Exceptional Children
2018, Vol. 85(1) 10–27

DOI: 10.1177/0014402918782150
journals.sagepub.com/home/ecx
SAGE

Exploring the Effect of Disability, Race-Ethnicity, and Socioeconomic Status on Scores on the Self-Determination Inventory: Student Report

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Abstract

The Self-Determination Inventory: Student Report (SDI:SR) was developed to address a need in the field for tools to assess self-determination that are aligned with current best practices in assessment development and administration, and emerging research and best practices in promoting self-determination. The present study explored patterns of differences in self-determination scores across students with and without disabilities (i.e., no disability, learning disabilities, intellectual disability, autism spectrum disorder, and other health impairments) of varying racial-ethnic backgrounds (i.e., White, African American or Black, Hispanic or Latino[a], and Other) as well as the impact of receiving free and reduced price lunch (as a proxy for socioeconomic status) on self-determination scores in these groups. Findings suggest an interactive effect of disability, race-ethnicity, and free and reduced price lunch status on self-determination scores. Implications for future research and practice are discussed.

Enhanced self-determination is recognized as a critical focus of school-based supports and services (Shogren, 2013a) as well as a predictor of post-school education, employment, and community participation outcomes (Shogren, Wehmeyer, Palmer, Rifenbark, & Little, 2015; Test, Mazzotti, Mustian, Fowler, Kortering, & Kohler, 2009). As such, promoting the development of self-determination has received significant attention, particularly in the context of transition supports and services for adolescents with disabilities (Wehman, 2012). However, researchers acknowledge that the development and expression of self-determination is influenced by one's personal culture, which is shaped by multiple intersecting factors, including age, gender, disability, family background, and race-ethnicity (Trainor, 2017; Trainor, Lindstrom, Simon-Burroughs, Martin, & Sorrells, 2008). Further, access to opportunities to develop self-determination is influenced by multiple environmental factors, including the availability of culturally responsive supports for the development and expression of self-determination (Shogren, 2011), administrator and teacher perceptions regarding the importance of self-determination instruction (Cho, Wehmeyer, & Kingston, 2013), and the availability of resources in schools and communities for supporting the use of research-based interventions to support self-determination (Shogren, 2013b).

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To better understand and address the multiple personal and environmental factors that influence the development of self-determination, there is a need for assessment tools that are sensitive to the influence of personal and environmental factors. Shogren, Little, Grandfield, Raley, Wehmeyer, Lang, & Shaw (in press) described the creation of a new measure of self-determination, the Self-Determination Inventory: Student Report (SDI:SR), designed using (a) current best practices in assessment development and administration and (b) emerging theoretical frameworks for understanding the development of self-determination. The SDI:SR was developed to align with causal agency theory (Shogren, Wehmeyer, Palmer, Forber-Pratt, Little, & Lopez, 2015), an emerging theory of self-determination, and its development. Causal agency theory expands understandings of self-determination in the disability and education field to include knowledge generated in motivational (Deci & Ryan, 2012; Niemiec & Ryan, 2009) and positive psychology (Lopez & Snyder, 2011; Shogren, Wehmeyer, & Singh, 2017; Wehmeyer, 2013) related to strengths-based assessment and intervention. There is also a Parent/Teacher Report version, the Self-Determination Inventory: Parent/Teacher Report (SDI:PTR), that assesses other perspectives on a student's self-determination. Assessments in the Self-Determination Inventory System (SDIS), including the SDI:SR and SDI:PTR, are delivered through an online, accessible platform, where data can be tracked over time and organized by student, classroom, and school or site.

To better understand and address the multiple personal and environmental factors that influence the development of self-determination, there is a need for assessment tools that are sensitive to the influence of personal and environmental factors.

The SDI:SR expands on existing tools that were introduced to assess self-determination in the mid-1990s, including The Arc's Self-Determination Scale (Wehmeyer & Kelchner, 1995) and the AIR Self-Determination Scale (Wolman, Campeau, Dubois, Mithaug, & Stolarski, 1994).

In developing the SDI:SR, there was a focus on promoting relevancy for inclusive classrooms and schools implementing multitiered systems of supports that target academic, behavioral, and social-emotional outcomes for all students (Shogren, Wehmeyer, & Lane, 2016). There was also a systematic effort to integrate knowledge that has developed in the fields of education and positive psychology since the 1990s on strengths-based and culturally responsive assessment (Lopez, Pedrotti, & Snyder, 2015; Lopez & Snyder, 2003; Wehmeyer, Shogren, Little, & Lopez, 2017). Such efforts are critical given the identified centrality of skills associated with self-determination, such as goal setting and problem solving, for all children (Council of Chief State School Officers & National Governors Association, 2011; National Research Council, 2012) and the potential benefits for students with and without disabilities of targeting these skills in inclusive environments (Raley, Shogren, & McDonald, in press; Shogren, Palmer, Wehmeyer, Williams-Diehm, & Little, 2012).

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The SDI:SR includes 21 items aligned with causal agency theory. The theoretical structure of causal agency theory is provided in Table 1, as are sample items from the SDI:SR. As shown in Table 1, causal agency theory defines self-determined actions by three essential characteristics and seven component constructs. *Volitional action* involves self-initiation and autonomy, that is, making intentional, conscious choices based on one's preferences. *Agentic actions* are defined by self-direction

Table 1. Theoretical Structure of Causal Agency Theory and Associated Self-Determination Inventory: Student Report (SDI:SR) Example Items.

	Essential characteristic	Component construct	Example SDI:SR item
Self-determined action	Volitional action	Autonomy	I choose activities I want to do.
		Self-initiation	I look for new experiences I think I will like.
	Agentic actions	Pathways thinking	I think of more than one way to solve a problem.
		Self-direction	I think about each of my goals.
	Action-control beliefs	Control-expectancy	I have what it takes to reach my goals.
		Psychological empowerment	I keep trying even after I get something wrong.
		Self-realization	I know my strengths.

