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Self-management of daily life tasks in diploma-track youth with disabilities

Elizabeth G. S. Munsell[a] (iD), Gael I. Orsmond[a], Daniel Fulford[a,b] and Wendy J. Coster[a]

[a]Occupational Therapy Department, College of Health and Rehabilitation Sciences: Sargent College, Boston University, Boston, MA, USA; [b]Department of Psychological & Brain Sciences, Boston University, Boston, MA, USA

ABSTRACT

Purpose: Youth with disabilities who graduate with a regular high school diploma often continue to have difficulties in their daily functioning that ultimately impact adulthood outcomes. To better understand these functional difficulties and determine how best to address them, it is important to distinguish deficits in discrete skills from difficulty organizing skills to self-manage complex tasks associated with adult roles. The purpose of this study was to explore the extent to which challenges in social, executive function and behavior management factors relate to these two aspects of daily functioning.

Methods: This is a secondary analysis of the National Longitudinal Transition Study 2 funded by the United States Department of Education. The direct and indirect associations between youth underlying factors and self-management of daily life tasks (SMDLT) versus discrete functional skills were modelled using structural equation modelling.

Results: A model incorporating social skills, communication, and behavior regulation explained 55% of the variance in SMDLT. In contrast, the model predicting discrete functional skills had fewer significant associations and described less variance (37%) in the outcome.

Conclusions: Findings suggest that using measures of SMDLT and designing targeted interventions for SMDLT might help improve participation in independent living and productivity for diploma-track youth with disabilities.

➤ **IMPLICATIONS FOR REHABILITATION**

- Successful transition from high school to adult roles requires the ability to self-manage the daily life tasks required for those roles, such as employment, post-secondary education, and independent living.
- The ability to self-manage daily tasks is distinct from mastery of discrete functional skills and should be assessed with measures that uniquely examine this domain.
- Social and communication skills, executive functioning, and behavioral regulation, are important contributors to the ability to self-manage life tasks for diploma-track youth with disabilities and should be incorporated into multifaceted interventions.
- Interventions to improve self-management of tasks should include teaching strategies and practice coordinating underlying skills in flexible ways that meet the varying demands of tasks and diverse environments.

Introduction

Successful transition from high school to adulthood traditionally involves taking on new roles in the contexts of employment or education. In addition to possessing necessary academic skills, participation in these adult roles requires the ability to manage the life tasks essential to meeting societal expectations. Managing daily life tasks includes organizing activities into effective sequences, monitoring task performance, and making necessary adjustments in order to carry out tasks, as well as adapting to changing contexts for task performance [1]. Most youth learn to manage the tasks required for adult roles through informal learning experiences at home, school and in the community during childhood and adolescence. For most youth, responsibility for daily life tasks naturally and gradually shifts from caregivers to the youth over a period of years, with a significant portion of the shift occurring in late adolescence [2,3]. Youth continue to develop their ability to manage tasks independently as they take on new roles in employment and post-secondary education [3].

When youth experience difficulty learning to self-manage life tasks, their ability to achieve traditional young adult outcomes like gaining and maintaining employment, participating in post-secondary education, and living independently [4] may be significantly affected. Such difficulties may partially explain the observed discrepancy between academic achievement and poor traditional outcomes for youth with disabilities who graduate with a regular high school diploma, that is, diploma-track (DT) youth (see Appendix A for list of abbreviations). Given that they have completed the requirements to obtain a regular high school diploma, these youth are assumed to have mastered the basic skills needed to adapt to typical environments in order to participate in adult roles, yet their participation in these contexts is often limited [5–8].

The International Classification of Functioning, Disability and Health (ICF) (Figure 2) [9] provides a framework to situate the concept of daily task management. The daily life tasks that are the focus of this study are classified as activity in the ICF model, defined as "the execution of a specific task or action". The ICF definition of activity is broad and captures a continuum of activities from simple discrete skills (e.g., reaching for a cup) to more complex activities in which multiple skills are used together (e.g., preparing a meal and cleaning the cooking area and utensils) [9,10]. Daily life tasks fall at the complex end of the activity continuum and most directly support participation in life situations such as independent living, employment, and postsecondary education. Self-management of these activities requires higher-order cognitive abilities that may be affected by a variety of disabilities experienced by academically capable youth.

Much of the research that explores functioning in daily life has utilized the concept of adaptive behavior. Adaptive behavior is defined as "conceptual, social and practical skills performed by people in their everyday lives" [11]. Studies consistently report that youth with disabilities such as autism spectrum disorder, mental health conditions, and attention deficit disorder (ADD/ADHD) are at risk for deficits in adaptive behavior compared to same age peers [12–15]. Further, adaptive behavior challenges are independent of intelligence quotient (IQ) and thus may also be found among youth with disabilities who are academically capable [13,16–19]. Research on adaptive behavior has also established a link between adaptive behavior challenges and poor traditional adulthood outcomes [20,21].

