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Preliminary Validity and Reliability of Scores on the *Self-Determination Inventory*: Student Report Version

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Abstract

The purpose of this article is to describe preliminary psychometric characteristics of a student self-report measure of self-determination, the *Self-Determination Inventory: Student Report* version (SDI-SR), designed for youth with and without disabilities. We administered the draft assessment to 311 youth and examined item functioning using structural equation modeling and item response theory. The 50 items that demonstrated strong psychometric properties were examined for construct validity using a series of confirmatory factor analyses. Overall, the pilot measure aligned well with the theoretical framework that guided its development, demonstrating acceptable model fit in adolescents with and without disabilities. Implications for further development and practice are discussed.

Keywords

self-determination, assessment

Promoting the self-determination of students with disabilities is recognized as best practice in secondary education and transition services (Shogren, 2013; Test et al., 2009). Researchers have documented the impact of interventions to promote self-determination on self-determination (Wehmeyer, Palmer, Shogren, Williams-Diehm, & Soukup, 2013; Wehmeyer et al., 2012) and postschool outcomes (Shogren, Wehmeyer, Palmer, Rifenbark, & Little, 2015). Researchers have also found a relationship between self-determination and academic outcomes (Konrad, Fowler, Walker, Test, & Wood, 2007), including access to the general education curriculum (Lee, Wehmeyer, Palmer, Soukup, & Little, 2008; Shogren, Palmer, Wehmeyer, Williams-Diehm, & Little, 2012). This body of research suggests that embedding interventions to promote self-determination in the context of the general education classroom and curriculum creates an opportunity to teach self-determination skills, and enhance academic and postschool outcomes for all students. Providing instruction in the context of the general education classroom and curriculum is logical given that the skills and attitudes associated with self-determination (e.g., goal-setting, problem-solving, self-regulation) have relevance for all students; for example, the Common Core State Standards (Council of Chief State School Officers & National Governors Association, 2011) as well as state or local education agency content standards include objectives related to goal-setting, problem-solving, and decision-making skills (Lombardi, Kowitt, & Staples, 2014; Wehmeyer, Field, Doren, Jones, & Mason, 2004).

Given the relevance of the skills and attitudes associated with self-determination for all students, there is a need for theoretical frameworks, assessment tools, and interventions to promote self-determination that are validated for adolescents with and without disabilities and can be used in inclusive school and community settings. To address this need, Shogren and colleagues (in press) introduced causal agency theory, an extension of the functional model of self-determination first introduced to the field of special education in the early 1990s (Wehmeyer, 1992). The functional model of self-determination has exerted significant influence in the disability field, guiding the development of evidence-based interventions such as the *self-determined learning model of instruction* (Wehmeyer, Palmer, Agran, Mithaug, & Martin, 2000; Wehmeyer et al., 2012) and empirically validated assessments such as *The Arc's Self-Determination Scale* (Shogren et al., 2008; Wehmeyer & Kelchner, 1995). Causal agency theory expands the focus of the functional model, emphasizing the relevance of self-determination for all people, incorporating advances from the field of positive psychology (Lopez & Snyder, 2011) related to strengths-based assessment and intervention.

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Causal agency theory conceptualizes self-determination as a general psychological construct within the organizing structure of theories of human agentic behavior. Human agentic theories hold that agentic people engage in self-regulated and goal-directed *action*, navigating challenges in the social and ecological environments they encounter (Little, Hawley, Henrich, & Marsland, 2002). Causal agency theory provides a theoretical framework to explain *how* people come to engage in self-caused, autonomous *action*. Within this context, self-determination is defined as a

> . . . dispositional characteristic manifested as acting as the causal agent in one's life. Self-determined *people* (i.e., causal agents) act in service to freely chosen goals. Self-determined *actions* function to enable a person to be the causal agent in his or her life. (Shogren, Wehmeyer, Palmer, Forber-Pratt, et al., in press)

Self-determined *action* is characterized by three essential characteristics—volitional action, agentic action, and action-control beliefs and attitudes. These essential characteristics refer not to specific actions, but to the *function* the action serves for the individual. *Volitional action* is defined by self-initiation and autonomy. Specifically, volitional action refers to making an intentional, conscious choice based on one's preferences. Volitional actions involve the initiation and activation of causal capabilities—the capacity to cause something to happen. *Agentic action* is defined by self-regulation, self-direction, and pathways thinking. Agentic people act in service of their goals; specifically, they identify pathways that create change and self-regulate and self-direct their actions when navigating pathways, responding to challenges and opportunities as they emerge. Finally, action-control beliefs and attitudes reflect understandings about the relationship between one's actions, the means involved, and the outcomes one experiences (Little & Lopez, 1997). Adaptive control expectancy, agency beliefs, and causality beliefs enable a person to act with self-awareness and self-knowledge in an empowered, goal-directed manner. It is assumed that these essential characteristics develop across the life span, emerging as adolescents have opportunities to develop and acquire multiple, interrelated skills, referred to as component elements of self-determined action, including learning to make choices and express preferences, solve problems, engage in making decisions, set and attain goals, self-manage and self-regulate action, self-advocate, and acquire self-awareness and self-knowledge. The essential characteristics and their subdomains are summarized in the first two columns of Table 1.