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and pathways thinking and involve actions that regulate one's progress toward goals and navigating challenges that emerge. Finally, *action-control beliefs* reflect the understanding and integration of understandings of the relationship between one's actions, the means involved, and the outcomes experienced. Adaptive action-control beliefs lead to positive control-expectancies and acting with self-realization in a psychologically empowered way. By promoting the component constructs through effective and culturally responsive instructional practices and supports, causal agency theory holds that the essential characteristics of self-determination develop over time, particularly during adolescence.

Shogren, Wehmeyer, Palmer, Forber-Pratt, Little, & Seo, (2017) described the pilot testing of the SDI:SR, and Shogren et al. (in press) reported on the steps taken with a large validation sample ($n = 4{,}741$) to select the final set of items and establish measurement invariance in 20 groups created by crossing disability status (i.e., no disability, learning disabilities, intellectual disability, autism spectrum disorders, and other health impairments) and racial-ethnic background (i.e., White, African American or Black, Hispanic or Latino[a], and Other). As reported by Shogren et al. (in press), an early finding was that race-ethnicity status had significant interactions with disability status, leading to the need to consider both disability and race-ethnicity in selecting the final set of items and evaluating measurement invariance.

The sample for the validation study was stratified to be representative of adolescents between the ages of 13 to 22 across multiple disability groups. Within each disability group, efforts were undertaken to promote representation across various demographic factors, particularly race-ethnicity given previous research that suggests an interactive effect of disability and race-ethnicity on self-determination scores (Shogren, Kennedy, Dowsett, Garnier Villarreal, & Little, 2014; Shogren & Shaw, 2017). For example, researchers have found that youth without disabilities tend to show higher levels of self-determination than youth with disabilities on a short version of the Arc's Self-Determination Scale (Shogren, Lopez, Wehmeyer, Little, & Pressgrove, 2006). And Shogren, Kennedy, Dowsett, & Little (2014) explored data collected using a subset of items from the Arc's Self-Determination Scale as part of the National Longitudinal Transition Study-2 (SRI International, 2000), which collected data with a nationally representative sample of adolescents with disabilities as they transitioned from school to adult life. They found that of the 12 disability categories recognized by IDEA at the secondary level, students with high incidence disabilities (i.e., learning disabilities, emotional disturbances,

speech or language impairments, and other health impairments) showed higher levels of self-determination generally compared to students with sensory disabilities (i.e., visual and hearing impairments), cognitive disabilities (i.e., autism, multiple disabilities, and deaf-blindness), intellectual disability, traumatic brain injury, and orthopedic impairments. Shogren and colleagues then explored the impact of race-ethnicity when crossed with the disability groups using data from NTLS-2, finding complex patterns of differences based on disability and race-ethnicity (Shogren, Kennedy, Dowsett, Garnier Villarreal, et al., 2014; Shogren & Shaw, 2017). For example, Shogren, Kennedy, Dowsett, Garnier Villarreal, et al., (2014) found that Hispanic or Latino(a) youth tended to score the lowest in levels of self-determination across disability groups. African American or Black youth with intellectual disability tended to score higher than other youth; however, the opposite pattern was identified in youth with sensory disabilities. Other researchers have qualitatively explored the impacts of race-ethnicity on the expression of self-determination (Leake & Boone, 2007; Shogren, 2011; Trainor, 2005), again suggesting differences in the expression of self-determined actions, necessitating ongoing research.

One purpose of this paper was to explore the impact of disability and race-ethnicity on scores on the newly introduced SDI:SR. Given that measurement invariance has been established in other studies (Shogren et al., in press), a logical next step was to explore difference in latent means and variance to determine if the SDI:SR detected similar or different patterns compared to previous research with other assessments. Secondarily, recognizing the multiple, intersecting, personal, and environmental factors that shape the outcomes of adolescents, we chose to explore the additional impact of free and reduced price lunch status as a proxy for socioeconomic status on self-determination scores. Although there are limitations to using free and reduced price lunch status as a proxy for socioeconomic status (Harwell & LeBeau, 2010; National Forum on Education Statistics, 2015), the inclusion of this variable expands on existing research, which has rarely explored the impact of environmental factors on self-determination scores. There are additional personal and environmental factors that potentially impact self-determination scores (e.g., gender, teacher attitudes, family practices), but research on educational outcomes, generally, has consistently suggested a complex pattern of relationships between socioeconomic status, race-ethnicity, and educational outcomes (Reardon, 2016).

Researchers have found that when accounting for socioeconomic status, different patterns of outcomes are often found. These differences are hypothesized to result from the increased likelihood of youth from diverse racial-ethnic backgrounds being in under-resourced schools or experiencing less access to high-quality teachers and instruction (Mason-Williams, 2015; Papay, Murnane, & Willett, 2015). However, to our knowledge, no systematic research has explored the interactive effects of disability, race-ethnicity, and socioeconomic status on self-determination scores. A better understanding of these factors can potentially provide meaningful information to consider related to the relative importance of systems-level (e.g., promoting equity in access to resources in schools, reducing segregation) and person-level (e.g., promoting skill development, promoting the use of culturally responsive practices) interventions to enhance self-determination.

As such, we addressed two research questions:

1. What are the patterns of differences in latent self-determination means and variances for adolescents with varying disability labels (i.e., no disability, learning disabilities, intellectual disability, autism spectrum disorder, and other health impairment) and racial-ethnic backgrounds (i.e., White, African American or Black, Hispanic or Latino[a], and Other)?
2. What impact does the inclusion of free and reduced price lunch status have on the patterns of differences in latent self-determination means for adolescents with varying disability labels (i.e., no disability, learning disabilities, intellectual disability, autism spectrum

disorder, and other health impairments) and racial-ethnic backgrounds (i.e., White, African American or Black, Hispanic or Latino[a], and Other)?

