, 2013).

If invariance was not supported (e.g., if there were changes in CFI > 0.01), further comparisons were made to determine the non-invariant elements of the model. Specifically, the factor loadings or intercepts were equated in pairs across the six groups and compared to the configural model. χ^2 difference testing was used to identify the estimates that could and could not be equated across groups. Those that could not be equated were freed (i.e., constraints were removed) in a partially invariant model.

Research Question 3. After examining invariance at the measurement level, we shifted to examining structural models to explore similarities and differences in the latent means, variances, and correlations of the constructs across the disability groups (Little, 1997). To explore the pattern of relationships in the constructs within and across disability groups, we performed a series of two-group contrasts using a χ^2 model comparison between nested models (Little, 2013). The focus was to identify differences in the latent means, variances and correlations across disability groups. All nested model comparisons were planned against the strong model. In order to reduce the potential of Type I errors due the large number of models tested during this stage of the analysis (390 comparisons for means and variances), a cut-off of $p < .005$ was set a priori.

Results

Model Development (Research Question 1)

The initial goal was to develop a higher-order model for each quality of life domain, with the subdomain identified in Table 1 as lower-order factors. Initial screening led to several constructs being re-conceptualized, primarily because of issues with low sample size and limited variability in the NLTS2 items (e.g., limited number of young adults participating in high risk behaviors) in one of the six disability groups. Additional items did not have sufficient coverage when combined with other items, so models could not converge to generate estimates. Fit indices and standardized factor loadings were evaluated at each step to determine the viability of each construct and determine the revisions that were needed.

Ultimately, extensive screening of the 26 potential quality of life subdomains (see Table 1) led to 11 sub-domains that were identified as viable for further analyses. These significant changes to the conceptual model are congruent with other work generating latent constructs from NLTS2 data (Shogren & Garnier Villarreal, in press). Because of the significant reduction of the number of constructs, we focused the analyses at the subdomain level, rather than trying to build higher-order quality of life constructs. In fact, most quality of life constructs only had one or two viable subdomains or items, rendering it impossible to talk about higher-order constructs. In fact to retain coverage of the eight quality of life domains in the final model, several single indicator constructs were included (i.e., access to services, health status, housing, and advocating for needs) in the final model. Overall, eleven constructs had empirical support including: social relationships; financial supports, self-perceptions of emotional well-being (from this point forward emotional well-being), access to services, health status, postsecondary education, financial independence, employment, housing, advocating for needs, and risky behaviors. These eleven constructs were then entered one by one into an overall model. Despite each construct demonstrating good fit in an individual CFA, the risky behavior construct could not be retained in the overall model as the model with these items would not converge. Thus, the final adult outcome construct model included 10 constructs, which are further described in Table 2. The results of this step suggest that empirically supported constructs representative of adult outcomes linked to quality of life domains can be generated from NLTS2 data, but that these constructs do not capture the full range of indicators of quality of life identified in the literature, as several subdomains had to be dropped from analysis. They do, however, provide an opportunity to explore nationally representative data across disability groups on elements of the quality of life constructs that could be defined and measured.

Measurement Invariance (Research Question 2)

After establishing the 10 adult outcome constructs that could be defined and measured, the next step was to determine if the constructs could be measured equivalently for each of the six disability groups. The overall (configural) model identified in Research Question 1 with 10 adult outcome constructs demonstrated good fit to the data ($\chi^2_{(7254, n=2930)} = 5949.229$, RMSEA = $0.035_{(0.033, 0.036}$, NNFI = 0.757, CFI = 0.801). When equating the factor loadings across the six disability groups, as shown in Table 3, the change in CFI between the configural model and loading invariance model was well below the threshold of 0.01, indicating that the factor loadings could be equated across disability groups. However, when the intercepts were equated across the six groups the model fit statistics indicated invariance was not supported. Further testing was undertaken to determine which intercepts needed to be freed. Testing indicated that financial independence, financial support, and social relationships constructs each had one indicator that could not be equated across all six groups. Testing indicated that the intercepts had to be freed for one indicator in financial independence, financial support, and social relationships constructs. Despite having to free these parameters, the findings suggest that, overall, the same constructs can be measured, in the same way across groups (Lee, Little, & Preacher, 2011).