Similar to the ICF definition of activity, the construct of adaptive behavior encompasses many skills and abilities, ranging from discrete functional skills to complex tasks taking place within varying contexts. This breadth is reflected in the design of measures of adaptive behavior that are widely used in research. However, this feature makes it difficult to distinguish task-level challenges from problems acquiring discrete skills. For example, two measures commonly used in studies of youth with disabilities [22,23] are the Vineland Adaptive Behavior Scales-III (VABS-III) [24] and Adaptive Behavior Assessment System (ABAS-3) [25]. Each assessment assesses three major domains (VABS-III: communication, daily living skills, and socialization; ABAS-3: conceptual, social, practical). The scales in the assessments incorporate items that reflect a range of behavioral complexity, from discrete functional skills (e.g., fastens snaps; tells time using digital clock; wipes up his/her own spills) to complex self-management items (e.g., keeps track of his/her medicines and refills when needed; notices when simple tasks around the house need to be done and does them; plans his/her monthly expenses and sticks to the plan) [22]. The range of behavioral complexity in these measures presents limitations when used in research with the population of DT youth with disabilities. Given their school achievement, it is unlikely that this group of youth who are academically capable have difficulty with the discrete skills included in measures of adaptive behavior. However, the design of the instrument makes it difficult to focus an evaluation specifically on the area of suspected deficit: the youth's performance of the complex self-management tasks needed to meet the responsibilities of adult roles.

Measures that focus specifically on the ability to self-manage daily life tasks would provide a more targeted approach to understanding the areas of challenge for many DT youth with disabilities. For example, the authors of the Pediatric Evaluation of Disability Inventory – Computer Adaptive Test (PEDI-CAT) [26] conceptualized this distinction in the design of the measure. The Responsibility domain of the PEDI-CAT captures the construct of self-management of daily life tasks separately from daily activities, social/cognitive, and mobility skills domains. Confirmatory factor analyses supported these four distinct content domains in a mixed sample of 2205 young people (ages 0-21) with and without disabilities [27]. Using the PEDI-CAT Responsibility domain measure, a preliminary study of 125 youth with autism without intellectual disability found that 46% of the sample fell in the significantly delayed range and an additional 40% of youth were in the borderline delayed range. Notably, 61% of youth age 18 and older were significantly delayed, compared to 38% of youth age 14–17, indicating that as youth grow older and expectations for responsibility increase, the discrepancy in ability to self-manage daily life tasks compared to peers widens [28]. These preliminary data support the hypothesis that DT youth with disabilities experience challenges specific to self-management of daily life tasks.

Separating measurement of complex task management from performance of discrete skills also would enable exploration of underlying factors that influence an individual's ability to self-manage daily life tasks. The literature has suggested three potential underlying factors: executive functions, social communication skills, and behavior management. Executive functions (EFs), which are higher order cognitive processes, including working memory, planning, flexibility, and organization, that support problem-solving and behavioral regulation [29], play a key role in initiation, time management, organization, and problem solving needed to coordinate the skills needed to manage daily life tasks [15,30]. EFs develop throughout childhood and typically increase rapidly beginning in adolescence [31,32]. However, many DT youth with disabilities demonstrate EF challenges [33–39] that persist after controlling for IQ [40]. Poor metacognitive EFs, which include "problem solving, abstracting, planning, strategy development and implementation, and working memory" [39,41 p. 93], have been shown to be negatively related to daily functioning as operationalized by adaptive behavior measures [23,42–44]. Impairments in metacognitive EFs make it difficult for youth to negotiate common occurrences that they face when engaging in daily tasks such as planning and sequencing multi-step actions or adjusting their plan when something unexpected happens [34,38,45].

Although considerable evidence suggests that EFs are an important contributor to the management of complex daily tasks, weak social communication skills and poor behavior management may also disrupt daily functioning. Both of these factors have also been associated with decreased adaptive skills for youth with disabilities including autism, TBI, mental health conditions, and ADHD [16,19,23,39,46,47]. Notably, the associations between daily functioning and EF, social communication, and behavior management were found in studies that used broad measures of adaptive behavior (i.e., included both discrete functional skills and more complex task management items). Thus, further investigation is needed to determine the presence and magnitude of associations between these underlying factors and self-management of daily life tasks. In addition, there is evidence that decreased social communication skills and poor behavior management are associated with EF in DT youth with disabilities [39,42,48,49]. While the literature provides little empirical guidance on the directions of these associations, it is likely that these three constructs underlying daily functioning are interrelated.

The present study is an initial investigation of the construct of self-management of daily life tasks (SMDLT) using data from the National Longitudinal Transition Study-2 (NLTS2) [50]. The NLTS2 data set has a sufficient sample size and survey items that can be

used to explore the proposed relationships between underlying factors (executive function, social communication skills, and behavior management) in a representative sample of DT youth with disabilities in the United States [50]. In addition, the NLTS2 data set has items that relate to both SMDLT and discrete functional skills, providing the opportunity to examine separately the associations and explained variance between underlying factors and these two different outcomes.

The aims of this study were to: (a) Explore how SMDLT relates to potential underlying factors (i.e. EF, social communication, and behavior management) of DT youth with disabilities and (b) examine how discrete functional skills relate to the same set of underlying factors. We hypothesized that SMDLT would be significantly associated with these underlying factors and explain a moderate amount of variance in the outcome (SMDLT). In contrast, we hypothesized that the model predicting discrete functional skills would demonstrate weaker associations and describe less variance in discrete functional skills.

Methods

NLTS2 data collection and instruments

The National Longitudinal Transition Study 2 (NLTS2) is a 10-year prospective study of youth receiving special education services conducted by the United States Department of Education through SRI International. The study included five waves of data collection between 2001–2009 evaluating the transition experiences, youth characteristics, and posthigh school outcomes of a nationally representative sample of youth (ages 13–16 at the start of the study) from each of the 12 federal special education disability categories established in the Individuals with Disabilities Education Act [51]. The five waves of data collection beginning in 2001/2 took place at two-year increments across 10 years total [50]. This analysis uses items from the wave 2 parent interview as this wave uniquely included items that were relevant to the construct of self-management of daily life tasks.

