

Examining the Reliability and Validity of the *Supports Intensity Scale–Children’s Version* in Children With Autism and Intellectual Disability

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Abstract

This study compared the reliability, validity, and measurement properties of the *Supports Intensity Scale–Children’s Version* (SIS-C) in children with autism and intellectual disability ($n = 2,124$) and children with intellectual disability only ($n = 1,861$). The results suggest that SIS-C is a valid and reliable tool in both populations. Furthermore, the results of multi-group confirmatory factor analyses suggest that measurement invariance can be established across the two groups but that latent differences are present. Specifically, children with autism and intellectual disability tend to have higher intensities of support needs in social activities across age cohorts (5- to 6-, 7- to 8-, 9- to 10-, 11- to 12-, 13- to 14-, and 15- to 16-year-olds), and children with intellectual disability only tended to have stronger correlations among support need domains measured on the SIS-C. Implications for applying the SIS-C to assessment and support planning are described.

Keywords

supports needs, intellectual disability, individualized planning

The introduction of the social-ecological model of disability by the World Health Organization in its International Classification of Functioning, Disability, and Health (ICF; World Health Organization, 2001, 2007) and the supports paradigm (Thompson et al., 2009) have provided a framework for understanding disability as a function of the interaction between personal competencies and environmental demands. This prompts a focus on identifying and providing supports to address discrepancies between an individual’s personal competencies and the demands or requirements posed by settings and activities that are encountered in an interdependent, inclusive society. *Support needs* is defined as a psychological construct referring to the pattern and intensity of support a person requires to participate in activities associated with typical human functioning. *Supports* are resources and strategies that enhance human functioning, and should be aligned with an individual’s unique support needs (Thompson et al., 2009). Although everyone uses supports, the types and intensity of supports needed by people with disabilities are assumed to be different from those needed by most people in terms of intensity, duration, and type. Personal characteristics, such as the presence of intellectual disability (ID) and/or autism, are assumed to

influence the profile of supports needed to participate in activities associated with typical human functioning (Thompson et al., 2009).

Classification in both ID and autism has begun to include reference to supports and assessment of intensities of support needs. Beginning with the ninth edition of the American Association on Intellectual and Developmental Disabilities’ (AAIDD) terminology and classification manual (Luckasson et al., 1992), ID has been characterized as the fit between a person’s competencies and the context within which he or she functions, shifting from previous conceptualizations that viewed disability as a problem residing within a person. Diagnostic criteria linked to deficits in intellectual functioning and adaptive behavior remained in place, but assumptions

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were added to the definition of ID asserting that “with appropriate personalized supports over a sustained period, the life functioning of the person with intellectual disability generally will improve” (Luckasson et al., 1992, p. 1). This perspective introduced a focus on developing frameworks to assess and plan for individualized supports. Relatedly, the most recent revision of the *Diagnostic and Statistical Manual of Mental Disorders* (5th ed. [DSM-5]; American Psychiatric Association [APA], 2013) shifted classification of autism spectrum disorder (ASD) from an array of five distinct developmental disorders to a three-level system based on the amount of support required in social communication and restricted, repetitive behavior. Level 3 designates the need for very substantial support, Level 2 the need for substantial support, and Level 1 the need for some support. Thus, evidence of unique support needs that most others from the general population do not experience is an indicator of both ASD and ID. Differences in support needs across these two groups, however, have never been directly tested.

Supports Intensity Scale (SIS)

To address the need for assessments of intensities of support needs, the first standardized, norm-referenced measure of the support needs of people with intellectual and developmental disabilities (IDDs), the SIS (Thompson et al., 2004) was developed. It was normed with people with IDD between the ages of 16 and 64 and has been widely adopted nationally and internationally. In recent years, the need for a tool for children was identified. The *Supports Intensity Scale—Children’s Version* (SIS-C; Thompson, Wehmeyer, Hughes, Shogren, Little, Copeland, et al., in press) was developed to provide a standardized support needs assessment for children with IDD aged 5 to 16.

Information about the development of the SIS-C can be found in Thompson, Wehmeyer, Hughes, Shogren, Little, Seo, et al. (in press). However, it is important to note that given the range of ages to be assessed with the SIS-C (5–16 years), a critical assumption was that support needs would be confounded with age because younger children would likely have higher intensities of support than older children. For this reason, the decision was made to stratify the standardization sample by age cohorts: 5- to 6-, 7- to 8-, 9- to 10-, 11- to 12-, 13- to 14-, and 15- to 16-year-olds. Within each age cohort, the sample was further stratified to ensure that the range of intellectual functioning/adaptive behavior of children was represented. Three classifications were used (i.e., mild, $IQ > 55$; moderate, $IQ = 40–55$; severe/profound, $IQ < 40$). Thompson et al. (in press) and Seo, Little, Shogren, and Lang (2015) described the characteristics of the norming sample and information on the reliability, validity, and process used to develop norms. Of note is that a large sample of students with autism and ID were included in the standardization sample, given the co-occurrence of