Method

Sample and Recruitment

A sampling plan was developed to enable analyses of measurement invariance, cross-group differences, and construct validity for the newly developed SDI:SR. The sample generated for these purposes, utilized by Shogren et al. (in press) to select the final 21 items for the scale and test measurement invariance for 20 groups created by crossing disability and race-ethnicity, was used for the present analyses. To generate the sample, after receiving Institutional Review Board (IRB) approval for the research, a multipronged recruitment effort was undertaken, including (a) seeking participation from school districts and postsecondary institutions in rural, suburban, and urban areas across the United States and (b) disseminating recruitment materials through local, state, and national organizations' email listservs and social media accounts. The sampling plan for the SDI:SR was designed to be representative of youth with varying disability statuses (i.e., no disability, learning disability, intellectual disability, other health impairments, autism spectrum disorders, emotional and behavioral disorders, and sensory disabilities) between the ages of 13 and 22. To determine disability status, self-report information was collected from adolescents using a standardized demographic form, and then disability was confirmed by an adult familiar with the adolescent (e.g., special education teacher, district administrator). We structured the sample to attempt to provide adequate coverage of each disability group in two-year age bands between 13 and 22 (e.g., 13- and 14-year-olds, 15- and 16-year-olds). Within each disability group, we also attempted to ensure representation of other personal factors (e.g., race-ethnicity, gender) to enable further subgroup analyses. To enable this outcome, we closely monitored sampling cell counts, adjusting recruitment efforts as needed. Because of the large-scale and diverse recruitment methods (e.g., emailing distribution lists, pushing out information about the project to multiple local, state, and national organizations), the percentage of groups approached who agreed to participate could not be calculated.

In total, 4,741 respondents, with ages ranging from 13 to 22 ($M = 16.50$, $SD = 2.31$) from 39 states, participated in the initial validation study of the SDI:SR. As mentioned, Shogren et al. (in press) reported the steps undertaken to finalize the SDI:SR items and establish measurement invariance (i.e., the same set of items can be used across disability and racial-ethnic groups). Given the focus on the interaction of disability and race-ethnicity described previously, this led to sample restrictions in certain disability groups, creating a need to drop certain groups (e.g., participants with sensory disabilities and emotional and behavioral disabilities) from the multigroup analyses. For the present analysis, a 20-group model consistent with Shogren, et al. (in press) was estimated. These 20 groups contained 4,165 respondents, 87.85% of the total validation sample. Additional demographic information was collected from adolescents on a standardized demographic form as well as from teachers or administrator who completed the SDI:PTR. One variable that teachers reported on was student eligibility for free and reduced price lunch, which was used to address Research Question 2. A majority of the sample (70.5%) was eligible for free and reduced price lunch, per the SDI:PTR. Frequencies and percentages of the 20 groups along with other descriptive statistics reported on the SDI:SR are in Table 2.

Additional measures were administered concurrently during the validation study to allow for examination of the validity of the scale in future research. Because of the number of items a given participant was required to complete, items from the measures were administered using a three-form planned missing protocol (Little & Rhemtulla, 2013). The multiform planned missing approach reduced burden on the participants and assessment reactivity, and promoted cost savings (Lang & Little, 2016; Little, Jorgensen, Lang, & Moore, 2014). Participants were randomly assigned to

Table 2. Sample Descriptive Statistics for 20 Disability Groups and All Other Respondents.

	n	%
Totals	4,165	100.00
No disability, White	594	14.26
No disability, African American or Black	753	18.08
No disability, Hispanic or Latino(a)	699	16.78
No disability, Other race-ethnicity	323	7.76
Learning disability, White	448	10.76
Learning disability, African American or Black	172	4.13
Learning disability, Hispanic or Latino(a)	305	7.32
Learning disability, Other race-ethnicity	114	2.74
Intellectual disability, White	142	3.41
Intellectual Disability, African American or Black	70	1.68
Intellectual disability, Hispanic or Latino(a)	48	1.15
Intellectual disability, Other race-ethnicity	39	0.94
Autism spectrum disorder, White	145	3.48
Autism spectrum disorder, African American or Black	25	0.60
Autism spectrum disorder, Hispanic or Latino(a)	38	0.91
Autism spectrum disorder, Other race-ethnicity	22	0.53
Other health impairment, White	123	2.95
Other health impairment, African American or Black	37	0.89
Other health impairment, Hispanic or Latino(a)	29	0.70
Other Health Impairment, Other race-ethnicity	39	0.94
Age		
13–14	923	22.23
15–16	1,353	32.48
17–18	1,074	25.79
19–20	529	12.70
21–22	305	7.32
M	16.50	*SD* = 2.31
Gender		
Male	2,295	55.10
Female	1,870	44.90

one of the three forms and administered a survey that included a select subset of items. All items were paired with each other item on at least one of the three forms to ensure covariance coverage. Because of the random assignment of participant to form, the missing data were missing completely at random (MCAR), ensuring no bias in any of the parameter estimates used to determine the adequacy of the items as indicators of the constructs.

Self-Determination Inventory: Student Report

SDI:SR includes 21 items that are rated using a slider scale with anchors of *disagree* and *agree*; an innovative approach to reducing discrimination errors, as discrete ratings are not required (Ahearn, 1997; Rausch & Zehetleitner, 2014). In the online system, ratings made on the slider scale are converted to scores ranging from 0 to 99. Users also have access to embedded accessibility features (e.g., audio playback, in-text definitions). A paper-and-pencil version was made available during the validation study to ensure the participation of schools that had limited access to technology and/or Internet, and an overlay was used to score the visual scale from 0 to 20. The paper-and-pencil version was then rescaled to match the online version ([paper-and-pencil score / 20] × 99) prior to analyses.