Mean, Variance and Correlation Differences (Research Question 3)

After establishing measurement invariance (partial at the intercept level), we moved on to examine differences in the latent means, variances, and correlations using two-group contrasts as described in the Method section. Specifically, we used nested model comparisons with the partial intercept invariance model used as the comparative model. Because of the large number of comparisons, we are unable to present the results of all tests in tabular format, and instead highlight the significant differences in the latent means, variances, and correlations in Tables 4-6. As shown in Table 4, the high incidence disability group tended to score more adaptively than other groups in outcomes related to financial independence, employment, emotional well-being, and independent living. However, this group tended to score lower on financial supports, advocating for needs, and access to services. So, despite less access to supports and less need to advocate than people with intellectual and developmental disabilities (e.g., intellectual disability, cognitive disabilities, sensory disabilities, orthopedic impairments) young adults with high incidence disabilities still reported more positive adult outcomes. Post-secondary education was the only construct where students with high incidence disabilities scored lower than students with sensory disabilities, although the effect size was relatively small (Cohen's $D = 0.18$).

Significant latent variance differences were found (see Table 5). The differences are represented as a ratio of two group variances (Variance Group 2 / Variance Group 1). Latent variance differences indicate the degree of variability within a disability group, and when examining the significant findings in Table 5, the cognitive disability group, followed by the high incidence group, had the most differences in their latent variances, and students with traumatic brain injury had the least latent differences. These findings suggest that even within disability classification there remains significant variability in outcomes that are not accounted for by classification alone. Other contextual factors are influencing outcomes.

In terms of the correlational differences, there were a limited number of significant differences across groups. As shown in Table 6, the differences found suggest that disability moderates the relationship between outcome constructs in specific ways. For example, students with high incidence disabilities tended to have significantly stronger relationships between financial constructs and outcomes related to employment and emotional well-being than students with other disability labels, perhaps because they tend to score more adaptively in these areas.

Discussion

This paper used NLTS2 data to attempt to define early adult outcome constructs linked to quality of life domains (Schalock, 2000; Schalock et al., 2002; Schalock et al., 2007; Schalock et al., 2005) in a nationally representative sample of students with diverse disability classifications transitioning from school-based services and supports to the adult world. The findings suggest that outcome constructs can be defined, but that there are significant limitations in the breadth and depth of these constructs and the degree to which they are representative of quality of life domains as defined in the literature. However, for the constructs that can be reliability defined and measured across disability groups there are clear patterns of differences based on disability classification with students with intellectual and developmental disabilities experiencing less positive outcomes and showing less strong patterns of relationships across outcome domains. The implications of these findings will be further described in the following sections.

Defining Outcome Constructs

A necessary first step in examining the early adult outcomes of young adults with disabilities is determining the best ways to measure these outcomes, particularly when engaging in secondary data analysis using available data collection through national surveys, like NLTS2. As described in the *Introduction*, NLTS2 provides a unique opportunity to examine (a) early adulthood outcomes (b) across multiple domains, (c) across multiple disability groups, and (d) with the possibility of linking adult outcomes to previous school-based services and supports because of the longitudinal data collection.

However, a limitation of NLTS2 further described in the *Limitations* section is the lack of use of valid and reliable scales for measuring outcomes. Despite the lack of formal assessment tools, when conceptually reviewing the NLTS2 items, a number of individual items related to quality of life domains were available. Given the emphasis on the quality of life construct as an organizing framework for evaluating outcomes in the intellectual and developmental disability field we decided to engage in a systematic process to test if we could (a) identify conceptual groupings of items that related to the operational definitions of quality of life domains (Schalock, 2000; Schalock et al., 2002; Schalock et al., 2007; Schalock et al., 2005) and (b) determine if these conceptual groups of items were empirically supported across disability groups. As described in the results section, conceptually, we were able to identify a diverse array of items (see Table 1) from NLTS2 that related to quality of life domains. In fact, so many items were identified that it was possible to identify subdomains within each overall quality of life domain that related to the operational definitions of the domains. This suggests that many of the defining features of the domains of quality of life were conceptually measured in NLTS2. However, when empirically examining the items, it became apparent that there was a significant gap between the conceptual relationship between the NLTS2 items and the empirical support for grouping the identified items together to measure latent constructs.