these conditions. However, differences in these two groups were not examined as part of the norming process. Therefore, research is needed that examines similarities and differences in the support needs of children with ID without an additional diagnosis of autism (ID-ONLY), and children diagnosed with both ID and autism (ID-ASD). Previous studies have focused only the assessment of support needs in children with ID-ONLY, however, there may be unique profiles of support needs for those with ID-ASD, given the core diagnostic criteria related to social communication and restricted, repetitive behavior associated with ASD (APA, 2013). Such analyses have the potential to inform further assessment, intervention, and supports planning. To that end, this article addressed the following questions.

Research Question 1: Do children with ID-ASD versus children with ID-ONLY show differences in their exceptional medical or behavioral support need scores (SIS-C; Section 1)?

Research Question 2: Is the standardized portion of the SIS-C (Section 2) reliable in the measurement of support needs of children with ID-ASD, and is the reliability comparable with children with ID-ONLY?

Research Question 3: Does the standardized portion of the SIS-C (Section 2) demonstrate validity in the measurement of support needs of children with a diagnosis of ID-ASD; and, is the validity comparable with children with a diagnosis of ID-ONLY?

Research Question 4: Can measurement invariance be established within age cohorts in the measurement of support needs of children with a diagnosis of ID-ASD and children with ID-ONLY?

Research Question 5: Are there latent differences within age cohorts in support needs of children with ID-ASD and children with ID-ONLY?

Method

Participants

The data analyzed for the present analyses were from the SIS-C norming sample (Thompson, Wehmeyer, Hughes, Shogren, Little, Seo, et al., in press). All analyses undertaken to norm the SIS-C explored support needs in the total norming sample, stratified by a priori age bands (5–6, 7–8, 9–10, 11–12, 13–14, 15- to 16-year-olds). Analyses indicated measurement invariance across age bands, but specific patterns of latent differences, justifying the importance of analyzing SIS-C data by age bands. In the present analyses, we split the SIS-C norming sample into two groups: (a) children with ID-ASD and (b) children with ID-ONLY. Information used to classify students into the two groups (ID-ASD and ID-ONLY) was collected from school and state disability service systems and included the diagnostic

Table 1. Demographic Characteristics.

Variable	Autism and ID (<i>n</i> = 2,124)		ID only (<i>n</i> = 1,861)	
	<i>n</i>	%	<i>n</i>	%
Gender				
Male	1,614	76.0	1,094	58.8
Female	474	22.3	725	39.0
Missing	36	1.7	42	2.3
Data source				
State ID/DD system	1,459	68.7	1,422	76.4
School district	665	31.3	439	23.6
Age cohort				
5–6	317 (317)	14.9 (14.9)	194 (194)	10.4 (10.4)
7–8	335 (335)	15.8 (15.8)	226 (226)	12.1 (12.1)
9–10	462 (470)	21.8 (22.1)	300 (311)	16.1 (16.7)
11–12	409 (424)	19.3 (20.0)	393 (403)	21.1 (21.7)
13–14	379 (379)	17.8 (17.8)	439 (442)	23.6 (23.8)
15–16	199 (199)	9.4 (9.4)	285 (285)	15.3 (15.3)
Missing	23	1.1	24	1.3
Student's intelligence level				
<25 or profound	124 (128)	5.8 (6.0)	335 (347)	18.0 (18.6)
25–39 or severe	482 (512)	22.7 (24.1)	379 (400)	20.4 (21.5)
40–55 or moderate	776 (822)	36.5 (38.7)	544 (574)	29.2 (30.8)
55–70 or mild	632 (662)	29.8 (31.2)	523 (540)	28.1 (29.0)
Missing	110	5.2	80	4.3
Student's adaptive behavior level				
Profound	160 (160)	7.5 (7.5)	403 (403)	21.7 (21.7)
Severe	627 (642)	29.5 (30.2)	424 (434)	22.8 (23.3)
Moderate	782 (810)	36.8 (38.1)	553 (570)	29.7 (30.6)
Mild	505 (512)	23.8 (24.1)	440 (454)	23.6 (24.4)
Missing	50	2.4	41	2.2
Ethnicity				
White	1,161	54.7	1,079	58.0
Black	354	16.7	466	25.0
Hispanic	244	11.5	140	7.5
Multiple ethnic backgrounds	153	7.2	84	4.5
Asian/Pacific Islander	133	6.3	26	1.4
Other	42	2.0	31	1.7
Native American	10	0.5	16	0.9
Missing	27	1.3	19	1.0

Note. Numbers in parentheses are estimates after imputing the missing data. ID = intellectual disability; DD = developmental disability.

label(s) that were indicated in the child's educational or service record. Consistent with the standardization process of the SIS-C, we analyzed the data by the six age cohorts.