Shogren et al. (in press) provide additional details on the selection of the 21 items and measurement invariance testing.

Analysis

The first research question examined the pattern of similarities and differences in the latent means and variances of the 20 groups generated by crossing disability and race-ethnicity to better understand the impact of disability and race-ethnicity on self-determination scores. The second research question examined the additional predictive effects of free and reduced price lunch status. As a first step to address these purposes, we examined correlation matrices for the 20 groups to determine the best way to model the data based on the factor structure of the SDI:SR (see Table 1) and our research goals. Our primary interest was in overall self-determination scores. Based on the correlation matrices, we determined that the best approach was to model a single self-determination construct with the seven component constructs as indicators, as shown in Figure 1 (see online supplementary material). The individual questions for each of the seven component constructs were averaged to create parceled indicators. This differed from the validation study (Shogren et al., in press) in which invariance testing was conducted on the three essential characteristics with the component constructs as indicators as the intent was to ensure measurement invariance within each domain. However, there were high correlations between each essential characteristic, suggesting that an overall self-determination score was both warranted and may be useful to model in future analyses. Further, in practice-based applications, the component constructs represent the level at which instruction can occur, which suggests the importance of understanding the influence of the seven component constructs on overall self-determination scores. For this reason, we repeated invariance testing on the seven-indicator model with a single overall self-determination construct (see Figure 1 in the online supplementary material).

Configural, weak, and strong models were estimated to evaluate equality of form, factor loadings, and indicator intercepts, respectively. Cheung & Rensvold (2002) fit statistic guidelines were used to evaluate change in model fit between measurement invariance testing steps. Specifically, the threshold for change in the Comparative Fit Index (ΔCFI) was set to < 0.010. If ΔCFI was less than that amount, then parameter estimates could be equated without significant reduction in model fit. The imputed data sets described in Shogren et al. (in press) that emerged from the multiform planned missing approach were used for this analysis. Following best practice, the imputed data sets were generated from multiple imputation processes that imputed at the item level. Results from imputed data contained larger standard errors to reflect uncertainty in the estimates due to missingness, a property that controls Type I error rates. Adjusted standard errors and data that were MCAR enabled us to be confident about recovering unbiased estimates with corrected statistical results (Enders, 2010). All indicators were continuous on a scale from 0 to 99 and approximately normally distributed with skewness $< |2|$ and kurtosis < 7, so models were estimated with the maximum likelihood (ML) estimator in Mplus 7.2 (Muthén & Muthén, 1998–2015). Use of Mplus and the ML estimator also enabled nested model testing with the imputed data sets via the Wald test on effects of equating estimates. The scale of the latent variable was set with effects coding to obtain final estimates that were in the metric of the original questions (Little, 2013).

After measurement invariance testing, the strong model with equated factor loadings and equated indicator intercepts was used in a nested model testing process to evaluate invariance of the latent means and variances across the 20 groups. A systematic process guided the identification of the latent parameters that could be equated across groups, and a final model was estimated that specified the pattern of free and fixed latent means and variances across the 20 groups. This final model was compared to the strong model to ensure that both sets of latent

Table 3. Measurement and Latent Invariance Testing Fit Statistics.

	χ^2	*df*	*p*	Wald	Δ*df*	*p*	RMSEA	LB	UB	CFI	TLI	SRMR	ΔCFI
Measurement invariance													
Configural—equal structure	555.22	280	.00	—	—	—	0.069	0.060	0.077	0.988	0.982	0.018	—
Weak—equal factor loadings	682.41	394	.00	—	—	—	0.059	0.052	0.067	0.988	0.987	0.052	0.000
Strong—equal indicator intercepts	966.62	508	.00	—	—	—	0.066	0.060	0.072	0.981	0.984	0.066	0.007
Latent invariance													
Latent means—all equal	—	—	—	68.71	19	<.001							
Latent means—final	990.781	525	.00	22.54	17	.165							
Latent variance—all equal	—	—	—	183.95	19	<.001							
Latent variance—final	997.48	524	.00	30.89	16	.014							
Final latent means and variances	1026.36	541	.00	53.32	33	.014							

Note. RMSEA = root mean square error of approximation; LB = lower bound; UB = upper bound; CFI = Comparative Fit Index; TLI = Tucker-Lewis Index; SRMR = standardized root mean square residual.

parameters could be equated without a significant loss in model fit. To control the Type I error rate due to the number of separate models that were estimated in this analysis stage, α was set to .005. To explore the magnitude of the mean differences between groups, the last part of the analysis computed latent *d* (Little, 2013), a standardized effect size interpreted like Cohen's *d*. The exact formula is:

$$Latent\ d = \frac{\alpha_{2j} - \alpha_{1j}}{\sqrt{\frac{n_1\psi_{1j} + n_2\psi_{2j}}{n_1 + n_2}}}$$

where α_{1j} refers to the latent mean of the first group, which is subtracted from α_{2j}, the latent mean of the second group. The denominator computes the pooled standard deviation ($\sqrt{\psi_{pooled}}$) of the two groups with the size of the group determining the proportion of variance each group contributes to the statistic.

To address the second research question, we added a covariate to examine the additional predictive effect of free and reduced price lunch status (yes or no) as a proxy for socioeconomic status on self-determination scores in the 20 groups. Specifically, we generated estimates of latent mean differences for self-determination scores in our 20 groups, comparing students eligible for free and reduced price lunch to students not eligible for free and reduced price lunch.