As shown in Table 2, all of the conceptual constructs were significantly modified. All quality of life constructs had multiple subdomains that had to be dropped completely from the analyses because of issues with the items (e.g., lack of sufficient variability across groups) or lack of empirical relationships across items, despite the conceptual predictions. For example, for the quality of life domain of social inclusion the only indicator that could be retained in the model was related to independent living. And, while independent living is a key outcome area, it does not capture the range of factors that define societal inclusion, most notably issues related to community participation, social networks, and the supports needed to participate in one's community. Other domains, however, were more robust. A number of indicators related to material well-being were retained in the model.

This limitation has also been found in other analyses of NLTS2 data (Shogren & Garnier Villarreal, in press). This occurs because, when engaging in secondary data analysis of datasets that primarily adopt individual survey items, rather than validated scales, the only approach available to researchers is to use individual survey items and determine, post hoc, the degree to which they operate as latent constructs. These findings suggest in future research and data collection on national surveys such as NLTS2, researchers should carefully consider the purpose of the data collection and explore the use of reliable and valid tools that represent key constructs being assessed.

Establishing Measurement Invariance across Groups

Overall, despite the restricted nature of the outcome constructs that could be included in the model, the constructs do provide an opportunity to explore differences across disability groups. Another unique feature of NLTS2 is that data are representative of each of the 12 disability classifications recognized under IDEA and that these classifications represent young adults with a range of support needs (Thompson et al., 2009). Access to data on a wide range of young adults with disabilities provides an opportunity to better understand differences in outcomes and the pattern of those differences. Prior to exploring those differences, however, it is necessary to ensure that the same NLTS2 indicators can be used to measure the constructs across groups. For example, it is possible that disability-related factors could influence the definition and measurement of outcome constructs (e.g., social relationships could be defined differently in students with autism vs. those with high incidence disabilities). In analyzing the identified constructs, we were able to establish partial measurement invariance, suggesting that despite the need to free a small number of parameters in the model the overall latent adult outcome constructs can be measured using the same indicators across groups (Lee, Preacher, & Little, 2010). This creates the opportunity for meaningful comparisons of the latent constructs across disability groups.

Examining Latent Differences

After establishing measurement invariance, we examined latent differences across disability groups. As shown in Tables 4-6, significant differences emerged across disability groups. This suggests that disability classification has a strong and significant impact on adult outcomes, and as suggested by the significant differences in the correlational relationships among constructs that disability not only leads to mean level differences in outcomes but also moderates the relationship between outcome constructs. It is also important to note that there are likely other contextual factors that impact outcomes (Shogren, 2013) and the impact of disability label. Future research is needed to explore the interaction of disability and other personal and environmental factors. However, this work provides an initial framework for thinking about other personal and environmental factors.

For example, when looking at mean level differences (see Table 4) a consistent pattern emerges that suggests that students with high incidence disabilities (i.e., learning disabilities, emotional disturbances, speech or language impairments, and other health impairments) score more adaptively than students with intellectual and developmental disabilities (i.e., intellectual, cognitive, and sensory disabilities or traumatic brain injury). There is not a single domain where young adults with more significant support needs score more adaptively, although it is important to note that young adults with intellectual and developmental disabilities showed significantly greater variability in outcomes in several areas, as shown in Table 5, suggesting more diversity in this population than in students with high incidence disabilities. Further, in several key outcome domains there were mean level differences between students that would generally fall into the intellectual and developmental disability group. For example, young adults with intellectual disability scores significantly less adaptively in financial independence, emotional well-being, and post-secondary education than students with sensory disabilities. Students in the cognitive disability group, who had labels like autism, multiple disabilities, and deaf-blindness tended to score somewhere in between students with intellectual disability and sensory disabilities.