Causal agency theory has direct linkages with the functional model of self-determination and assessments and interventions derived from the functional model. However, there are differences, particularly in the structure of the essential characteristics that define self-determination based on advances in positive psychology and assessment. Causal agency theory emphasizes the importance of three domains (volitional action, agentic action, and action-control beliefs and attitudes) whereas the functional model emphasized four domains (autonomy, self-regulation, psychological empowerment, and self-realization). The four domains of the functional theory are all reflected in the subdomains of causal agency theory (see second column; Table 1). Given this, there is a need for the expansion of existing interventions and assessments of self-determination to align with Causal agency theory. This has the potential to enable the application of intervention and assessment tools in inclusive contexts, providing supports for all students to develop self-determination. The purpose of this article is to describe the development and initial testing of a new student self-report measure of self-determination, the *Self-Determination Inventory: Student Report* version (SDI-SR), designed to be appropriate for self-report by youth with and without disabilities aged 13 to 22 years. Specifically, we were interested in examining the factorial validity of the assessment in students with and without disabilities as well as potential differences in self-determination across students with and without disabilities, which previous research has suggested may be present due to differential access to environments that support the development of skills and attitudes associated with self-determination (Shogren, Wehmeyer, Pressgrove, & Lopez, 2006). Our specific research questions were as follows:

> **Research Question 1:** Do the three essential characteristics of self-determined action (i.e., volitional action, agentic action, and action-control beliefs and attitudes) demonstrate good model fit for adolescents with and without disabilities (i.e., does measurement invariance hold)?
> **Research Question 2:** Do personal characteristics (i.e., age, gender, and race/ethnicity) predict the three essential characteristics of self-determined action of adolescents with and without disabilities?
> **Research Question 3:** Are there latent differences (i.e., variances, covariances/correlations, and means) in the essential characteristics in adolescents with and without disabilities?

Method

Participants

Adolescents with (n = 176) and without (n = 135) disabilities aged 12 to 22 years (M = 16.9; SD = 2.6 years) participated in the pilot testing of the SDI-SR. The majority of participants with disabilities were identified as having learning (n = 57, 32%) or intellectual disability (n = 34, 19%). Males outnumbered females in the disability group

Table 1. Sample SDI-SR Items From Each Construct With Response Scale.

Construct	Subdomain	Intent	Pilot item	Response scale
Volitional action	Autonomy[a]	Acting on the basis of preference, beliefs, interests, and abilities	1. I plan weekend activities I like to do	(1) *Disagree* (2) *Tend to disagree* (3) *Disagree/agree* (4) *Tend to agree* (5) *Agree*
Volitional action	Self-initiation	Self-governed action	11. I consider many possibilities when I make plans for my future	(1) *Disagree* (2) *Tend to disagree* (3) *Disagree/agree* (4) *Tend to agree* (5) *Agree*
Agentic action	Self-direction	Responding to challenges and opportunities	25. I make my own decisions	(1) *Disagree* (2) *Tend to disagree* (3) *Disagree/agree* (4) *Tend to agree* (5) *Agree*
Agentic action	Pathways thinking	Proactive, purposive identification of paths to a goal	31. I think of more than one way to solve a problem	(1) *Disagree* (2) *Tend to disagree* (3) *Disagree/agree* (4) *Tend to agree* (5) *Agree*
Agentic action	Self-regulation[a]	Interpersonal cognitive problem-solving	18. Hotel management scenario	Open-ended student response; scored 0, 1 or 2[b]
Action-control beliefs and attitudes	Psychological empowerment[a]	Beliefs about having what it takes to achieve goals	38. I can make good choices	(1) *Disagree* (2) *Tend to disagree* (3) *Disagree/agree* (4) *Tend to agree* (5) *Agree*
Action-control beliefs and attitudes	Self-realization[a]	Self-awareness Self-knowledge	41. It is better to be yourself than to be popular	(1) *Disagree* (2) *Tend to disagree* (3) *Disagree/agree* (4) *Tend to agree* (5) *Agree*
Action-control beliefs and attitudes	Control expectancy	Belief about link between self, means, and goal in a context	53. I have the ability to get what I want	(1) *Disagree* (2) *Tend to disagree* (3) *Disagree/agree* (4) *Tend to agree* (5) *Agree*

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Note.
a. Indicates this subdomain was an essential characteristic in the functional theory of self-determination.
b. A "0" score means that the student either gave no answer or the solution the student gave would fail to achieve the indicated ending to the story. A "1" score indicates that the answer the student provided was acceptable, but might have limited utility to achieve the ending. A "2" score indicated that the answer provided was an acceptable, adequate way to achieve the indicated ending. A score of "2" does not represent an "optimal" answer, but simply an answer that would achieve the ending. SDI-SR = *Self-Determination Inventory: Student Report* version.