NLTS2 sample

The NLTS2 sample was a stratified random sample designed to be generalizable to the United States population of students within and across disability categories. Thus, data were weighted in each

statistical analysis to ensure that the target population was adequately represented [50]. The present study analyzes a subgroup of high school students with disabilities who graduated high school with a diploma. Participants ($n = 1070$) were determined to fit this criterion based on report of graduation with a regular diploma on wave 3, 4 or 5 of data collection (variable codes: np5A2g, np4D1L, np3D1L).

Variable selection

Variables that align with the constructs of interest were selected from the NLTS2 wave 2 parent survey (Table 1). *Ability to self-manage daily life tasks:* Selection of NLTS2 items was guided by the operationalization of self-management of daily life on the PEDI-CAT: Responsibility Domain [26]. Eight items were selected to capture complex daily living tasks or functional cognitive skills that were linked to a specific life task. *Discrete functional skills:* Four indicators of discrete functional skills were selected following previous work on the NLTS2 dataset that captured this construct [52,53]. *Social communication skills:* Five items were selected to capture social communication skills. The same five items were used in a composite with good internal consistency (Cronbach's alpha = .74) by Shattuck and colleagues [54,55] for a subsample of youth with autism. *Behavior management:* The NLTS2 items rely strongly on parent report, thus most of the items related to behavior management focus on observable externalizing behaviors. Five items, used previously by Shattuck et al. [54] to explore the impact of externalizing behaviors on social participation for adolescents with autism (Cronbach's alpha = .60) were selected. *Executive functions (EF):* The NLTS2 parent survey does not include a specific focus on EF, thus EF has never been directly examined using NLTS2 data. Selection of EF items for this analysis was guided by the Behavior Rating Inventory of Executive Function (BRIEF) [56] assessment that captures the behavioral manifestation of EF abilities. In addition, only items that were general statements related to EF were included, rather than items that were linked to performance of a specific task, in order to differentiate EF items from items reflecting ability to self-manage daily life tasks. Two EF items were identified from the NLTS2 parent survey: 1) How often youth works at something until finished and 2) How good youth is at being well organized. These items align with the

Table 1. List of latent factors and observed variables.

Proposed latent factor	Survey item (*variable name*)	W2 variable code
Social Communication	How well youth converses (*Converse*)	np2B5d
	How often youth joins group activities without being told (*Group*)	np2G1a
	How often youth makes friends easily (*Friends*)	np2G1b
	How often youth starts conversations (*StartConvo*)	np2G1f
	How often youth seems confident in social situation (*Confident*)	np2G1d
Behavior Regulation	How often youth ends disagreements with you calmly (*Disagree*)	np2G1c
	How often youth gets into trouble situations (*Trouble*)	np2G1e
	How often youth receives criticism well (*Criticism*)	np2G1g
	How often youth behaves poorly at home (*PoorBehav*)	np2G1h
	How often youth controls temper when arguing with peers (*Temper*)	np2G1i
Executive Function	How often youth works at something until finished (*Persevere*)	np2G1j
	How good youth is at being well organized (*Organized*)	np2G2a
Functional Skill	How well youth can tell time on clock with hands (*Time*)	np2G3a_a
	How well youth can read/understand common signs (*Signs*)	np2G3a_b
	How well youth can count change (*Count*)	np2G3a_c
	How well youth can look up phone numbers/use phone (*Phone*)	np2G3a_d
SMDLT	How well youth can get places outside the home (*Navigate*)	np2G3a_e
	How well youth can buy own clothes at a store (*Clothes*)	np2G3a_g
	How well youth can arrange a plane or train trip (*Trip*)	np2G3a_h
	How often youth does laundry (*Laundry*)	np2G3b_b
	How often youth buys a few things at the store (*Store*)	np2G3b_d

task monitor, plan/organize, and organization of materials sub-scales of the BRIEF.

Data analysis

We developed models of the direct and indirect associations between youth underlying factors (i.e. EF, social communication skills, behavior management) and their ability to self-manage daily life tasks (*SMDLT*) using structural equation modeling (SEM). We compared the SMDLT models with alternate models of the association between youth underlying factors and their discrete Functional Skills.

All data analyses were conducted in Mplus, version 8.4 [57]. NLTS2 survey data were weighted using Mplus weight, strata, and cluster commands and type = complex command, where applicable. Six of the selected NLTS2 indicators did not meet requirements for normally distributed data (including three items for discrete functional skills). Thus, robust maximum likelihood (MLR) estimator was used for all analytic procedures. MLR is the recommended estimation procedure for continuous variables that do not meet the requirements for normal distribution [58]. The presence of missing data was also explored. All items had less than 10% missing data except for how well youth can use public transportation (23%) and how well youth can arrange a train or plane trip (24%). MLR assumes normality when modeling missing data, which is appropriate for the two indicators with more extensive missing data [59].

Model fit

A nonsignificant Chi-square ($\chi 2$) test is indicative of good model fit. However, the Chi-square significance test tends to be inflated with larger sample sizes [60]; thus, several other indices were also considered to holistically assess goodness of model fit. In general, standardized root mean square residual (SRMR) <.05, root mean square error of approximation (RMSEA) <.05 with 90% confidence interval (90% CI) of RMSEA between <.05 – <.10, Tucker–Lewis index (TLI) >.90, and comparative fit index (CFI) >.90 supported good fit of the model to the data [60]. Bayesian information criterion (BIC) was also used to compare fit of nested models. In addition, we examined modification indices and standardized residuals to identify potential localized points of ill fit [60]. While modifications were prompted by statistical results, all potential changes were evaluated for conceptual plausibility.