Results

The model specified in Figure 1 (in the online supplemental material) shows measurement invariance across the 20 groups, consistent with Shogren et al. (in press). Specifically, when compared to the model with equal structure across groups, there was no change in CFI in the weak model after factor loadings were equated across the 20 groups. Equated intercepts in the strong model resulted in a CFI of 0.981, a reduction of 0.007 from the weak model. Complete fit statistics for the three models and latent invariance testing are provided in Table 3. After confirming measurement invariance based on the model in Figure 1 (in the online supplemental material), reliability of the measure was calculated with the omega statistic (McDonald, 2011). For the overall sample of 4,165 respondents, $\omega = 0.96$. Standardized factor loadings all exceeded 0.70, a value that indicated more shared variance in the self-determination construct than

Table 4. Unstandardized and Standardized Factor Loadings (λ), Standard Error (*SE*), and Fraction Missing.

	Unstandardized			Standardized		
	λ	*SE*	Fraction missing	λ	*SE*	Fraction missing
Action-control beliefs						
Control-expectancy	1.04	0.007	0.10	0.87	0.011	0.17
Self-realization	1.01	0.008	0.07	0.81	0.013	0.09
Psychological empowerment	0.99	0.008	0.11	0.87	0.011	0.16
Agentic action						
Pathways thinking	1.03	0.007	0.14	0.90	0.010	0.20
Self-direction	1.04	0.007	0.12	0.90	0.010	0.21
Volitional action						
Self-initiation	0.98	0.008	0.08	0.84	0.012	0.09
Autonomy	0.91	0.010	0.04	0.73	0.016	0.05

Note. The scale was set with effects coding.

unique to the component constructs. Unstandardized and standardized factor loadings, standard errors (*SE*), and fraction missing are listed for the indicators in Table 4. Fraction missing is interpreted as the percent of variance in the estimate that is due to missing information.

After confirming measurement invariance, nested model testing was used to address our first research question. All latent means could not be equated, suggesting differences among the 20 groups, so groups were compared to determine which latent means could be equated across groups. Differences were observed across the five disability groups (i.e., no disability, learning disabilities, intellectual disability, autism spectrum disorder, and other health impairments) within White respondents. Adolescents who identified as White with no disability or learning disabilities had similar latent means ($\alpha = 75.71$, $SE = .054$). White respondents in the intellectual disability, autism spectrum disorder, and other health impairment groups also had latent means that could be equated with each other ($\alpha = 69.99$, $SE = 1.03$), although their means were significantly lower than those for White students with no disability or learning disabilities. Latent means could be equated in the remaining 15 groups ($\alpha = 71.23$, $SE = 0.44$) across disability status and race-ethnicity, a result partly due to larger variances, which in turn resulted in larger standard errors. Table 5 contains latent estimates and standard errors, both freely estimated in the strong model and equated where possible in the final model.

Latent variance results were similar to the latent mean testing results with one difference. Latent variances for African American or Black respondents were significantly larger than all other groups' responses ($\psi = 630.26$, $SE = 28.14$). The only group that had a similar variance were respondents with intellectual disability who identified as Hispanic or Latino(a) ($\psi = 762.74$, $SE = 160.51$); but in the final latent variance model, respondents in the Hispanic or Latino(a) or Other race-ethnicity groups, regardless of disability, were equated on the latent variance parameter.

It is important to note that some of the standard errors were large due to the small group size, such as those for respondents with autism spectrum disorder in the Other race-ethnicity category or respondents with another health impairment who identified as Hispanic or Latino(a). To better understand true group differences, separate from significantly different as determined by the a priori alpha level, latent *d* effect sizes were computed from the strong model. Each

Table 5. Latent Means and Variances From the Strong Invariant Model and the Final Model.

	Latent Means				Latent Variances			
	Strong		Final		Strong		Final	
Group	α	*SE*	α	*SE*	ψ	*SE*	ψ	*SE*
No disability, White	76.05	0.70	75.71	0.54	273.87	16.83	280.43	12.43
No disability, African American or Black	72.09	0.89	71.23	0.44	580.88	30.76	630.26	28.14
No disability, Hispanic or Latino(a)	71.97	0.83	71.23	0.44	463.20	25.68	458.85	16.62
No disability, Other race-ethnicity	69.83	1.29	71.23	0.44	519.76	42.12	458.85	16.62
Learning disability, White	75.25	0.81	75.71	0.54	274.01	19.85	280.43	12.43
Learning disability, African American or Black	70.75	2.04	71.23	0.44	698.17	76.99	630.26	28.14
Learning disability, Hispanic or Latino(a)	72.63	1.16	71.23	0.44	389.20	33.20	458.85	16.62
Learning disability, Other race-ethnicity	71.78	1.81	71.23	0.44	352.36	49.52	458.85	16.62
Intellectual disability, White	66.57	2.06	69.99	1.03	576.16	71.16	506.45	44.36
Intellectual disability, African American or Black	63.70	3.42	71.23	0.44	799.54	138.20	630.26	28.14
Intellectual disability, Hispanic or Latino(a)	62.57	4.04	71.23	0.44	762.74	160.51	458.85	16.62
Intellectual disability, Other race-ethnicity	70.60	3.30	71.23	0.44	391.96	94.08	458.85	16.62
Autism spectrum disorder, White	70.58	1.77	69.99	1.03	426.41	52.95	506.45	44.36
Autism spectrum disorder, African American or Black	72.99	5.52	71.23	0.44	742.69	214.83	630.26	28.14
Autism spectrum disorder, Hispanic or Latino(a)	72.81	3.20	71.23	0.44	358.17	88.92	458.85	16.62
Autism spectrum disorder, Other race-ethnicity	74.31	3.55	71.23	0.44	244.46	84.12	458.85	16.62
other health impairment, White	71.84	1.70	69.99	1.03	331.74	45.10	280.43	12.43
Other health impairment, African American or Black	62.85	4.50	71.23	0.44	731.31	173.77	630.26	28.14
Other health impairment, Hispanic or Latino(a)	70.64	4.10	71.23	0.44	467.37	127.65	458.85	16.62
Other health impairment, Other race-ethnicity	70.05	3.58	71.23	0.44	474.60	113.27	458.85	16.62

group was compared to White respondents with no disability. All effect sizes were negative, which indicated self-determination latent means were smaller in comparison to White respondents with no disability. As expected from the nested model testing, White respondents with learning disabilities had the smallest effect size of −0.05. In absolute terms, the two groups with the largest effect sizes were Hispanic or Latino(a) respondents with intellectual disability and African American or Black respondents with other health impairments ($d = -0.76$). Interpreted, the latent mean of self-determination for these two groups was three-quarters of a standard deviation smaller than the latent mean for White respondents with no disability. Latent *d* statistics for all 19 groups as compared the White group with no disability are provided in Table 6.