Children with ID and autism (ID-ASD). The sample consisted of 2,124 children with ID-ASD distributed across the a priori age bands. Males comprised 76% (*n* = 1,614) of the sample, whereas females were 22% (*n* = 474). The majority of protocols were collected from state disability service systems (*n* = 1,459, 69%) with the rest collected from school districts (*n* = 665, 31%). Table 1 provides further demographic characteristics.

Children with ID only (ID-ONLY). The sample was comprised of 1,861 children with ID-ONLY. Males comprised 59% (*n* = 1,094) of the participants of Group 2, whereas females were 39% (*n* = 725). Data were collected from state disability service systems (*n* = 1,422, 76%) or school districts (*n* = 439, 24%). Further demographic characteristics are in Table 1.

Procedures

The SIS-C is completed by a qualified interviewer. To serve as an interviewer, a person must have (a) completed at least

a bachelor-level degree in a field such as education, social work, or psychology; and (b) been trained in administration. State DD systems that were currently using the SIS were contacted and asked to use the SIS-C for children they were serving; interviewers currently administering the SIS were trained in the SIS-C. To promote representativeness in the data, the SIS-C team received a federal grant and trained interviewers in school districts across geographic regions of the country. Data from either a DD system or school district in 23 states were obtained, representing all geographic regions of the United States.

The scale is completed via a semi-structured interview with two or more *respondents* who know the child well. The interviewer focuses on gathering information about the child's support needs to function successfully (i.e., fully participate) in typical settings. A respondent can be a parent, relative, guardian, educational assistant, direct support professional, work supervisor, teacher, or any other individual who works or lives with the child being evaluated. There were 694 interviewers who participated in collecting data. The majority of interviewers were female (81%) and most had a graduate degree and more than 10 years of experience in the field. The interviewers had known the target students for an average of 1.1 years ($SD = 1.79$ years). Across interviews, 12,050 respondents participated. In all interviews, at least two respondents participated and in 14% of interviews more than two respondents participated. Family members were the most frequent respondent (28%), followed by teachers (13%), direct support providers (5%), and paraprofessionals (5%). The average time that respondents had known participants was 6 years ($SD = 4.99$ years).

Measure

The SIS-C has two sections. Section 1, the Exceptional Medical and Behavioral Support Needs section lists common medical conditions (e.g., postural drainage, tube feeding, turning, or positioning) and problem behaviors (e.g., prevention of property destruction, prevention of self-injury, prevention of wandering), and provides the opportunity for raters to identify other types of medical and behavioral concerns. The assumption is that certain medical conditions and challenging behaviors predict that a child will require increased levels of support, regardless of his or her relative intensity of support needs in other life domains. For example, a child who elopes will require additional support, regardless of his or her level of needs in other areas of life. A scale ranging from 0 to 2 is used to rate the relative significance of supports needed to manage medical conditions and challenging behaviors. This information is not used in generating standard scores or support needs profiles, but scores on the exceptional medical and behavioral support needs sections are represented as a total score and if the total score is larger than 5 or if a rating of

2 (extensive support need) is made for any item, planning teams should give medical and/or behavioral support needs special consideration.

Section 2, *Support Needs Index Scale*, is the standardized portion of the scale. Standard scores for each of the seven support need domains (described below) are provided as a standard composite score (referred to as the *Support Needs Index* score). The *Support Needs Index* score provides an overall measure of the intensity of a child's support needs, as well as a meaningful comparison of a child's support needs with the larger population of children with IDD. Importantly for educators and support providers, the completion of the SIS-C also generates a support needs profile. Standard scores are calculated and graphed for each child in each life domain (subscale), providing an indication of which areas of life a child may need relatively less or more intensive supports. Doing so provides critical information for the development of support plans and (within schools) Individualized Education Programs (IEPs).

Section 2 of the SIS-C includes 61 items organized into seven support need domains or subscales. Each item is rated on a 5-point scale on the following three dimensions: type (the nature of support that is needed), frequency (how often support is needed), and time (how much total daily time is needed to provide support). Because the domains/subscales have different numbers of items and to maintain the metric of the original scale, responses on these three dimensions are averaged to generate a score for each item. The seven support need domains/subscales are as follows:

- *Home Life* (nine items)—activities related to living in a household (e.g., eating, using toilet);
- *Community and Neighborhood* (eight items)—activities completed as a function of being a member of a community or neighborhood (e.g., participating in leisure activities that require physical activity, complying with basic community standards, rules, and/or laws);
- *School Participation* (nine items)—activities associated with participating in school community (e.g., being included in general education classrooms, following classroom rules);
- *School Learning* (nine items)—activities associated with acquiring knowledge and/or skills while attending school (e.g., learning academic skills, learning how to use problem solving);
- *Health and Safety* (eight items)—activities that assure safety and health across environments (e.g., communicating health issues and medical problems, responding in emergency situations);
- *Social* (nine items)—activities that pertain to social integration (e.g., maintaining conversation, coping with changes in routines, and/or transitions across social situations); and

- *Advocacy* (nine items)—activities related to acting as a causal agent in one's life (e.g., expressing preferences, communicating wants and needs).