Exploratory structural equation modeling (ESEM)

The exogenous variables representing underlying factors (executive functioning, social skills, and behavior management) were fit using ESEM. The number of factors specified was based on a parallel analysis (100 replications) and scree plot of eigen values from the reduced correlation matrix [60]. ESEM can be a useful intermediate step between exploratory factor analysis (EFA) and confirmatory factor analysis (CFA) to gain an understanding of the underlying factor structure and develop realistic measurement models [58,60]. Using aspects of EFA, CFA, and structural equation modeling (SEM), ESEM allows for factor cross loadings among items (similar to EFA) while providing valuable information such as fit and modification indices (similar to CFA). Further, like SEM, ESEM allows for modeling regressions between EFA factor blocks and CFA factors (as employed in this analysis) [60]. The extracted factors were rotated using oblique (geomin) rotation, which is recommended for its ability to produce factor loadings and factor correlations similar to those of confirmatory factor analysis without having to specify the factor loading pattern [61].

Confirmatory factor analysis (CFA)

A single factor CFA is structurally and statistically equivalent to a single factor ESEM, thus CFA was used to establish the measurement models for the outcomes of interest. Our rationale for a tentative CFA model of the latent factor for SMDLT was based on previous empirical analysis of this construct using items from the PEDI-CAT Responsibility domain [27]. CFA analysis indicated that items similar to those identified from the NLTS2 data set loaded significantly on to the same underlying factor. For the comparison model, data were fit to a CFA model of discrete functional skills based on the previous empirical work that grouped the same NLTS2 variables into a summary score [52,53]. Goodness-of-fit indices were used to evaluate how well data fit the specified models and modification indices were examined when considering adjustments in parameter specification to improve the fit of data to the model.

Results

Establishing the measurement model

Self-management of daily life tasks (SMDLT)

CFA was used to model the SMDLT outcome. The initial model included eight indicators that were hypothesized to fit into the factor model; however, Pearson correlations and modification indices were examined to guide modification to the model to improve fit. While suggested modifications were prompted by statistical results, changes were only made if they were determined to be conceptually acceptable, as described here. The following modifications were made: (a) *how well youth uses public transportation* was removed due to the high correlation with two other items (*Navigate*: $r = .55$; *Trip*: $r = .56$), suggesting extensive conceptual overlap across these items leading to redundancy in the measurement model [62]; (b) two of the indicators, *how well youth fixes simple meals* and *how often youth cleans their room* were removed due to low communalities ($R^2 < .06$) - conceptually, these items may be a greater reflection of parenting style and a parent's influence on the home environment rather than youth's ability to manage the tasks; (c) modification indices suggested that covariance between residuals for *how often youth do their own laundry* and *how often youth buy items at a store* be freely estimated in the final model to improve model fit, which may be due to these two items capturing the frequency ("often") of behavior rather than the ability ("well") that the other items capture. Model fit indices suggest that the final, five item CFA model for SMDLT fit the data well (Figure 1). Inspection of standardized residuals and modification indices indicated no localized points of ill fit in the solution (e.g., largest standardized residual = .874, largest modification index = 4.933).

Discrete functional skills

The outcome of discrete Functional Skills was also modeled using CFA. The initial four item model (Figure 2) demonstrated good fit to the data and no localized points of strain in model fit (e.g., largest standardized residual = .629, largest modification index = 2.418).

Underlying factors

ESEM was used to model the latent factors for underlying factors, including executive function, social communication, and behavior management. A parallel analysis was conducted to determine the number of latent factors to retain in the ESEM model of underlying factors. One thousand correlation matrices were generated from the data using Monte-Carlo simulation. The results of the
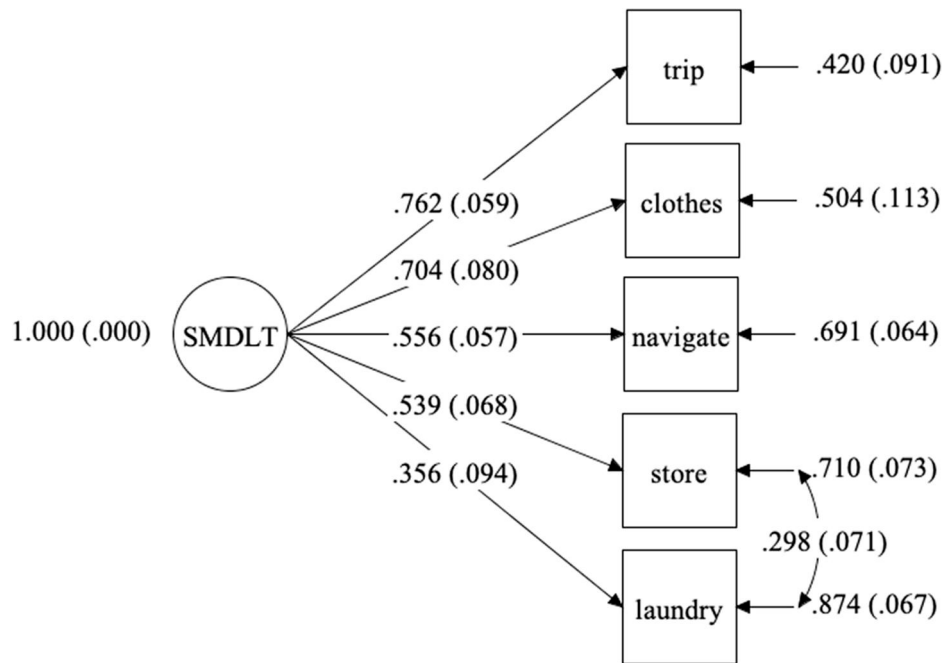
Figure 1. SMDLT measurement model. Completely standardized parameter estimates and standard errors. χ^2 (4) = 7.276, p = .122; RMSEA: .028 (90% CI = .000 - .059); SRMR: .031; CFI = .980; TLI = .949. All factor loadings significant at $p<.001$.
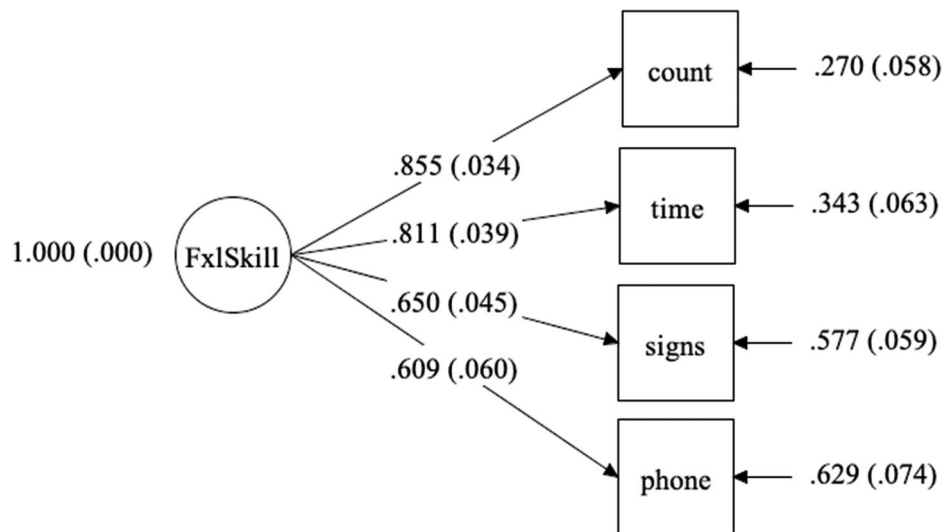