These findings suggest that need for support, in addition to specific disability label, impacts outcomes. However, it also highlights the influence of social expectations as young adults with intellectual disability tended to experience the least adaptive outcomes, despite this group likely being highly diverse in terms of their support needs as the majority of students served under school-based classifications of intellectual disability would be students with less intensive support needs, or what has traditionally been called “mild” intellectual disability (Snell et al., 2009). This may be related to support needs, but it may also be related to external factors such as societal perceptions of the capabilities of people with intellectual disability. Further research is needed to more systematically explore these issues, as well as other contextual factors (Shogren et al., 2014) that make a difference.

Additionally, it is important to highlight that students with high incidence disabilities tended to score higher on financial independence, employment, emotional well-being, and housing but lower on financial supports, advocating for needs, and access to services. In interpreting these findings it suggests that young adults with more significant support needs generally are receiving more financial support (e.g., public assistance), but report greater needs for services that are not being met (i.e., access to service construct), and have to engage in more advocacy to get what they need. It has been suggested that the greater use of public assistance limits outcomes in certain domains such as financial independence and employment because of existing policies related to the degree to which a person with a disability can work and save money when receiving public assistance (Wehman, 2012). The greater identified need for services in this population, however, suggests that individuals with more significant support needs are interested in getting services to support valued outcomes, but are not able to receive those services. Again, this suggests a complex relationship between personal and environmental factors, specifically highlighting the potential role of economic and policy-level factors in shaping outcomes related to employment, postsecondary education and financial independence. The complexity of these relationships is further highlighted when examining the correlations in Table 6, which suggest a stronger relationship between financial independence and employment and emotional well-being in people with high incidence disabilities. This suggests that access to employment opportunities, leads to a stronger relationship between employment and financial status and well-being, a logical finding, but one that differentially occurs across disability groups.

It is also important to highlight that disability groups including those with intellectual disability, cognitive disabilities, and sensory disabilities generally reported lower emotional well-being and health outcomes, indicating a critical need to address physical and mental health in young adults with intellectual and developmental disabilities (Brolan et al., 2012; Krahn, Putnam, Drum, & Powers, 2006). Further, there were negative correlations between needing to advocate for needs and emotional well-being, and these negative correlations were significantly higher for those with intellectual and developmental disabilities suggesting the potentially damaging effects of needing to engage in repeated advocacy efforts to get one’s needs met.

Limitations of the Study

Any secondary analysis of existing datasets is limited by the availability and quality of the data. In assessing outcomes, NLTS2 was designed to primarily include individual survey items. Although this allows for in-depth reporting of responses to each item or for individual items to be used as outcome variables in analyses; it limits the ability to general latent constructs represent broad outcome constructs, likely quality of life domains. As mentioned previously, the only way to engage in analysis of latent constructs is to use individual survey items and determine, post hoc, the degree to which they operate as latent constructs. As demonstrated in the present analysis, this contributes to narrow latent constructs. A major limitation of the present analysis in that the latent constructs were generated post hoc from individual items and the conceptual constructs had to be changed significantly. While the constructs used are reliable, their validity as outcome domains related to the broader quality of life is more limited.

Additionally, the process of generating conceptual constructs is subjective and different research teams may define constructs in different ways and obtain different findings.

Implications for Future Research and Practice

Even with the limitations described above, it was possible to define outcome constructs associated with social relationships, financial independence and supports, emotional well-being, postsecondary education, employment, independent living, health status, access to services, and advocating for needs. When reviewing this list, many key areas that define valued adult outcomes are included. Further, this allows us to explore differences across disability groups, and after defining the constructs and establishing measurement invariance, it was clear that there were differences based on disability classification. Generally students with high incidence disabilities experienced more positive outcomes; however, while disability is an important variable, it is not enough to explain all of the differences. Future research is needed to further examine the impact of contextual factors, specifically the role of access to systems of supports and policy-level factors on outcomes. Work is also needed to examine the degree to which previous experiences (e.g., school-based experiences) are linked with outcomes. Ultimately, the findings suggest a need for ongoing attention to the promotion of positive outcomes for young adults with disabilities, with a specific focus on how to build supports for those with intellectual and developmental disabilities that facilitate rather than impede outcomes.