Data Analysis

Pre-analysis steps. There was a small amount of missing data on the age variable ($n = 47$, 1.2%), which was imputed using the Amelia package (Honaker, King, & Blackwell, 2011) in R (R Core Team, 2013). Consistent with the norming process for the SIS-C and analyses of its psychometric properties, we created parcels to specify measurement models and examine latent differences for Section 2 (Seo et al., 2015). The parceling scheme and rationale described in Seo et al. (2015) was adopted for all relevant analyses. Further information on the norming process, including the results of confirmatory factor analyses (CFAs) across age cohorts for the norming sample can be found in Thompson et al. (in press).

Research Question 1—Exceptional Medical and Behavioral Support Needs

To examine differences in exceptional medical and behavioral support needs, we calculated total scores as well as the percentage of children in the ID-ASD and the ID-ONLY groups that were rated a 2 on at least one item on each scale. We then examined mean differences for the two groups in medical and behavioral needs, as well as whether there were any differences in the proportion of people scoring above 2. We examined this for the group as a whole, and for the age cohorts.

Research Question 2—Internal Consistency Reliability

Two types of reliability indices were calculated to examine the consistency of the SIS-C scores across children with ID-ASD and ID-ONLY: coefficient alpha (Cronbach, 1951) and coefficient omega (McDonald, 2013) at the item and parcel level. Although Cronbach's alpha is the most frequently reported reliability index, it requires that factor loadings equally contribute to the latent variable, which is rarely achieved in applied social sciences (Schmitt, 1996). Thus, we also calculated coefficient omega (Widaman, Little, Preacher, & Sawalani, 2011), which assumes different factor loadings.

Research Question 3—Validity

For criterion-related validity, we examined intercorrelations between respondents' estimated ratings of the participants' support needs and their actual SIS-C scores in children with ID-ASD and with ID-ONLY. To generate estimated ratings

of support needs, two respondents were asked to estimate a participant's support needs for each need domain on a 5-point Likert-type scale (from 1 = *low support needs* to 5 = *high support needs*). Because ratings of the two respondents were highly correlated ($r \geq .8$), we created a new construct by equating two factor loadings (i.e., respondents' ratings) to provide more accurate estimates.

In terms of construct validity, we examined latent correlations among the seven support need domains in children with ID-ASD and ID-ONLY within each of the six age cohorts. We also examined latent relationships between SIS-C scores and two key diagnostic areas used for the identification of an ID (i.e., intelligence and adaptive behavior).

Research Questions 4 and 5—Measurement Invariance and Latent Differences

We conducted six separate, two-group CFAs. Each of the six tests represented one of the age cohorts, and differences across the two disability groups were tested. Multiple-group CFA involves tests of measurement invariance and tests of population heterogeneity (Brown, 2015). Tests of measurement invariance consist of a series of sequential evaluations: (a) configural invariance identifying the baseline model with identification constraints (the least restricted model), (b) weak invariance that restricts the factor loadings to be equal across groups (nested within the configural model), and (c) strong invariance that places invariance constraints on measurement intercepts (nested within the weak model). Configural invariance is evaluated with standard model fit indices (i.e., root mean square error of approximation [RMSEA], Comparative Fit Index [CFI], Tucker Lewis Index [TLI], and Standardized Root Mean Square Residual [SRMR]). Weak and strong invariances are evaluated by the change in CFI; if ΔCFI is less than .01 between nested models (i.e., configural vs. weak, weak vs. strong), the invariance is regarded as tenable (Cheung & Rensvold, 2002). Measurement invariance establishes the degree to which constructs are comparable across groups, which is a critical step to move on further tests of population heterogeneity.

After establishing measurement invariance, we tested population heterogeneity by examining across-group differences. Tests of population heterogeneity involve (a) tests of homogeneity of latent variances and covariances (if groups differ in variances and covariances in this omnibus test, additional tests are needed to decompose differences) and (b) tests of latent mean invariance (if groups differ in latent means, follow-up tests are performed to identify which sub-groups have different means in each support need domain). For population heterogeneity tests, we used likelihood ratio tests (i.e., χ^2 difference tests between a model of non-invariance and a model of invariance) to identify the statistical significance (Gonzalez & Griffin, 2001).