Adding free and reduced price lunch status to the model highlighted the interactive effects of disability, race-ethnicity, and socioeconomic status. Mean estimates for self-determination (see Table 7; comparison group is the peer group not eligible for free and reduced price lunch) were statistically significantly lower for students without disabilities across races and ethnicities who were eligible for free and reduced price lunch. The same pattern was found for students with intellectual disability who identified as African American or Black and were eligible for free and reduced price lunch. To assess the effects of eligibility independent of sample size, latent *d* was again calculated. The effect sizes for students without disabilities across racial and ethnic groups who were eligible for free and reduced price lunch compared to their peers in the same racial-ethnic group not eligible for free and

Table 6. Latent *d* Effect Size for Each Group Compared to White Respondents With no Disability.

Group	Latent *d*
No disability, African American or Black	−0.19
No disability, Hispanic or Latino(a)	−0.21
No disability, Other race-ethnicity	−0.33
Learning disability, White	−0.05
Learning disability, African American or Black	−0.28
Learning disability, Hispanic or Latino(a)	−0.19
Learning disability, Other race-ethnicity	−0.25
Intellectual disability, White	−0.52
Intellectual disability, African American or Black	−0.68
Intellectual disability, Hispanic or Latino(a)	−0.76
Intellectual disability, Other race-ethnicity	−0.32
Autism spectrum disorder, White	−0.31
Autism spectrum disorder, African American or Black	−0.18
Autism spectrum disorder, Hispanic or Latino(a)	−0.19
Autism spectrum disorder, Other race-ethnicity	−0.11
Other health impairment, White	−0.25
Other health impairment, African American or Black	−0.76
Other health impairment, Hispanic or Latino(a)	−0.32
Other health impairment, Other race-ethnicity	−0.35

reduced cost lunch were medium to large, ranging from −0.42 to −0.95. The effect size was also large for African American or Black youth with intellectual disability who were eligible for free and reduced price lunch (d = −0.95) compared to their African American or Black peers who were not eligible for free and reduced price lunch. Based on absolute effect sizes <.20, eligibility for free and reduced price lunch did not change the self-determination scores for White youth with learning disabilities and Hispanic or Latino youth with either intellectual disability (d = −0.11) or other health impairments (d = −0.07). Self-determination scores were most affected by eligibility for free and reduced price lunch for youth with autism spectrum disorder who identified as African American (d = −1.35) or Hispanic or Latino(a) (d = −1.27).

Discussion

The purpose of this paper was twofold. The first goal was to determine if the SDI:SR was sensitive to differences in self-determination scores in youth with and without disabilities of varying racial-ethnic backgrounds. This is important as previous research has suggested differences based on disability and race-ethnicity (Shogren, Kennedy, Dowsett, Garnier Villarreal, et al., 2014; Shogren & Shaw, 2017), but the sensitivity of the SDI:SR to these differences had not yet been evaluated. As such, establishing the sensitivity of the SDI:SR is an important first step to enable the use of the scale across diverse students in today's schools and classrooms. The present analyses suggest that if either personal characteristic (disability or race-ethnicity) was considered in isolation, there would be a strong potential for misinterpretation of patterns of differences in scores (see Table 6). This finding must be considered by researchers as syntheses of the literature have suggested that race-ethnicity is rarely considered in existing research (Hagiwara, Shogren, & Leko, 2017; Shogren, 2011).

Establishing the sensitivity of the SDI:SR is an important first step to enable the use of the scale across diverse students in today's schools and classrooms.

The second goal was to examine the intersectionality of disability, race-ethnicity, and free and reduced price lunch status (as a proxy for socioeconomic status) to provide direction for future research and practice. This line of work is particularly important as it has implications for future considerations of the level at which self-determination interventions are conceptualized. The finding that free and

Table 7. Effects of Eligibility for Free and Reduced price lunch on Self-Determination Latent Means.

		Free lunch					
Group	No free lunch	*B*	*SE*	β	*z*	*p*	Latent *d*
No disability, White	76.39	−15.64	4.73	−0.14	−3.31	.001*	−0.95
No disability, African American or Black	73.54	−15.15	2.98	−0.19	−5.09	<.001*	−0.64
No disability, Hispanic or Latino(a)	72.82	−8.92	2.80	−0.12	−3.19	.001*	−0.42
No disability, Other race-ethnicity	71.32	−15.52	4.29	−0.20	−3.62	<.001*	−0.69
Learning disability, White	75.30	−0.46	2.85	−0.01	−0.16	.873	−0.03
Learning disability, African American or Black	74.04	−11.33	4.41	−0.20	−2.57	.010	−0.44
Learning disability, Hispanic or Latino(a)	73.92	−8.57	3.21	−0.16	−2.67	.018	−0.44
Learning disability, Other race-ethnicity	73.14	−9.11	5.01	−0.17	−1.82	.069	−0.49
Intellectual disability, White	67.60	−6.96	5.76	−0.10	−1.21	.227	−0.29
Intellectual disability, African American or Black	71.62	−24.09	6.69	−0.40	−3.60	<.001*	−0.93
Intellectual disability, Hispanic or Latino(a)	63.16	−3.15	10.35	−0.05	−0.30	.761	−0.11
Intellectual disability, Other race-ethnicity	72.35	−5.19	6.88	−0.12	−0.76	.451	−0.26
Autism spectrum disorder, White	70.48	4.94	12.36	0.03	0.40	.689	0.24
Autism spectrum disorder, African American or Black	79.48	−32.43	12.17	−0.48	−2.67	.008	−1.35
Autism spectrum disorder, Hispanic or Latino(a)	76.24	−21.78	8.02	−0.42	−2.72	.007	−1.27
Autism spectrum disorder, Other race-ethnicity	73.73	6.36	12.37	0.12	0.51	.607	0.41
Other health impairment, White	72.34	−4.45	5.35	−0.08	−0.83	.406	−0.25
Other health impairment, African American or Black	68.71	−15.47	8.94	−0.28	−1.73	.083	−0.60
Other health impairment, Hispanic or Latino(a)	71.07	−1.41	8.86	−0.03	−0.16	.873	−0.07
Other health impairment, Other race-ethnicity	67.07	12.96	8.22	0.25	1.58	.115	0.61