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Table 1

Quality of Life Constructs with Sub-Domains generated from NLTS2 data (Number of Associated NLTS2 Variables) and Brief Description of NLTS2 Item Content

Quality of Life Constructs and Subdomains Created from NLTS2 Data	**General Content of Included NLTS2 Items**
Interpersonal Relations	
- Supports – Personal (5)	- Receives support to get services, case manager, job training, etc.
- Social Interactions (6)	- Participation in social activities, spends time with friends, emails friends
- Social Relationships (6)	- Gets along with others, feels cared about by others
- Reliance on Others (8)	- Frequency of relying on friends, parents, coworkers, etc. to make decisions
Societal Inclusion	
- Social Supports / Services (5)	- Number of services received since high school, currently has case manager
- Community Integration and Participation (5)	- Participation in community activities, registered to vote, has driver's license, volunteers
- Independent Living (1)	- Integration of living arrangement
Emotional Well Being	
- Satisfaction with Services (11)	- Getting enough services, usefulness of services, getting appropriate accommodations
- Work Attitudes (4)	- Youth feels paid well, treated well, has opportunities to move up at work
- Life Satisfaction (3)	- Satisfied with living arrangement, job and feels safe in neighborhood
- Moods and Enjoyment (5)	- Enjoys life, hopeful about the future
- Self-Perceptions (8)	- Feels proud, can make friends, life is interesting, can handle things
Rights	
- Access (3)	- On a waiting list for supports for living, other services, or case manager
- Equality (2)	- Most workers at job have disability (reverse coded), participates in groups only for those with special needs (reverse coded)
- Accommodations (4)	- Receives postsecondary services and accommodations, receives employment supports and accommodations
Physical Well-Being	
- Health Insurance (4)	- Covered by public or private health insurance, covers costs of care
- Health Status (2)	- Status of health, impact of health or emotional problems on social activities
- Leisure (3)	- Number of hobbies, hours watches TV
- Health Risk Behaviors (15)	- Engagement in risky behaviors (e.g., smoking, unprotected sex, illegal drugs)
Personal Development	
- Postsecondary Education (12)	- Participation in postsecondary education, earned diploma
- Ongoing Training (3)	- Access to career or vocational training or counseling
- Personal Competence (3)	- Participation in household activities and chores, engages in shopping and other routine activities

Material Well-Being - Financial Independence (8) - Financial Supports (4) - Employment (15)	 - Has savings, checking and charge accounts - Receives food stamps, SSI, money from TANF - Employment status, access to benefits, promotion, salary
Advocacy - Advocating for Needs (6)	 - Tells professionals about service needs, request accommodations

Table 2

10 Empirically Verified Adult Outcome Constructs, Brief Descriptions and Modifications from Conceptual Model

	Description of Construct	**NLTS2 Source & Indicators**	**Modifications from Conceptual (Table 1)**
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	np5P6_A4h; Np5p8_J4; np5A4h; np5P12_J8; np5P11_J7; np5P3_J11_[01,02,05,07]; np5V4[a,b,c] (9 indicators)	Combined items related to social interactions and relationships into one construct
Independent Living	Type and inclusiveness of current residential arrangement	np5P1a[0-16]_A1a[0-16] (1 indicator)	Variable recoded to reflect a scale representing living on one's own to living in a congregate setting
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	np5V2[a-e]; np5V3[a-h] (13 indicators)	Combined items from moods and enjoyment and self-perceptions subdomains; young adults ratings of their moods and perceptions of their lives hung well together
Access to Services	Reports needing services beyond what is currently available	np5T10e_C1d (1 indicator)	Single indicator of need for services
Health Status	Rating of general health status	np5Q1_B7A(1 indicator)	Single indicator items of status of general health (rated on 1-5 scale, poor to excellent)
Postsecondary Education	Enrollment in any form of postsecondary education; duration and continuity of attendance; graduation status	np5S3a_A3[a,e,i]; np53Sd1_S4d1_S5d1_K6b1_K7b1_K8b1; np5S3e_S4e1_S5e_K6c_K7c1_K8c; np5s3e2_S5e2_K6c2_K8c2 (4 indicators)	Only items related to postsecondary education status fit into model, and items needed to be combined to represent attendance at any type of institution
Financial Supports	Receives financial support from SSI, food stamps or any government program	np5W4d_A4g; nptW4b_m7d; np5W5b_m8c (3 indicators)	Only items related to publically funded programs demonstrated good fit
Financial Independence	Young adult has checking, savings, and charge account	np5P16b_J14b_[a-c] (3 indicators)	3 items related to having accounts fit well together
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	np5CompEmplmt; np5T2c_L2c; np5T4j_J4j_b; np5T1c_A4c; np5T4d_L4d; np5T4j_L4j_a; np5T4k_L4k_[a-c]; np5T4t_[a-d]; np5T4u_[a-b] (13 indicators)	Multiple items related to employment could be combined into a latent employment construct that was distinct from other elements of material well-being (i.e., financial independence
Advocating for Needs	Communicating needed accommodations to employer	np5T4m_L4m (1 indicator)	Only item related to telling employer about disability fit