Table 2. Exceptional Medical and Behavioral Support Need Scores.

Age cohort	Autism and ID		ID alone		t test (M difference)		Autism and ID		ID alone		Chi-square test (proportion difference)	
	M	SD	M	SD	T	p	Frequency ^a	%	Frequency ^a	%	χ^2 (df)	p
Medical support needs												
Total sample	.14	.16	.30	.31	20.39	.00	1,051	49.5	1,147	61.7	59.67 (1)	.00
5–6 age cohort	.11	.13	.31	.33	8.43	.00	146	46.1	126	64.9	17.25 (1)	.00
7–8 age cohort	.15	.18	.35	.31	8.47	.00	191	57.0	166	73.5	15.76 (1)	.00
9–10 age cohort	.15	.18	.35	.32	10.01	.00	253	53.8	209	67.4	14.29 (1)	.00
11–12 age cohort	.15	.17	.33	.32	9.68	.00	206	48.8	260	64.7	21.08 (1)	.00
13–14 age cohort	.14	.16	.28	.29	8.52	.00	172	45.4	258	58.5	14.07 (1)	.00
15–16 age cohort	.13	.13	.23	.30	4.96	.00	83	41.7	128	44.9	.49 (1)	.48
Behavioral support needs												
Total sample	.48	.35	.26	.30	21.12	.00	1,345	63.4	724	39.0	236.61 (1)	.00
5–6 age cohort	.42	.38	.22	.26	7.11	.00	175	55.2	72	37.1	15.77 (1)	.00
7–8 age cohort	.50	.36	.25	.27	9.42	.00	230	68.7	98	43.4	35.56 (1)	.00
9–10 age cohort	.47	.34	.27	.31	8.43	.00	295	62.8	143	46.1	21.00 (1)	.00
11–12 age cohort	.49	.33	.27	.32	9.53	.00	274	64.9	149	37.1	63.99 (1)	.00
13–14 age cohort	.51	.36	.27	.30	10.55	.00	247	65.2	166	37.6	61.80 (1)	.00
15–16 age cohort	.47	.36	.25	.32	6.83	.00	124	62.3	96	33.7	38.73 (1)	.00

Note. ID = intellectual disability.

^aRepresents the frequency of people in each group who were rated a 2 on at least one item on the Exceptional Medical and Behavioral Scale.

Results

Research Question 1: Exceptional Medical and Behavioral Support Need Scores

Table 2 provides the mean scores and percentages of children who had at least one rating of 2 for the ID-ASD and the ID-ONLY. Significant differences were found across age groups, with children with ID-ASD tending to have lower exceptional medical support need scores and higher exceptional behavioral scores. Similarly, the proportion of children with ID-ASD who had a rating of 2 or higher on at least one item tended to be lower for medical but higher for behavior. The only non-significant difference was medical support needs in the 15 to 16 age cohort.

Research Question 2: Internal Consistency Reliability

Table 3 provides coefficient alphas and coefficient omegas at the item and parcel levels. Due to space consideration, we only present the results for the total sample, but findings were similar within each age band. At the item level, both coefficient alphas and coefficient omegas exceeded .90 for all domains, demonstrating excellent internal consistency ($\alpha \geq .9$, $\omega > .9$; Kline, 2000; McDonald, 2013). At the parcel level, we also found excellent internal consistency for total samples ($\alpha \geq .9$, $\omega > .9$) and for all six stratified age bands ($\alpha \geq .89$, $\omega \geq .89$).

Research Question 3: Validity

Criterion-related validity. The intercorrelations between SIS-C scores and respondents' estimates of support needs across

the two disability groups and age cohorts are presented in Table 4. Correlations for children with ID-ONLY are in parentheses. All correlations in Groups 1 and 2 were significant at $p < .01$ and exceeded .35, the minimum criterion to determine criterion-related validity (Hammill, Brown, & Bryant, 1992).

Construct validity. As shown in the lower portion of Table 4, moderate to strong correlations were found among seven support need domains scores, indicating that subscales of the SIS-C measure interrelated but distinct aspects of support needs. In children with ID-ASD (correlations not in parentheses), correlations ranged from .57 to .91, with all intercorrelations significant at the .01 level. In children with ID-ONLY (correlations in parentheses), the correlations were slightly higher ranging from .66 to .94. Next, we examined latent relationships between support needs and IQ and support needs and adaptive behaviors. As shown in Table 5, each support need domain was significantly correlated with levels of intelligence in children with ID-ASD and ID-ONLY. However, children with ID-ONLY tended to have higher correlations. A similar pattern was found for adaptive behavior.

Research Question 4: Measurement Invariance in Each Age Band

Six sets of parallel two-group (ID-ASD and ID-ONLY) CFAs were conducted for six age bands. Each set of analysis demonstrated measurement invariance between the two groups (please contact the authors for the full results of tests of measurement invariance, including the factor loadings

Table 3. Reliability Indices at the Item and Parcel Levels.