Note. The standard deviation for the whole group was used in the calculation of latent *d*. The numerator was calculated as eligible for free lunch minus not eligible for free lunch.
*significant at $\alpha < .005$.

reduced cost lunch explained additional variability in self-determination scores suggests that future research should consider the need for systems-level interventions that focus on environmental change (e.g., promoting equity in financial resources, promoting inclusion and access to self-determination interventions for students with disabilities and from diverse racial-ethnic backgrounds, etc.) along with student-level interventions to promote self-determination skills.

Overall, the findings suggest, as in previous research, that White students without disabilities consistently score highest on the SDI:SR compared to adolescents from other racial-ethnic backgrounds and with disabilities. However, there were limited differences between White adolescents with and without learning disabilities. Instead, the largest disability-based differentiations in scores resulted from comparisons between White adolescents without disabilities and youth with autism spectrum disorders, intellectual disability, and other health impairments. Within disability groups, there was a general pattern of disparities between White adolescents and those from diverse racial-ethnic backgrounds, although White adolescents with autism spectrum disorders tended to score lower than those with autism spectrum disorders from other racial-ethnic backgrounds. When examining the additional predictive effects of socioeconomic status, however, it becomes clear that disability and race-ethnicity

are not the only factors that influence self-determination scores, and exploring other factors may begin to enable greater understanding the specific patterns of differences observed on the SDI:SR.

Across almost the entire sample (as shown in Table 7), youth who were eligible for free and reduced price lunch status had lower self-determination scores than their peers with the same disability, and racial-ethnic characteristics not eligible for free and reduced price lunch. This suggests a significant impact of socioeconomic status on self-determination scores, particularly as in some cases, racial-ethnic differences in self-determination scores decreased when considering free and reduced price lunch status. This highlights the importance of considering systems-level interventions and the impact of systemic barriers. This is particularly important as African American or Black and Hispanic or Latino(a) students' self-determination scores were consistently lower, and these students are likely to face larger systemic barriers associated with under-resourced schools and less access to high-quality teachers and instruction (Mason-Williams, 2015; Papay et al., 2015). These findings are consistent with research on other educational outcomes and suggest the need for ongoing examination of the impact of socioeconomic status and poverty on self-determination, and further consideration of the best way to target systemic interventions to address the disparate outcomes that result from inequities at the student, school, and community levels for diverse youth.

There were differential impacts of free and reduced price lunch status across the disability and racial-ethnic groups that must also be considered when developing future research and practice directions. For example, White youth without disabilities showed significant differences in self-determination scores based on eligibility for free and reduced price lunch status across racial-ethnic groups with moderate to large effects sizes. White students with learning disabilities had limited differences based on free and reduced price lunch status, but students from other racial-ethnic backgrounds with learning disabilities showed more disparate outcomes when eligible for free and reduced price lunch, again suggesting complex intersections of disability, race-ethnicity, and socioeconomic status. Further research is needed to explore how each of these factors interacts with systemic inequalities in school-based experiences, specifically, the quality of educational services and supports that students have access to and how these specific factors impact self-determination. As noted previously, these issues cannot be considered independently of systemic barriers that may be differentially experienced by youth from differing racial-ethnic backgrounds who are and are not living in poverty. The interactional nature (Cole, 2010) of one's personal cultural identity and experiences with systemic barriers and the experience of power (or the lack thereof) must be further examined to devise interventions at the systems level to increase not only opportunities for self-determination but also address systematic inequalities that limit opportunities for self-determination.

Further confirming the intersectionality of these factors and the need for systems-level as well as student-level interventions was the finding that when examining disability and race-ethnicity alone, youth with autism spectrum disorders who were White tended to have lower self-determination scores than youth from other racial-ethnic backgrounds, but when accounting for free and reduced price lunch status, youth with autism spectrum disorders who were African American or Black and Hispanic or Latino(a) had the largest differences in scores compared to their peers who were not receiving free and reduced price lunch. This suggests that the experiences in school of youth with autism spectrum disorders from diverse backgrounds who experience lower socioeconomic status may introduce specific risks that should be further explored. Data have suggested underidentification of children with autism spectrum disorders from diverse backgrounds (Travers & Krezmien, 2018; Travers, Krezmien, Mulcahy, & Tincani, 2014) and the impact of who receives this classification in school systems, the characteristics of the schools these youth are educated in, and the impact on outcomes should be further explored.