(males: $n = 111$, 63%; females: $n = 65$, 37%). The group of adolescents without disabilities, however, had more females ($n = 79$, 59%). Table 2 provides additional demographic information broken down by disability group.

Settings and Recruitment

Project staff contacted assessment coordinators for school districts in Arizona, Illinois, Kansas, Maryland, New Hampshire, Oklahoma, Texas, and Vermont to recruit the pilot sample. Information was shared on the purpose and nature of the study and, if the assessment coordinator indicated interest, appropriate steps were taken to complete school district Institutional Review Board (IRB) procedures. School personnel from 16 districts or programs representing urban, semi-urban, and rural districts agreed to participate. Participating school personnel identified students, and sent home information about the study asking parents to provide informed consent for participation for students under 18 or not their own legal guardian. After informed consent was received, along with assent

Table 2. Demographic Characteristics of Sample.

	With disabilities (n = 176)		Without disabilities (n = 135)		Total (N = 311)	
Characteristic	*n*	%	*n*	%	*n*	%
Disability						
No disability	—	—	135	100	135	43.4
Learning disability	57	32.4	—	—	57	18.3
Intellectual disability	34	19.3	—	—	34	10.9
Other health impairment	29	16.5	—	—	29	9.3
Autism	26	14.8	—	—	26	8.4
Other[a]	21	11.9	—	—	21	6.8
Emotional disturbance	9	5.1	—	—	9	2.9
Gender						
Male	111	63.1	56	41.5	167	53.7
Female	65	36.9	79	58.5	144	46.3
Age						
12–13	19	10.8	34	25.2	53	17.0
14–15	37	21.0	7	5.2	44	14.1
16–17	36	20.5	21	15.6	57	18.3
18–19	49	27.8	64	47.4	113	36.3
20–22	35	19.9	9	6.7	44	14.1
M	17.1 (*SD* = 2.6)		16.6 (*SD* = 2.5)		16.9 (*SD* = 2.6)	
Ethnicity						
White	130 (132)	73.9 (75.0)	101 (104)	74.8 (77.0)	231	74.3
Black	15 (15)	8.5 (8.5)	5 (5)	3.7 (3.7)	20	6.4
American Indian/Pacific Islander	4 (4)	2.3 (2.3)	4 (4)	3.0 (3.0)	8	2.6
Asian	4 (4)	2.3 (2.3)	5 (5)	3.7 (3.7)	9	2.9
Other	21 (21)	11.9 (11.9)	14 (17)	10.4 (12.6)	35	11.3
Missing	2	1.1	6	4.4	8	2.6

Note. Numbers in parentheses represent estimates after imputing missing data. The imputation model was estimated based on 10,000 rounds of iterative refinement using the R package mice (van Buuren & Groothuis-Oudshoorn, 2011).
[a]Other includes orthopedic impairment, visual impairment, hearing impairment, and speech language impairment.

from the student, school personnel administered the assessments in individual or group settings. For students with disabilities, support (i.e., reading questions or deciphering words) was provided as needed by school personnel.

SDI-SR

Item generation. To develop the pilot version of the SDI-SR, the theoretical structure of causal agency theory (Shogren et al., in press) served as the guide for item generation. The SDI-SR was developed to represent the three theoretical domains (i.e., essential characteristics) and eight associated subdomains (see Table 1). The research team, which included theoreticians well versed in causal agency theory and disability, positive psychology, and assessment development, engaged in a series of activities to develop a pool of items for each domain and subdomain that represented (a) the breadth of content in each domain and (b) levels of self-determination across each domain. We developed operational definitions for each domain and subdomain to guide item identification and construction. A comprehensive review of the extant literature and assessments (if available) for each subdomain was conducted. This review was used to generate content areas and, as appropriate, items from other tools that could be used, when appropriate, to seed the subdomains. For example, we used psychometrically sound items from *The Arc's Self-Determination Scale* (Wehmeyer & Kelchner, 1995) to seed subdomains associated with the functional model of self-determination.

This process led to the initial draft version of the assessment that was completed by the participants. This version included 68 items. The response scale for the majority of items was a Likert-type scale, ranging from 1 (*disagree)* to 5 (*agree)*. The only exception was 6 items measuring the subdomain of self-regulation within agentic action from *The Arc's Self-Determination Scale*. These items were constructed to be means-ends problem-solving questions, and required students to read a beginning and ending to a story and fill in the middle; thus, responses were open-ended and were scored by raters using a rubric ranging from 0 to 2. Table 1 provides sample items from each subdomain and the associated response scale.