Table 3

Model Fit Statistics for Evaluation of Measurement Invariance

	χ^2	df	RMSEA	RMSEA 90% CI	NNFI	CFI	ΔCFI	Constraint Tenable
Configural	5949.229	2927	0.035	.033 - .036	0.757	0.801		
Loading Invariance	6074.140	3032	0.034	.033 - .035	0.764	0.800	0.001	Yes
Intercept Invariance	6507.798	3142	0.035	.034 - .036	0.748	0.778	0.023	No
Partial Intercept Invariance	6359.418	3137	0.034	.033 - .036	0.758	0.788	0.013	Yes

Table 4

Significant Latent Mean Differences between Disability Groups

Construct	Disability Group1	Disability Group 2	Mean Group 1	Mean Group 2	Cohen's D
Financial Independence					
	HIN	INT	0.000	-0.818	-0.758
	HIN	COG	0.000	-0.420	-0.368
	INT	SEN	-0.818	0.183	0.641
	INT	ORT	-0.818	0.025	0.628
	INT	COG	-0.818	-0.420	0.275
	SEN	COG	0.183	-0.420	-0.498
	SEN	TBI	0.183	-0.242	-0.416
	ORT	COG	0.025	-0.420	-0.311
Financial Support					
	HIN	INT	0.000	1.117	0.879
	HIN	ORT	0.000	1.237	0.977
	HIN	COG	0.000	1.389	0.956
	INT	SEN	1.117	0.381	-0.291
	INT	TBI	1.117	0.228	-0.464
	SEN	ORT	0.381	1.237	0.490
	SEN	COG	0.381	1.389	0.495
	ORT	TBI	1.237	0.228	-0.577
	COG	TBI	1.389	0.228	-0.625
Employment					
	HIN	INT	0.000	-0.782	-0.699
	HIN	SEN	0.000	-0.487	-0.391
	HIN	ORT	0.000	-1.070	-0.922
	HIN	COG	0.000	-0.895	-0.746
	HIN	TBI	0.000	-0.598	-0.572
	SEN	ORT	-0.487	-1.070	-0.419
Emotional Well-being					
	HIN	INT	0.000	-0.390	-0.350
	HIN	COG	0.000	-0.432	-0.369
	INT	SEN	-0.390	-0.143	0.148
	INT	ORT	-0.390	-1.070	-0.418
	SEN	COG	-0.143	-0.432	-0.228
	ORT	COG	-0.005	-0.432	-0.292
Health Status					
	SEN	TBI	3.751	3.440	-0.277
Advocating for Needs					
	HIN	INT	0.329	1.122	0.836
	HIN	SEN	0.329	0.927	0.520
	HIN	ORT	0.329	1.418	1.132
	HIN	COG	0.329	1.343	0.996
	HIN	TBI	0.329	0.801	0.537
Independent Living					
	HIN	INT	0.504	0.302	-0.260
	HIN	ORT	0.504	0.275	-0.291
	HIN	COG	0.504	0.150	-0.443
	HIN	TBI	0.504	0.277	-0.307
	INT	COG	0.302	0.150	-0.147
	SEN	ORT	0.430	0.275	-0.179
	SEN	COG	0.430	0.150	-0.314
	ORT	COG	0.275	0.150	-0.127
Access to Services					
	HIN	COG	0.343	0.520	0.217