Figure 2. Discrete functional skill measurement model. Completely standardized parameter estimates and standard errors. χ^2 (2) = 2.489, p = .288; RMSEA: .015 (90% CI = .000 − .065); SRMR: .018; CFI = .998; TLI = .994. All factor loadings significant at $p<.001$.

parallel analysis indicated that a two-factor solution fit the data well. Sequential χ^2 model tests were also examined along with the factor structure for each solution. While the χ^2 test statistic demonstrated significant improvement in model fit from two to three factors, only two items loaded on the third factor and two other items that were included to represent executive functions were not significantly associated with any of the factors. Thus, we ultimately selected the two-factor ESEM solution in order to align with the conceptual underpinnings of this study. We named the two factors Social Skills and Behavior Regulation. The Behavior Regulation factor is a composite factor that operationalizes both executive function and behavior management. Following inspection of modification indices, we made two modifications to the model: error variances were freed to covary between (a) *How often youth gets into trouble situations* and *How often youth behaves poorly at home* and (b) *How often youth works at*

something *until finished* and *How good youth is at being well organized*. In both instances, the items loaded on to the same factor and included similar content (i.e. trouble behaviors and executive functioning, respectively), thus these modifications were deemed theoretically reasonable. The final model (Table 2) had acceptable overall fit and no localized areas of poor fit (e.g., largest standardized residual = .855, largest modification index = 8.481).

Path analyses for the structural model

Model predicting SMDLT
Our initial model tested direct associations between the exogenous variables of underlying factors (Social Skills and Behavior Regulation) and SMDLT or Functional Skills. For the SMDLT model, the path from Social Skills to SMDLT was significant (fully

Table 2. ESEM solution for underlying factors measurement model.

Items	Factor 1			Factor 2			Dimension
	Est.	S.E.	Sig.	Est.	S.E.	Sig.	
Confident	**.762**	.047	***	.005	.016		Social Skills (SS)
Friends	**.600**	.076	***	.096	.106		SS
Converse	**.593**	.066	***	-.182	.089	*	SS
StartConvo	**.589**	.087	***	-.041	.112		SS
Group	**.547**	.121	***	.016	.151		SS
Disagree	.002	.055		**.716**	.096	***	Behavioral Regulation (BR)
Criticism	.004	.076		**.680**	.108	***	BR
Temper	-.040	.110		**.528**	.137	***	BR
Trouble[a]	-.147	.131		**.430**	.143	**	BR
Persevere[b]	.120	.121		**.367**	.150	*	BR
PoorBehav[a]	.044	.112		**.361**	.121	**	BR
Organized[b]	.067	.114		**.346**	.130	**	BR

Extraction method: robust maximum likelihood; Rotation method: geomin. Completely standardized parameter estimates and standard errors. χ^2 (41) = 55.762, $p < .062$; RMSEA: .018 (90% CI = .000 – .030); SRMR: .038; CFI: .963; TLI: .940. Loadings larger than .3 are in bold. [a,b]Correlated residual errors. *$p<0.05$; **$p < 0.01$; ***$p < 0.001$.

standardized estimate (SE) = .690 (.095), $p < 0.001$), while the path from Behavior Regulation to SMDLT was not significant (estimate (SE) = .107 (.120), $p = 0.372$). The overall model explained 55% variance in SMDLT (R^2 = .554, $p < 0.001$) and the fit was generally acceptable (χ^2 (103) = 161.836, $p < 0.001$; RMSEA: .023 (90% CI = .016 − .030); SRMR: .052; CFI: .919; TLI: .893). However, inspection of modification indices prompted us to consider freely estimating the direct path from the indicator *How well youth converses* to SMDLT as an alternative model. Applying this modification was theoretically and conceptually consistent, as the ability to hold a conversation is likely a required skill that is independently related to SMDLT while also influencing the underlying factors of Behavior Regulation and Social Skills. Adding the direct path from *converse* to the outcome positioned the indicator as a partial mediator of the two latent ESEM factors and the outcome. This alternative model (Figure 3) had a higher level of fit than the initial model (BIC of initial vs. alternative model = 36,482.10 vs. 36,421.32) and explained 55% variance in SMDLT (R^2 = .551, $p < 0.001$), had good overall fit, and had no localized areas of poor fit (e.g. largest standardized residual = .890, largest modification index = 9.085). Notably, all direct paths to SMDLT were significant in this model.