Item refinement. We assessed the functioning of the 68 items using two distinct but compatible approaches—structural equation modeling (SEM) and item response theory (IRT). The goal of the item refinement stage was to reduce the number of items on the assessment by identifying those that were not functioning as expected, or were problematic in one or both of our groups (disability or no disability). In the IRT framework, we examined items based on the indices of poor fit, low discrimination, high residual correlations, or the presence of differential item functioning (DIF) across groups. In the SEM framework, we conducted confirmatory factor analyses (CFAs) for each subdomain. CFA was used because of the strong theoretical grounds used to develop the assessment and prior empirical evidence for each domain. When the model for a domain did not fit the data well, we proceeded to examine factor loadings and modification indices to identify problematic items (i.e., items with low factor loadings <.40, items with cross-loadings, or highly correlated residuals using modification indices >5.0). During this process, despite the small sample sizes, we also explored differences in item functioning across the disability subgroups represented in the sample: no disability, high incidence disability (learning disability, emotional and behavioral disorder), intellectual disability, autism, other health impairment, and other (physical disability, vision, deaf/auditory, speech/language, traumatic brain injury, etc.). This process led to the elimination of 18 items, resulting in 50 items with roughly equal distribution across the domains and subdomains that were subject to further analysis to address the research questions.

CFAs

After the 50 items that demonstrated strong psychometric properties were identified using SEM and IRT analyses, we then conducted a series of CFAs within the SEM framework to examine the construct and factorial validity of the items identified as robust in the item-level analyses. As an initial step, we converted the raw data to a 0 to 1 scale because the self-regulation subdomain has a different scoring key (0–2 point scale) than the rest of subscales (1–5 point scale), and we wanted to examine a model that included all domains and subdomains necessitating scores be on a comparable metric (Little, 2013). After data conversion, we generated eight facet-representative parcels representing the eight subdomains identified in causal agency theory (for more information on parcels, see Little, Rhemtulla, Gibson, & Schoemann, 2013). As per the theoretical structure, there were two facet-representative parcel indicators for the volitional action construct (autonomy and self-initiation), three facet-representative parcels for the agentic action construct (self-regulation, self-direction, and pathways thinking), and three facet-representative parcels for the action-control beliefs and attitudes construct (self-realization, psychological empowerment, and control expectancies and agency and causality beliefs). After the creation of parcels, there was a small amount of missing data (average = 0.4%, range = 0%–1.3%), which were recovered by full information maximum likelihood (FIML) estimation (Mplus version 7.2; Muthén & Muthén, 1998–2012).

Model fit and parameter estimates/measurement invariance. To examine the model fit of the three-factor solution in students with and without disabilities and to meaningfully compare latent parameters, measurement invariance between two groups was examined. Tests of measurement invariance (i.e., construct comparability) consist of three sequential steps (Brown, 2015). First, the configural invariance model functions as a baseline model specifying that each group has the same pattern of fixed and free parameters with no constraints imposed across groups. Configural model fit was evaluated with several goodness-of-fit indices, including an absolute fit index of root mean square error of approximation (RMSEA) less than .08, comparative fit index (CFI) and Tucker–Lewis index (TLI) greater than .90, and standardized root mean square residual (SRMR) close to .08 or below (Hu & Bentler, 1999; Little, 2013). After estimating parameters in the configural invariance model, we calculated both coefficient alpha (Cronbach, 1951) and coefficient omega (McDonald, 2013) to examine the consistency of the SDI-SR scores across those with and without disabilities (see Widaman, Little, Preacher, & Sawalani, 2011, for more information). Second, the weak invariance model adds invariance constraints on factor loadings. Third, the strong invariance model adds equality restrictions on the intercepts, in addition to constraints from the weak invariance model. To evaluate the viability of the increasing constrains, changes in the CFI are examined; when the change in CFI is ≤.01 between two sets of nested models (configural vs. weak models and weak vs. strong models), it is justified to retain invariance constraints (Cheung & Rensvold, 2002), and it can be assumed that the same set of indicators can be used to measure and define the construct across groups. After establishing measurement invariance, we evaluated the statistical significance of the parameter estimates from the strong invariance model by dividing the unstandardized parameter estimate by its standard error (i.e., the *Wald* test). The effects-coding method of identification was used to estimate the parameters for latent constructs.

The impact of personal characteristics. Building on the strong invariance model, we added three personal characteristics (i.e., age, gender, race/ethnicity) to examine the degree to which each of these characteristics predicted the three essential characteristics of self-determined action. Age was included as a continuous variable, while gender and race/ethnicity were dummy coded. Males and females were

coded as 0 and 1, respectively. For the race/ethnicity analyses, we created two sets of dummy-coded variables. Students who identified as Caucasian served as the reference group. For the first set of comparisons, this group was compared with students who identified as African American. For the second group of comparisons, the Caucasian group was compared with all other students (except those that identified as African American). This approach was taken to account for our small sample size, while also allowing for very preliminary examination of the impact of racial/ethnic group on SDI-SR scores.

Differences in latent variances, covariances or correlations, and means. To examine latent differences across the two groups, using the final model from the tests of measurement invariance, we conducted an omnibus test for differences in the variances and covariances across groups and constructs using a likelihood ratio test. If the omnibus test indicates differences, follow-up tests are performed using chi-square difference tests to decompose differences. After evaluating differences in variances/covariances, we examined differences in latent means. As with the variances/covariances, if omnibus differences are found, follow-up comparisons are conducted using chi-square difference tests (Little, 2013).