Total sample	Autism and ID			Total sample	ID only		
	Construct	α	ω		Construct	α	ω
Total (item)	HLA	.910	.909	Total (item)	HLA	.943	.944
	CNA	.934	.936		CNA	.940	.941
	SPA	.924	.929		SPA	.934	.941
	SLA	.946	.947		SLA	.952	.953
	HSA	.922	.923		HAS	.937	.939
	SA	.942	.942		SA	.953	.953
	AA	.914	.916		AA	.941	.943
Total (parcel)	HLA	.905	.905	Total (parcel)	HLA	.945	.947
	CNA	.936	.937		CNA	.945	.946
	SPA	.920	.923		SPA	.928	.932
	SLA	.935	.936		SLA	.947	.947
	HSA	.935	.935		HSA	.952	.952
	SA	.952	.953		SA	.960	.961
	AA	.937	.941		AA	.952	.956

Note. ID = intellectual disability; HLA = Home Living activities; CNA = Community and Neighborhood activities; SPA = School Participation activities; SLA = School Learning activities; HSA = Health and Safety activities; SA = Social activities; AA = Advocacy activities.

Table 4. Intercorrelations of SIS-C Scores With Rater Estimates of Abilities and Intercorrelations of SIS-C Scores for Participants With Autism and ID and (ID Only).

Total sample	HLA	CNA	SPA	SLA	HSA	SA	AA
Intercorrelations of SIS-C scores with rater estimates of abilities							
Respondent HLA	.71 (.85)						
Respondent CNA		.63 (.78)					
Respondent SPA			.67 (.79)				
Respondent SLA				.64 (.72)			
Respondent HSA					.66 (.77)		
Respondent SA						.62 (.69)	
Respondent AA							.55 (.67)
Intercorrelations of SIS-C scores							
HLA	1.00						
CNA	.84 (.89)	1.00					
SPA	.77 (.84)	.84 (.87)	1.00				
SLA	.64 (.67)	.76 (.77)	.86 (.89)	1.00			
HSA	.76 (.86)	.85 (.91)	.82 (.89)	.78 (.82)	1.00		
SA	.71 (.76)	.79 (.78)	.81 (.83)	.76 (.77)	.88 (.87)	1.00	
AA	.69 (.77)	.80 (.83)	.79 (.84)	.77 (.82)	.89 (.90)	.87 (.89)	1.00

Note. Every correlation is significant at $p < .01$. Correlations outside of parentheses represent participants with ID and autism and correlations within the parentheses represent participants with ID only. SIS-C = *Supports Intensity Scale—Children's Version*; ID = intellectual disability; HLA = Home Living activities; CNA = Community and Neighborhood activities; SPA = School Participation activities; SLA = School Learning activities; HSA = Health and Safety activities; SA = social activities; AA = advocacy activities.

from the CFA models). Next, both weak and strong invariance in each age band were supported based on changes in CFI ($0 \leq \Delta CFI \leq .003$).

Research Question 5: Latent Differences in Each Age Band

Tests of latent variances, covariances, and correlations. After evaluating measurement invariance, the omnibus test of

homogeneity of variances and covariances was performed for each age band (please contact the authors for the full results and CFA diagrams). Across each of the six age cohorts the ID-ASD and ID-ONLY groups differed significantly. Follow-up tests confirmed differences between both variances and covariance. Children with ID-ONLY tended to show more variability in scores (variance range = 0.30–1.24) compared with children with ID-ASD (variance range = 0.36–0.69). As the relationships between constructs (covariances) were

Table 5. Relationship of the SIS to Intelligence and Adaptive Behavior for Participants With Autism and ID and (ID Only).