Another group that was significantly impacted by free and reduced price lunch status was adolescents with intellectual disability who were African American or Black, with youth who received free and reduced price lunch showing large disparities in self-determination scores. African American or Black youth with intellectual disability have been repeatedly identified as a group at significant risk for disparate outcomes in school and post-school (Newman et al., 2011). Researchers have suggested that African American or Black youth with intellectual disability are at significant risk for not receiving high-quality special education supports and services, in large part because of the disproportionate numbers of African American or Black youth with intellectual disability living in poverty and the impact of systemic barriers and power differentials in shaping experiences, opportunities, and outcomes. The present study suggests that disproportionate access to effective education may also differentially impact self-determination, suggesting the need for ongoing, targeted research on the experiences of this group to implement systemic solutions that improve outcomes and address demonstrable inequalities.

Differences in self-determination scores based on personal factors such as disability and race-ethnicity should not be simply interpreted as differences in personal capacity per se but instead differences shaped by limited opportunities and supports that are further shaped by systemic barriers and lead to demonstrable inequalities.

Overall, these findings confirm the importance of considering multiple personal and environmental factors, the complexity of the intersection of personal and environmental factors in influencing outcomes, and the need for ongoing work that explores other factors, including gender and family and teacher attitudes, beliefs, and practices. These findings also suggest that, as has been suggested by other researchers, differences in self-determination scores based on personal factors such as disability and race-ethnicity should not be simply interpreted as differences in personal capacity per se, but instead differences shaped by limited opportunities and supports that are further shaped by systemic barriers and lead to demonstrable inequalities. Further work is needed, but the findings suggest that researchers interested in issues pertaining to self-determination must begin to move beyond only targeting student- or person-level interventions and also explore and address systems-level factors that impact outcomes related to self-determination. Additionally, there is a need for ongoing data collection utilizing complex sampling plans that can enable analysis of the complex personal and environmental factors that impact outcomes. Including self-determination assessments in school-wide data systems and population-level studies can enable more effective analysis of the various factors that impact self-determination, informing assessment and intervention practices.

Limitations

There are limitations in the present analyses that must be considered in interpreting the results. First, as noted, the SDI:SR validation sample was structured to be representative of disability groups, including students without disabilities, across adolescence. Although the intent was to sample for other personal factors within the disability and age group bands, as we did not systematically stratify for each of these factors, this resulted in smaller samples in several cells when race-ethnicity was crossed with disability status and even more restricted samples when eligibility for free and reduced price lunch status was considered. As such, we could not include all disability groups (i.e., sensory disabilities and emotional and behavioral disabilities were dropped) in the present analyses. This limitation introduces a need for ongoing research. Further, even in the included groups, there were large standard errors in estimates in some disability by race-ethnicity groups, likely resulting from the small sample size and variability in responses.

This is a sign of heterogeneity of experiences within the single race-ethnicity categories that we used to group respondents for analysis, and future work is needed to allow for more systematic examination of the factors that influence self-determination scores by collecting larger representative samples.

Second, we utilized free and reduced price lunch status as a proxy for socioeconomic status, which is common in education research. Although the two variables are correlated, as noted in the introduction, researchers are increasingly finding that free and reduced price lunch status is less relevant as a proxy for socioeconomic status, particularly as free and reduced price lunch programs are being expanded (Harwell & LeBeau, 2010; National Forum on Education Statistics, 2015), which was confirmed in our sample given the large number of youth eligible for free and reduced price lunch. Future data collection efforts should consider the inclusion of other indicators of socioeconomic status, such as household income or eligibility for other means-tested programs, as well as collect and analyze school- and community-level data on economic conditions and the quality of educational supports and services that are available to students to enable more robust analyses.

Third, we modeled the data as shown in Figure 1 (in the online supplementary material). However, Table 1 provides the theoretical structure of causal agency theory, which included the seven component constructs, organized into three essential characteristics that define self-determination. We chose to focus on overall self-determination as defined by the component constructs given our interest in overall self-determination scores and the role of the component constructs in instruction that promotes change in self-determination. With larger sample sizes, we may be able to model the full complexity of the theoretical framework, including the essential characteristics. This may provide useful information about differences at the level of the essential characteristics and the structure of the scale. Fourth, data were also collected on the SDI:PTR as part of the validation study. This study did not look at differences between the perspectives of youth and the adults that support them, and future research is needed in this area. Fifth, data from the validation study were not structured to look at sensitivity of the SDI:SR to change over time. The data provided a point-in-time examination of differences in overall self-determination, and further work is needed to explore developmental profiles of self-determination scores to better understand how differences emerge over time or are influenced by instruction or intervention at the system or person-level.

Conclusion

More work is needed to explore the intersectionality of personal and environmental factors that lead to differences in self-determination scores to develop interventions that address the personal and environmental factors that shape self-determination outcomes. The analyses presented here suggest that there is likely an interactive effect of restricted opportunities, financial resources, and a lack of culturally responsive supports for self-determination that lead to inequalities. There is a pressing need to study the impacts of systemic inequalities experienced by diverse youth and youth living in poverty on self-determination. In practice, given the intersection of these factors, there is a need to consider how to systematically assess, plan for, and implement a "flexible self-determination perspective" (Shogren, 2011) that integrates cultural responsiveness into self-determination instruction at the student level as well as the school and district levels in the context of broader school reform efforts to address systematic inequalities. Further, there is a need to address the disparities in access to the resources that disproportionality affects certain groups of students who are scoring lower on the SDI:SR. Until this occurs, there will continue to be disparities in self-determination scores as adolescents with disabilities, those from diverse racial-ethnic backgrounds, and those who are impacted by poverty are more at risk for restrictions in their access to appropriate, culturally responsive self-determination opportunities, supports, and instruction.

Authors' Note

The research reported here was supported by the Institute of Education Sciences, U.S. Department of Education, through Grant R324A130065 to the University of Kansas. The opinions expressed are those of the authors and do not represent views of the Institute or the U.S. Department of Education.

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Manuscript received December 2017; accepted May 2018.