Results

Model Fit and Parameter Estimates/ Measurement Invariance

To examine measurement invariance across the disability and no disability groups, we specified a two-group CFA model. The model fit for configural invariance was acceptable: $\chi^2(34) = 63.861$, RMSEA = .075, CFI = .976, TLI = .960, and SRMR = .038. We found, however, that the self-regulation subscale had a non-significant factor loading in both groups. Thus, we conducted subsequent analyses with a self-regulation parcel being removed to more effectively examine how other subscales function within the theoretical structure of the SDI-SR in adolescents with and without disabilities. The model without the self-regulation parcel also demonstrated satisfactory fit: $\chi^2(22) = 36.472$, RMSEA = .065, CFI = .988, TLI = .977, and SRMR = .024 (Table 3). Both weak and strong invariance were supported based on the change in CFI less than .01 for each invariance test. Table 4 provides factor loadings, intercepts, and R^2 for each parcel, and estimated latent variances obtained from the strong invariance model. These findings suggest that the three essential characteristics of self-determination can be measured using the same indicators across adolescents with and without disabilities. The latent correlations obtained from the strong invariance model were significant (Table 5), ranging from .81 to .94 for the disability group and from .91 to .99 for the without disability group.

We also calculated reliability indices using estimates obtained from the configural models. As shown in Table 6, when the self-regulation subscale was included, coefficient alphas and omegas ranged from .60 to .87 for students with disabilities and .46 to .85 for those without disabilities. The reliability indices improved significantly when the self-regulation subscale was dropped, ranging from .71 to .87 for adolescents with disabilities and .69 to .85 for those without disabilities. These reliability indices demonstrated acceptable or very near (.69) levels of internal consistency (≥.70; Ponterotto & Ruckdeschel, 2007).

The Impact of Personal Characteristics

The personal characteristics (age, gender, and ethnicity) were simultaneously included in the strong invariance model that did not include the self-regulation parcel. None of the personal characteristics demonstrated significant relations with the three essential characteristics of self-determined action in students with disabilities. However, for students without disabilities, we found significant relationships, as shown in the right-hand side of Table 7. Age significantly predicted scores in all three domains, after controlling for gender and race/ethnicity. Specifically, older adolescents tended to report higher scores on the SDI-SR. Volitional action was most sensitive to age ($\gamma = .02$, $z = 5.49$, $p < .05$). In addition, females tended to have higher scores on Volitional action than males, after controlling for age and race/ethnicity.

Differences in Latent Variances, Covariances or Correlations, and Means

After strong invariance was confirmed, differences in latent parameters between two groups were examined with likelihood ratio tests. As shown in Table 5, there were very strong correlational relations between the latent constructs. However, we continued to perform likelihood ratio tests because the test statistic under unconstrained estimation still preserves the chi-square distribution when testing for parameters on the boundary in the SEM setting, and we assumed that although the constructs were highly related, measuring each was still important (for more information, see Savalei & Kolenikov, 2008).

As shown in Table 3, equating the variances, covariances, and means across groups were not justified, and we, therefore, examined differences in each of the three constructs across groups. Differences were concentrated in the latent variances, with students with disabilities showing greater variability in their scores on all three constructs than students without disabilities. In terms of latent means, the omnibus test also suggested differences, and we conducted chi-square difference tests between nested models. Findings suggested that the two groups differed on each of

Table 3. Fit Indices for the Nested Sequence in the Two-Group CFA.

Model	χ^2	*df*	*p*	$\Delta\chi^2$	Δdf	*p*	RMSEA	RMSEA 90% CI	CFI	TLI	Constraint tenable
Null model	1,359.26	49	.00	—	—	—	—	—	—	—	—
Configural invariance	36.47	22	.03	—	—	—	.065	[.022, .101]	.988	.977	—
Weak invariance[a]	38.73	26	.05	—	—	—	.056	[.000, .091]	.990	.983	Yes
Strong invariance[a]	41.87	30	.07	—	—	—	.050	[.000, .084]	.990	.986	Yes
Homogeneity of variances/ covariances[b]	64.06	36	.00	22.19	6	.001	—	—	—	—	No
Homogeneity of variances[b]	54.83	33	.01	12.96	3	.005	—	—	—	—	No
Homogeneity of covariances[b]	52.99	33	.02	11.12	3	.011	—	—	—	—	No
Phantom (unconstrained)	41.87	30	.07	—	—	—	—	—	—	—	—
Phantom (constrained)[b]	46.75	33	.06	4.88	3	.181	—	—	—	—	Yes
Latent mean invariance[b]	70.72	33	.00	28.85	3	<.0001	—	—	—	—	No
Volitional action	65.48	31	.00	23.61	1	<.0001	—	—	—	—	No
Agentic action	64.34	31	.00	22.47	1	<.0001	—	—	—	—	No
Action-control beliefs	50.49	31	.02	8.62	1	.003	—	—	—	—	No

Note. The self-regulation subscale was not included in the model. Each nested model contains its constraints, plus the constraints of all previous, tenable models. Highlighted models indicate results from omnibus tests. CFA = confirmatory factor analysis; RMSEA = root mean square error of approximation; CI = confidence interval; CFI = comparative fit index; TLI = Tucker–Lewis index.
[a]Evaluated with CFI model test. [b]Evaluated with chi-square difference test.