Construct	Disability Group1	Disability Group 2	Mean Group 1	Mean Group 2	Cohen's D
	SEN	COG	0.366	0.520	0.163
Post-secondary Education					
	HIN	INT	0.329	0.083	-0.396
	HIN	SEN	0.329	0.454	0.175
	HIN	COG	0.329	0.246	-0.122
	INT	SEN	0.083	0.454	0.378
	INT	ORT	0.083	0.362	0.359
	INT	COG	0.083	0.246	0.187
	INT	TBI	0.083	0.321	0.394
	SEN	COG	0.454	0.246	-0.261
	ORT	COG	0.362	0.246	-0.128

Note: The disability groups are listed with the following abbreviations: HIN = high incidence; INT = intellectual; SEN = sensory; ORT = orthopedic; COG = cognitive; TBI = traumatic brain injury.

Table 5

Significant Latent Variance Differences between Disability Groups

Construct	Disability Group 1	Disability Group 2	Variance Group 1	Variance Group 2	Ratio
Financial Support					
	HIN	INT	1.000	2.771	2.771
	HIN	ORT	1.000	2.300	2.300
	HIN	COG	1.000	2.930	2.930
	SEN	COG	1.760	2.930	1.665
Social Relationships					
	ORT	COG	0.882	1.240	1.406
Advocating for Needs					
	HIN	INT	0.674	1.013	1.503
	HIN	SEN	0.674	0.927	1.375
	HIN	ORT	0.674	0.957	1.420
	HIN	COG	0.674	0.955	1.417
	HIN	TBI	0.674	0.949	1.408
Housing					
	HIN	COG	0.500	0.364	0.728
	INT	COG	0.457	0.364	0.796
	SEN	COG	0.497	0.364	0.732
Access to Services					
	HIN	COG	0.474	0.499	1.053
Postsecondary Education					
	HIN	INT	0.341	0.201	0.589
	INT	SEN	0.201	0.366	1.821
	INT	ORT	0.201	0.342	1.701
	INT	COG	0.201	0.330	1.642
	INT	TBI	0.201	0.349	1.736

Note: The disability groups are listed with the following abbreviations: HIN = high incidence; INT = intellectual; SEN = sensory; ORT = orthopedic; COG = cognitive; TBI = traumatic brain injury.

Table 6

Significantly Different Correlations between Constructs by Group

Disability Group 1	Disability Group 2	Correlation Group 1	Correlation Group 2	Differences
Financial Independence – Employment				
HIN	SEN	0.582	0.213	0.369
SEN	COG	0.213	0.653	-0.440
Financial Independence – Emotional Well-being				
HIN	ORT	0.435	0.113	0.322
HIN	TBI	0.435	-0.276	0.711
INT	TBI	0.331	-0.276	0.607
SEN	TBI	0.223	-0.276	0.499
ORT	TBI	0.113	-0.276	0.389
COG	TBI	0.358	-0.276	0.634
Financial Support – Emotional Well-being				
HIN	TBI	-0.253	0.128	-0.381
SEN	ORT	-0.051	-0.389	0.338
SEN	COG	-0.051	-0.381	0.330
ORT	TBI	-0.389	0.128	-0.517
COG	TBI	-0.381	0.128	-0.509
Employment – Emotional Wellbeing				
HIN	SEN	0.531	0.148	0.383
HIN	COG	0.531	0.187	0.344
HIN	TBI	0.531	-0.052	0.583
Emotional Well-being – Advocating for Needs				
HIN	INT	-0.168	-0.434	0.266
HIN	TBI	-0.168	0.184	-0.352
INT	SEN	-0.434	0.088	-0.522
INT	ORT	-0.434	-0.172	-0.262
SEN	COG	0.088	-0.282	0.370
ORT	TBI	-0.172	0.184	-0.356
COG	TBI	-0.282	0.184	-0.466
Health Status – Postsecondary Education				
HIN	SEN	0.015	0.299	-0.284
INT	SEN	-0.060	0.299	-0.359
SEN	COG	0.299	0.015	0.284
SEN	TBI	0.299	-0.154	0.453

Note: The disability groups are listed with the following abbreviations: HIN = high incidence; INT = intellectual; SEN = sensory; ORT = orthopedic; COG = cognitive; TBI = traumatic brain injury.