Model predicting discrete functional skills
The initial model for Functional Skills demonstrated the same pattern of associations as the initial *SMDLT* model. Only the direct path from Social Skills to Functional Skills was significant (fully standardized estimate (SE) = .452 (.104), $p < 0.001$); Behavior Regulation to Functional Skills: estimate (SE) = .208 (.116), $p = 0.073$). The overall model explained 33.2% of the variance in Functional Skills (R^2 = .332, $p < 0.001$). Model fit was adequate (χ^2 (89) = 152.949, $p < 0.001$; RMSEA: .026 (90% CI = .019 − .033); SRMR: .051; CFI: .923; TLI: .896) and modification indices also suggested freely estimating the direct path from *converse* to Functional Skills as an alternative model of the associations between underlying factors and Functional Skills. The updated model with this modification (Figure 4) had a higher level of fit than the initial model (BIC of initial vs. alternative model= 31,711.19 vs. 31,641.46) and explained 37% variance in *functional skills* (R^2 = .369, $p < 0.001$), had improved overall model fit and no localized areas of poor fit (e.g., largest standardized residual = .858, largest modification index = 9.041). Of note, only the paths from *converse* and Behavior Regulation were associated with Functional Skills in the updated model; Social Skills was no longer

significantly associated with Functional Skills. Further, the overall model for Functional Skills explained less variance in the outcome than the model for SMDLT (37% vs. 55%).

Discussion

As hypothesized, SMDLT was significantly associated with underlying factors of social skills, communication, and behavior regulation and the overall model explained a moderate amount of variance (55%) in the SMDLT outcome. In contrast, the model predicting discrete functional skills had fewer significant associations and described less variance (37%) in the functional skills outcome. Taken together, these findings indicate that common areas of challenge in diploma-track youth with disabilities, including social and communication skills, executive functioning, and behavior management, are more strongly associated with the ability to self-manage life tasks (e.g., managing laundry, buying items at a store, getting places outside of the home) than performance of discrete functional skills (e.g., counting change, using the phone, telling time).

The greater variance explained in the SMDLT model supports the conceptual distinction between SMDLT and foundational functional skills. While other studies have used various combinations of the NLTS2 items to capture functional skills [52–55,63,64], this is the first study using the NLTS2 data to construct a measure of SMDLT. Our measure was guided by the operationalization of self-management of daily life tasks on the PEDI-CAT: Responsibility Domain [26] and is comprised of items that are complex tasks that take place in variable or unpredictable contexts. SMDLT items are representative of the type of complex tasks that youth are expected to carry out in adulthood. Most of the items in the SMDLT factor take place in the community (i.e. buying items at a store, getting to places outside the home) and involve tasks that require the individual to coordinate multiple underlying skills over time and adjust to external contexts. Items in this measure also require social awareness and safety judgement in contexts that can vary across occasions. In contrast, the items that comprise the discrete functional skills factor represent basic functional skills that do not require the same coordination of multiple underlying factors.