Table 4. Loading and Intercept Values, Residuals, and R^2 Values for Each Parcel, and the Estimated Latent Variances.

	Equated estimates		Standardized		
Indicator	Loading (*SE*)	Intercept (*SE*)	Loading	θ	R^2
Volitional action (with disabilities): Estimated latent variance = .018					
Autonomy	0.95 (.04)	.03 (.03)	.68	.54	.46
Self-initiation	1.05 (.04)	−.03 (.03)	.82	.34	.66
Volitional action (without disabilities): Estimated latent variance = .012					
Autonomy	0.95 (.04)	.03 (.03)	.73	.47	.53
Self-initiation	1.05 (.04)	−.03 (.03)	.85	.28	.72
Agentic action (with disabilities): Estimated latent variance = .028					
Self-direction	0.99 (.04)	.01 (.03)	.91	.18	.83
Pathways thinking	1.01 (.04)	−.01 (.03)	.71	.50	.50
Agentic action (without disabilities): Estimated latent variance = .013					
Self-direction	0.99 (.04)	.01 (.03)	.79	.38	.62
Pathways thinking	1.01 (.04)	−.01 (.03)	.68	.53	.47
Action-control beliefs and attitudes (with disabilities): Estimated latent variance = .020					
Psychological empowerment	1.08 (.04)	−.06 (.03)	.91	.18	.82
Self-realization	0.92 (.04)	.09 (.03)	.78	.40	.60
Control expectancy, agency, and causality beliefs	1.01 (.04)	−.04 (.03)	.81	.35	.65
Action-control beliefs and attitudes (without disabilities) : Estimated latent variance = .013					
Psychological empowerment	1.08 (.04)	−.06 (.03)	.87	.25	.75
Self-realization	0.92 (.04)	.09 (.03)	.75	.43	.57
Control expectancy, agency, and causality beliefs	1.01 (.04)	−.04 (.03)	.79	.38	.62

Note. Estimates were obtained from the strong invariance model without the self-regulation subscale.

the three latent constructs (bottom of Table 3), with adolescents without disabilities scoring more adaptively in each area. Table 8 provides the means for each group, and the effect sizes for the differences were relatively large particularly for the volitional action (.63) and agentic action (.59) domains.

Table 5. Latent Correlations for Groups With and Without Disabilities.

Construct	Volitional action	Agentic action	Action-control beliefs and attitudes
With disabilities			
Volitional action	1		
Agentic action	.936**	1	
Action-control beliefs and attitudes	.805**	.838**	1
Without disabilities			
Volitional action	1		
Agentic action	.990**	1	
Action-control beliefs and attitudes	.906**	.962**	1

Note. Estimates are obtained from the strong invariance model without the self-regulation subscale.
**$p < .01$.

Table 6. Reliability Indices of Self-Determination Inventory.

	With disabilities		Without disabilities	
Construct	α	ω	α	ω
With self-regulation subscale				
Volitional action	.720	.711	.774	.771
Agentic action	.603	.643	.457	.600
Action-control beliefs and attitudes	.870	.868	.854	.852
Without self-regulation subscale				
Volitional action	.720	.711	.774	.769
Agentic action	.767	.762	.693	.691
Action-control beliefs and attitudes	.870	.868	.854	.852

Note. Unstandardized parameters from the configural invariance models were used to calculate omegas.

Discussion

Having reliable and valid assessment tools that can be used to assess self-determination and evaluate the impact of interventions to promote self-determination is critical to the field. And, if self-determination interventions are to be used in inclusive settings to support all students to gain critical skills associated with self-determined action (e.g., goal-setting, problem-solving, self-regulation) and to enable students with disabilities greater access the general education curriculum, assessments (and interventions) are needed that can be used with students with and without disabilities and can provide meaningful information to guide instruction and ongoing assessment and progress monitoring in both groups. The SDI-SR was designed to meet these needs, and this preliminary study suggests that the SDI-SR is a reliable and valid tool to assess the essential characteristics of self-determined action defined in causal agency theory in students with and without disabilities. In the following sections, we first acknowledge limitations of the study and then discuss implications for future research and practice.

Limitations

The results of this study provide preliminary information on the reliability and validity of the SDI-SR in youth with and without disabilities. However, there are limitations that must be considered to inform future research on the development and use of the SDI-SR. First, the study reports the results from a pilot version of the SDI-SR. As described subsequently, ongoing development activities are being undertaken to further refine the assessment, and the analyses undertaken in this study will need to be replicated with the final version of the SDI-SR. In future research, larger samples of specific disability classifications will need to be collected to allow for greater analysis of the assessment across disability groups, particularly as previous research has suggested disability-related differences (Carter, Lane, Pierson, & Glaeser, 2006; Shogren et al., 2007) and our small sample sizes for specific disability classifications (i.e., students with emotional and behavioral disorders) did not allow for such analyses.