Group	HLA	CNA	SPA	SLA	HSA	SA	AA
Intelligence							
Total sample	.45 (.65)	.37 (.58)	.35 (.56)	.31 (.46)	.35 (.57)	.33 (.52)	.36 (.54)
5–6	.47 (.58)	.44 (.56)	.45 (.47)	.44 (.38)	.40 (.48)	.39 (.51)	.40 (.40)
7–8	.46 (.61)	.37 (.48)	.36 (.50)	.32 (.39)	.34 (.49)	.36 (.43)	.38 (.50)
9–10	.42 (.70)	.34 (.58)	.32 (.58)	.32 (.42)	.32 (.57)	.32 (.50)	.37 (.54)
11–12	.42 (.68)	.29 (.59)	.34 (.55)	.28 (.48)	.32 (.60)	.30 (.51)	.30 (.55)
13–14	.50 (.66)	.38 (.60)	.29 (.59)	.24 (.50)	.34 (.61)	.29 (.58)	.32 (.61)
15–16	.57 (.65)	.50 (.60)	.35 (.58)	.26 (.48)	.47 (.59)	.42 (.50)	.44 (.54)
Adaptive behavior							
Total sample	.47 (.67)	.39 (.59)	.37 (.57)	.32 (.47)	.37 (.57)	.38 (.54)	.38 (.55)
5–6	.47 (.61)	.40 (.61)	.42 (.51)	.41 (.41)	.40 (.51)	.40 (.54)	.38 (.39)
7–8	.40 (.66)	.33 (.51)	.32 (.50)	.29 (.37)	.28 (.51)	.35 (.46)	.34 (.49)
9–10	.41 (.71)	.36 (.60)	.34 (.60)	.35 (.42)	.35 (.57)	.35 (.51)	.39 (.54)
11–12	.50 (.73)	.38 (.62)	.41 (.60)	.33 (.51)	.40 (.60)	.38 (.56)	.39 (.58)
13–14	.50 (.69)	.40 (.62)	.35 (.61)	.29 (.54)	.38 (.62)	.36 (.59)	.37 (.63)
15–16	.59 (.64)	.53 (.56)	.38 (.54)	.26 (.50)	.47 (.57)	.45 (.51)	.42 (.52)

Note. Every correlation is significant at $p < .01$. Correlations outside of parentheses represent participants with ID and autism and correlations within the parentheses represent participants with ID only. ID = intellectual disability; SIS = Supports Intensity Scale; HLA = home living activities; CNA = Community and Neighborhood activities; SPA = School Participation activities; SLA = School Learning activities; HSA = Health and Safety activities; SA = social activities; AA = advocacy activities.

different across age groups, we standardized covariances to allow for meaningful comparisons of the correlations. Likelihood ratio tests were then performed between two nested models; in general, results from nested chi-square tests indicated children with ID-ONLY tended to have significantly stronger correlations (range of significantly different correlations = .72–.93) between support need domains than children with ID-ASD (range of significantly different correlations = .69–.86) across age bands, although all correlations in both disability groups were significant at $p < .001$.

Test of Homogeneity of Latent Means

Six parallel sets of latent mean comparisons were conducted to compare latent means between children with ID-ASD and ID-ONLY in each age cohort. At the omnibus level, all seven support needs domains demonstrated differences across the two groups in each age cohort (please contact the authors for the full results of the invariance testing). To decompose the specific patterns of differences across the two disability groups in each age band, we conducted follow-up tests. In the 5 to 6 age band, we found significant differences in Health and Safety, Social, and Advocacy, with children with ID-ASD scoring significantly higher than children with ID-ONLY (see Table 6). The largest effect size (see Table 6) was in the intensity of support needs in the Social domain ($d = .45$). In the 7 to 8, 9 to 10, and 11 to 12 age cohorts, children with ID-ASD continued to report higher support needs in the Social domain, but reported lower support needs than children with ID-ONLY

in the Home Living domain, with small effect sizes. In the 13 to 14 age cohort, youth with ID-ASD continued to show significantly higher support needs in the Social domain with a medium effect size, as well as in the Health and Safety and Advocacy domains with a small effect size. Finally, as shown in Table 6, the 15 to 16 age band has the most number of domains ($n = 5$) that differ in latent means: Community and Neighborhood, School Participation, Health and Safety, Social, and Advocacy. Youth with ID-ASD scored significantly higher in each of these domains with small to moderate effect sizes. The largest effect size was found in the Social domain ($d = .56$).

Discussion

The SIS-C, as well as the SIS, was developed and standardized for people with ID, and although children with a concomitant diagnosis of autism were a part of the sample, the reliability and validity of the tool as well as differences in scores of those with and without autism have never been examined. The demand for tools to assess support needs is becoming increasingly important in the autism field with the introduction of the *DSM-5* (APA, 2013), which suggests that people with ASD should be classified based on differences in their intensity of support need. Although the levels of support identified in *DSM-5* align with support needs emerging from limitations in social communication and restricted, repetitive behaviors (the core diagnostic features of autism), potential indicators of support needs specific to these domains cut across support need domains on the

Table 6. Estimated Latent Means and Standard Errors in Each Age Band.