Of note, the ability to carry on a conversation was an important predictor of the outcome in both models. This association was expected for SMDLT as conversational skills are required for interacting with others in order to carry out daily life tasks in the community [65]. The relationship of conversation with discrete functional skills is less clear; one potential explanation for the association with functional skills is that parents may rely on youth's ability to communicate in order to assess their child's skill level. The conversation (*converse*) variable was a complete mediator of social skills on the functional skills outcome, suggesting that social skills do not play a significant role in performance of discrete functional skills outside of being able to communicate. However, the SMDLT model indicated that social skills also had a significant direct effect on SMDLT aside from the mediation path through the conversation variable. This suggests that social skills (e.g., ability to initiate a conversation, appearing confident in social situations, etc.) are particularly relevant to the self-management of daily life tasks. Adequate social skills are necessary to be able to navigate different social interactions that take place in the varying contexts in which daily life tasks are carried out [66–68]. As these findings are from an initial exploration of the role of conversational skill as it relates to SMDLT, discrete functional skills, and underlying factors, these relations should be
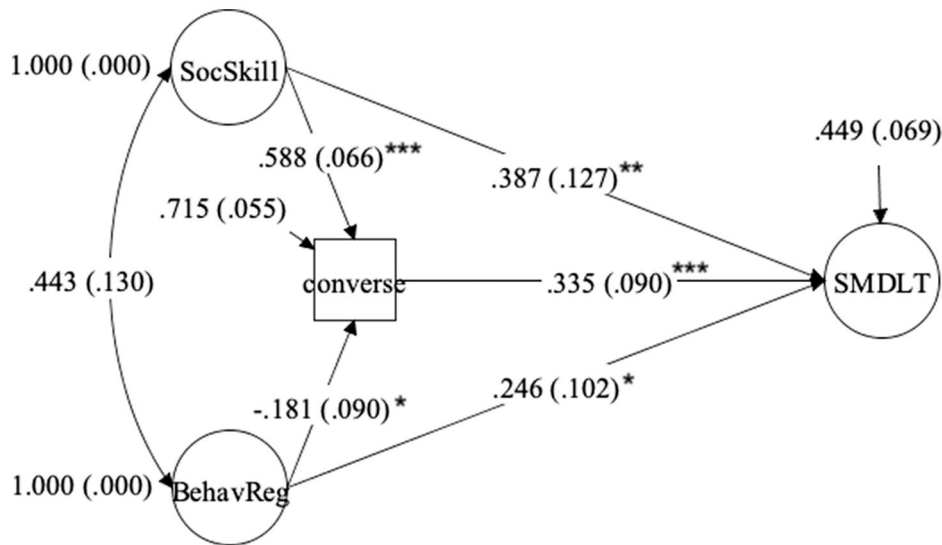
Figure 3. Model of underlying factors predicting SMDLT. Completely standardized parameter estimates and standard errors. χ^2 (102) $=$ 148.124, p $=$ .002; RMSEA: .021 (90% CI $=$ .013 $-$ .028); SRMR: .049; CFI $=$ .936; TLI $=$ .915. *p<.05; **p<.01; ***p<.001. Paths from other indicators besides convers to social skills and behavior regulation not shown.
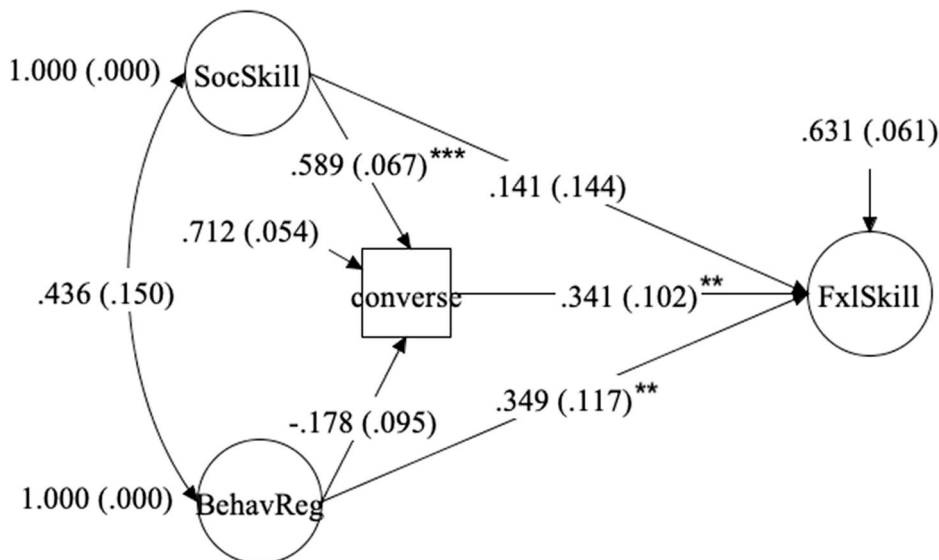

Figure 4. Model of underlying factors predicting functional skill. Completely standardized parameter estimates and standard errors. χ^2 (88) $=$ 136.450, p $<$ .001; RMSEA: .023 (90% CI $=$ .015 - .030); SRMR: .044; CFI $=$ .941; TLI $=$ .920. *p<.05; **p<.01; ***p<.001. Paths from other indicators besides convers to social skills and behavior regulation not shown.

investigated further with more complete measures of conversational skills.

The SMDLT model also had a small but significant negative association between behavior regulation and the conversation variable. This finding implies that lower behavior regulation scores are associated with better conversation ability. One potential interpretation of this finding is that youth who are quieter (perhaps reflecting lower conversation ability) are less likely to show the externalizing behaviors included in the behavior regulation factor, such as controlling one's temper when arguing or receiving criticism well. On the other hand, moderate behavioral responses may facilitate conversation and intervention [69,70], thus ultimately encouraging more self-management of tasks.

There is a growing body of evidence on the relationships between social communication skills, behavior management, EF

and daily functioning [16,19,23,39,46,47], as well as interventions that target these underlying factors in order to improve daily functioning (e.g. Cognitive Behavior Therapy [71], social skills training [72], mindfulness interventions [73]). The majority of these studies operationalize daily functioning using measures that combine discrete functional skills and complex task performance within the same measure or domain. Our findings suggest that dismantling the broad operationalization of adaptive behavior by considering SMDLT as a construct that is related yet distinct from more discrete functional skills could provide a more targeted approach to understanding the challenges in daily functioning that DT youth with disabilities may experience. Task-level performance is complex and requires coordination, flexibility, problem solving, and adaptation to *in vivo* contexts, in addition to possessing the relevant discrete functional skills. This complexity has been explored by Brown and colleagues through a study of

the everyday task of going to the grocery store, using the Test of Grocery Shopping Skills (TOGGS) [74]. This measure involves a detailed task analysis of how one completes a typical grocery shopping task in an everyday grocery store. Brown's work highlights the complexities of everyday task performance and distinguishes task performance from underlying factors, such as metacognition [75,76]. However, research analyzing everyday task performance is limited; thus, an improved understanding of self-management of daily life tasks is needed. Research describing the variation in SMDLT across different disability groups and typically developing peers, determining variations in associations of underlying factors with SMDLT across groups, and quantifying the relationship between ability to self-manage daily tasks and success in traditional adult outcomes (e.g. employment, post-secondary education, and independent living) would provide needed insight on this potential area of challenge.