Table 7. Gamma Weights Indicating the Impact of Age, Gender, and Ethnicity on Essential Characteristics of Self-Determined Action.

Latent construct	γ (SE)	z score	p	Standardized γ	Latent construct	γ (*SE*)	z score	*p*	Standardized γ
	Group 1: With disabilities					Group 2: Without disabilities			
Impact of age					Impact of age				
Volitional action	.00 (.01)	0.90	.37	.08	Volitional action	.02 (.00)	5.49	.00	.49
Agentic action	.01 (.01)	1.13	.26	.09	Agentic action	.01 (.01)	2.43	.02	.25
Action-control beliefs and attitudes	.01 (.00)	1.81	.07	.15	Action-control beliefs and attitudes	.01 (.00)	3.00	.00	.28
Impact of gender					Impact of gender				
Volitional action	−.00 (.03)	–0.06	.96	−.01	Volitional action	.05 (.02)	2.40	.02	.21
Agentic action	.01 (.03)	0.29	.78	.02	Agentic action	.01 (.02)	0.31	.76	.03
Action-control beliefs and attitudes	–.01 (.02)	−2.00	.84	−.02	Action-control beliefs and attitudes	.01 (.02)	0.34	.74	.03
Impact of race/ethnicity (Caucasian vs. African American)					Impact of race/ethnicity (Caucasian vs. African American)				
Volitional action	−.00 (.04)	−0.01	.99	−.00	Volitional action	.01 (.05)	0.29	.77	.03
Agentic action	.06 (.05)	1.20	.23	.10	Agentic action	.04 (.06)	0.66	.51	.07
Action-control beliefs and attitudes	.04 (.04)	1.09	.28	.09	Action-control beliefs and attitudes	.04 (.06)	0.64	.52	.06
Impact of race/ethnicity (Caucasian vs. Other)					Impact of race/ethnicity (Caucasian vs. Other)				
Volitional action	.05 (.03)	1.65	.10	.15	Volitional action	.02 (.02)	0.63	.53	.06
Agentic action	.05 (.04)	1.29	.20	.11	Agentic action	.04 (.03)	1.26	.21	.13
Action-control beliefs and attitudes	−.03 (.03)	−0.82	.41	−.07	Action-control beliefs and attitudes	.02 (.03)	0.85	.40	.08

Note. Estimates from the strong invariance model with age, gender, and race/ethnicity paths are presented (the self-regulation subscale was not included). Only significant paths are highlighted. Model fit: $\chi^2(62) = 74.084$, $p = .14$, RMSEA = .035, 90% CI = [.000, .063], CFI = .990, TLI = .985, and SRMR = .042. RMSEA = root mean square error of approximation; CI = confidence interval; CFI = comparative fit index; TLI = Tucker–Lewis index; SRMR = standardized root mean square residual.

Table 8. Estimated Latent Means and Effect Sizes.

	With disabilities		Without disabilities		
Constructs	*M*	*SE*	*M*	*SE*	Effect size[a]
Volitional action	.75	.01	.83	.01	.63
Agentic action	.74	.01	.83	.01	.59
Action-control beliefs and attitudes	.77	.01	.81	.01	.35

Note. The self-regulation subscale was not included in the model. Parameter estimates from the strong invariance model were used to calculate effect sizes.

[a]Effect size is latent *d*, where $d = (\alpha_2 - \alpha_1) / \sqrt{(n1 \times \psi 1 + n2 \times \psi 2)/(n1 + n2)}$; α_2 and α_1 are the estimated means in latent variable metric; n_2 and n_1 are the sample size for each group; $\psi 2$ and $\psi 1$ are the estimated latent variances of the distributions around the latent means of α_2 and α_1, respectively.

Implications for Future Research and Assessment Development

Despite the limitations, the results of this study provide direction for ongoing research related to the assessment of self-determination in youth with and without disabilities. Overall, the pilot version of the SDI-SR aligned well with the theoretical framework that guided its development (see Table 1). Specifically, the SDI-SR demonstrated acceptable model fit in adolescents with and without disabilities and strong reliability indices for all essential characteristics and subdomains (except self-regulation, discussed subsequently). Furthermore, measurement invariance was established, suggesting the same set of items can be used across youth with and without disabilities to measure self-determination, an important implication for the use of the tool in inclusive settings with students with and without disabilities. And, although the same set of items can be used, at the latent

level (i.e., scores on the essential characteristics), the SDI-SR did detect differences in the scores of students based on disability status. This finding is expected, as research has suggested that students with disabilities tend to report lower levels of self-determination (Shogren, Lopez, Wehmeyer, Little, & Pressgrove, 2006), perhaps because of fewer opportunities to learn and express self-determination, suggesting that the SDI-SR can potentially be used to detect differences and to better understand the influence of environmental opportunities (e.g., access to inclusive opportunities) for self-determination.