Considering SMDLT as a distinct construct may provide useful guidance to design targeted interventions to enable participation in independent living and productivity for diploma-track youth with disabilities. It also suggests a potential target for measurement in intervention studies that aim to improve daily life functioning and participation in the community. Current interventions that aim to enhance daily functioning tend to focus on developing (or remediating) underlying factors like social or executive functioning skills and behavior management [71–73] but do not necessarily emphasize the actual doing of tasks in real-life contexts. In contrast, interventions to improve self-management of tasks would extend beyond teaching specific sequences of functional skills to include teaching strategies and practice coordinating underlying skills in flexible ways that meet the varying demands of tasks and diverse environments. Cognitive Orientation to daily Occupational Performance (CO-OP) [77] and Unstuck and on Target (UOT) [78] are examples of interventions that incorporate some of these principles. UOT is an executive function intervention for youth with autism in which youth learn strategies to accommodate for challenges with flexibility and other executive functions [78]. Notably, UOT uses a multi-contextual approach in which strategy teaching is embedded during typical daily activities in real life contexts at school and home. In a study comparing UOT to a traditional social skills training intervention, the UOT group demonstrated greater improvement in classroom performance compared to the social skills training group [79]. CO-OP was originally developed for children with developmental coordination disorder but has since been adapted to other populations, including adults post stroke [80–82]. Similar to UOT, CO-OP emphasizes guided self-discovery of task-specific and problem-solving strategies within real life contexts to improve functional task performance [77]. Studies using the CO-OP approach in adults post stroke demonstrate evidence of improved functional performance and generalization of skills [82] compared to interventions that employ training on component skills [80]. These findings support the effectiveness of contextually-based, task-level, strategy training interventions.

Considering SMDLT as a distinct construct and target for intervention also suggests the need to refine the approach to measuring daily functioning for academically capable youth with disabilities. In this study, use of a more refined measure enabled us to explore factors that contribute to variation in ability to self-manage daily life tasks more precisely. Self-management of daily life tasks should be measured separately from discrete functional skills in order to more specifically identify potential areas of weakness in this population. A measure of SMDLT would also provide a more precise indicator of the efficacy of interventions [83,84].

The Responsibility Domain of the PEDI-CAT is one measure that was developed to capture the extent to which youth take responsibility for managing their daily life tasks; however, other measurement approaches may need to be identified or developed.

Limitations

In this study, we explored self-management of daily life tasks using a pre-existing data set, the NLTS2. As such, the study sample is comprised of students who were identified as having a disability under United States federal special education law [51], which differs somewhat from clinical diagnostic criteria. In addition, youth in this sample was expected to meet the educational criteria for receiving a high school diploma in the United States. Diagnostic categories and requirements for graduation may differ internationally, thus limiting the generalizability of the study sample and findings. In addition, secondary analysis of an existing data set has inherent limitations [85]. One limitation of this study is that the factors representing our constructs of interest are comprised of preexisting survey items that are not specifically tailored to our research question. Thus, our analysis provides a broad, yet possibly imprecise picture of the relationships among these variables. In particular, the NLTS2 lacks items that specifically address executive functioning. It is well established that DT youth with disabilities often have EF challenges that make it difficult for them to negotiate common occurrences that they face when engaging in daily tasks, such as planning and sequencing multistep actions or adjusting their plan when something unexpected happens [33–39]. However, we were only able to use two items to capture executive functioning, limiting our ability to treat it as a separate predictor from the other underlying factors (executive function was ultimately combined with behavior management variables to create the Behavior Regulation latent factor). Theoretically, it is expected the executive functioning would influence SMDLT more than discrete functional skills but we were unable to test this direct association. There is a need to replicate these models using a large, independent data set using measures that more precisely capture these constructs.

Conclusion

Our findings support the conceptual distinction between SMDLT and discrete functional skills for diploma-track youth with disabilities, suggesting that these domains should be examined separately. These youth are assumed to have mastered the basic skills needed to adapt to typical environments in order to participate in adult roles, yet they have been reported to have reduced participation in the contexts of employment, post-secondary education, and independent living. Focusing on the construct of self-management of daily life tasks in this population of youth could facilitate clearer understanding of the challenges that likely contribute to their difficulty achieving adult outcomes commensurate with their academic performance. These findings have implications for designing targeted interventions and measures aimed at enabling participation in independent living and productivity for diploma-track youth with disabilities.

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ORCID

Elizabeth G. S. Munsell 🆔 http://orcid.org/0000-0003-2699-5328

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Appendix A. List of abbreviations

Abbreviation	Term
ABAS-3	Adaptive Behavior Assessment System-3
ADD/ADHD	Attention deficit disorder/attention deficit hyperactive disorder
BIC	Bayesian information criterion
BRIEF	Behavior Rating Inventory of Executive Function
CFA	Confirmatory factor analysis
CFI	Comparative fit index
CO-OP	Cognitive Orientation to daily Occupational Performance
DT	Diploma-track
EFA	Exploratory factor analysis
EFs	Executive functions
ESEM	Exploratory structural equation modeling
IQ	Intelligence quotient
MLR	Robust maximum likelihood estimator
NLTS-2	National Longitudinal Transition Study-2
PEDI-CAT	Pediatric Evaluation of Disability Inventory – Computer Adaptive Test
RMSEA	Root mean square error of approximation
SEM	Structural equation modeling
SMDLT	Self-management of daily life tasks
SRMR	Standardized room mean square residual
TLI	Tucker-Lewis index
UOT	Unstuck and On Target
VABS-III	Vineland Adaptive Behavior Scales-III