Additional research is needed with a larger sample to further examine the reliability and validity of SDI-SR, and the results of this study provide several directions for further field testing. First, the results suggested that self-regulation items need to be reconceptualized, given the issues with the reliability and factor loadings of these items. We are exploring modifying the self-regulation items from an open-ended response format to a rank ordering of best responses. This change is supported by best practices in assessment development (Downing & Haladyna, 2006), particularly as the change of response format in self-regulation alleviates the concern about scoring reliability by removing the need for an external scorer. Second, there is a need to move beyond paper and pencil–based assessment of self-determination and develop online tools that can be used by students with and without disabilities. Online tools have the potential to provide immediate feedback on self-determination scores to teachers and students, and can also embed universally designed supports (e.g., questions read aloud, definitions of words) that make the assessment tool more accessible to students with disabilities. We are also exploring alternatives to the Likert-type rating scale in an online format, which can be difficult for people with disabilities given the need to differentiate between different anchors (e.g., *never, rarely, sometimes, occasionally, often*, and *very often*; Hartley & MacLean, 2006). Slider systems that provide a line where the level of agreement can be marked (rather than necessitating the selection of a specific anchor on a Likert-type scale) have been identified as a way to reduce discrimination errors because discrete ratings are not required (Ahearn, 1997; Rausch & Zehetleitner, 2014). In online tools, marks can be automatically scored on a slider system line, increasing precision as well as discrimination. Research is needed, however, to examine the use of slider systems in youth with disabilities and its impact on scores and model fit. Further research is also needed to examine the predictive validity of the SDI-SR as the present study primarily examined the construct and factorial validity of the SDI-SR. Examinations of the degree to which scores on the essential characteristics of self-determination action predict outcomes, such as academic performance and access to the general education curriculum in students with and without disabilities are needed.

Implications for Practice

As described earlier, the results of this study suggest that that the pilot version of the SDI-SR is a valid and reliable tool for youth with and without disabilities. Establishing measurement invariance suggests that the same set of items can be used across youth with and without disabilities, and in practice, this means that educators can use the same assessment to initially assess and monitor progress on the impact of interventions to promote self-determination in youth with and without disabilities. This would enable the same assessment to be used with all students in general education settings. And, although the same items can be used, the SDI-SR differentiated between students with and without disabilities in overall scores on the essential characteristics of self-determined action, suggesting it is sensitive to contextual factors that may be important to consider in understanding current levels of self-determination and changes over time. Researchers have found differences in the self-determination of youth with and without disabilities (Shogren, Lopez, et al., 2006); however, the tools used in these studies were not developed or validated for youth with and without disabilities. The finding that the SDI-SR is equally reliable and valid in both populations and differentiates between students with and without disabilities suggests its potential use as a tool in general education classrooms.

It is important to note, however, that although there were mean differences in the essential characteristics of self-determined action based on disability label, the results (and previous research) also suggest that other factors influence the development and expression of self-determination. For example, students with disabilities had greater variability for scores than students without disabilities, perhaps, suggesting that the types of opportunities and experiences with instruction in self-determined action are more variable in this population. Furthermore, for students without disabilities, age affected scores on each of the essential characteristics, and gender affected volitional action scores. This suggests the importance, in practice, of considering the role of various contextual factors in shaping self-determination and the importance of individualizing interventions based on contextual factors, including personal characteristics such as gender, age, and disability status, as well as environmental factors such as access to previous opportunities to develop volitional and agentic action and action-control beliefs and attitudes

In practice, therefore, the SDI-SR could potentially be used to examine differences across students within a classroom to individualize instruction and supports as well as monitor changes over time as a result of instruction and supports. Shogren, Wehmeyer, and Lane (2014) have suggested that when considering the application of self-determination interventions to all students in inclusive settings, a multi-tiered system of support (MTSS) framework

could be used to guide universal instruction in self-determination for all students with more intensive instruction and supports as needed. Lombardi et al. (2014) highlighted the importance of critical-thinking skills to promote career decision making and college and career readiness for all students, with and without disabilities. A key element of providing universal instruction in self-determination and critical-thinking skills will be educators having access to tools to determine response to instruction and supports needs, and the SDI-SR has the potential to meet this need. Furthermore, by developing an online version of the SDI-SR, educators can have immediate feedback on student scores on the essential characteristics and their associated subdomains, and tailor instruction to the specific profile that students show. Research has suggested that specific domains and subdomains are differentially associated with outcomes (Shogren & Shaw, in press); thus, access to information on key postschool goals and profiles of self-determination scores could be used to individualize and tailor instruction.

Overall, there is a need for new measures of self-determination that are relevant for adolescents with and without disabilities and can be used to describe current levels of self-determination and evaluate the impact of interventions to promote self-determination. Developing effective ways to measure the essential characteristics of self-determined action emphasizes the roles of educators and support providers in assessing and building on strengths and developing instruction that is student-centered and teaches the skills needed to engage in critical self-regulated problem-solving skills to all students. The Self-Determination Inventory System will fill this need, providing a psychometrically strong tool based on a strong theoretical perspective. This article presents the initial work done to develop such a tool, and provides a framework for further research and development in this area.

Authors' Note

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