Age band	Construct	Autism and ID		ID only		Effect size
		M	SE	M	SE	
5–6	Health and Safety	3.19	.04	2.96	.07	.28
	Social	3.22	.04	2.84	.07	.45
	Advocacy	3.11	.04	2.90	.07	.26
7–8	Home Living	2.38	.04	2.62	.06	.30
	Social	3.16	.04	2.87	.07	.36
9–10	Home Living	2.33	.04	2.60	.05	.34
	Social	3.08	.04	2.87	.05	.25
11–12	Home Living	2.19	.04	2.45	.05	.31
	Social	3.02	.04	2.72	.05	.34
13–14	Health and Safety	2.98	.04	2.82	.04	.19
	Social	3.01	.04	2.60	.05	.46
	Advocacy	2.99	.04	2.84	.04	.20
15–16	Community and Neighborhood	2.72	.05	2.50	.05	.27
	School Participation	2.87	.06	2.63	.06	.27
	Health and Safety	2.87	.06	2.57	.06	.33
	Social	2.91	.06	2.37	.07	.56
	Advocacy	2.98	.05	2.60	.06	.44

Note. Unstandardized estimates from the strong invariance model are presented. Domains that indicate significant mean differences are only presented.

SIS-C. The present study examined support needs across all seven domains, but future research should explore the application of specific items related to communication and repetitive behaviors and their role in classifying support needs specific to autism. The fact that students with ID-ASD demonstrated significantly higher support needs in the Social Activities domains suggests the potential of SIS-C domains and items to support classification related to the core features of autism.

Overall, the results suggested that the SIS-C is as reliable and valid a tool for children with ID-ASD as it is for those with ID-ONLY. Moreover, the same items can be used to measure the seven support need domains across the groups. In addition, the findings reveal specific patterns of differences in support needs based on having an autism diagnosis in addition to an ID diagnosis. These findings can drive future work on support needs assessment and planning. We will address these issues, after discussing limitations of the study.

Limitations

As mentioned previously, the primary purpose of the SIS-C standardization sample was to generate data to allow for the standardization of the scale for children with IDD (Thompson, Wehmeyer, Hughes, Shogren, Little, Seo, et al., in press). Thus, the target population had been diagnosed or classified as having an ID. We had a large subset of the sample that also had an autism label; however, each of these individuals had also been diagnosed with an ID. Thus, our results are only applicable to children with ID-ASD,

which is not the full range of individuals identified on the autism spectrum. In addition, we did not independently verify the diagnoses of ASD and ID, instead using information provided from education and service records about diagnosis and classification. This is a limitation that must be considered in interpreting the results, particularly as other researchers (see Pinborough-Zimmerman et al., 2012; Shattuck, 2006) have suggested a lack of congruence between educational classifications and medical diagnoses of ASD. Relatedly, we examined construct validity for intellectual functioning and adaptive behavior, as these are core diagnostic criteria for ID. However, we had considerably more children with ID only who fell in the profound range of intellectual functioning, and more children with ID-ASD in the mild and moderate range of intellectual functioning, which may have influenced the results. This is likely because, although our sample was stratified based on level of intellectual functioning/adaptive behavior overall, it was not stratified for these characteristics within the group of children with ID-ASD. Although the correlations between intellectual functioning/adaptive behavior across groups provides initial information, further work is needed to explore the impact of level of intellectual functioning/adaptive behavior on the support needs of children with ID-ASD, including work with matched samples of children with ID-ASD, ID-ONLY, and ASD with verified medical diagnoses. Relatedly, work is needed examining construct validity with a representative population of students with ASD only, to examine social communication and restricted, repetitive behaviors, the core diagnostic criteria of ASD.

Measurement of Exceptional Medical and Behavioral Support Needs

Overall, significantly higher medical support needs were reported for the ID-ONLY group across age cohorts, whereas higher behavioral support needs were reported for the ID-ASD group. Given the behavioral items (prevention of self-injury, tantrums, wandering, etc.) and the increased risk of these behaviors in children with autism (Hattier, Matson, Belva, & Horovitz, 2011), particularly in response to challenging contexts, it is not surprising that children with autism scored higher. It is not as clear why children in the ID-ONLY group scored significantly higher in exceptional medical support needs, although one hypothesis is that this group had considerably more children whose intellectual functioning was reported to be in the profound range. Children whose measured intelligence is in the profound range often have significant central nervous system impairment, and many have chronic health conditions (Schalock et al., 2010). As mentioned previously, additional work is needed with a more representative sample of children with ASD to better understand exceptional behavioral needs. Furthermore, although beyond the scope of this study, work is needed to examine the degree to which the groups of children who do and do not have exceptional medical or behavioral support needs differ.

Reliability and Validity of the Standardized Portion of the Scale

Overall, the SIS-C showed excellent reliability and validity in children with ID-ASD and ID-ONLY. This is consistent with findings with the overall sample, when the data were analyzed as a whole to validate the scale (Thompson et al., in press). It is important to note, however, as described in the "Limitations" section, that when examining construct validity we only used measures of intellectual functioning and adaptive behavior. Although support needs in each group were significantly correlated with intellectual functioning and adaptive behavior, as would be expected, the correlations were slightly lower in those with ID-ASD. This finding suggests that intellectual functioning and adaptive behavior may not be as strongly correlated with support needs in those that have an autism diagnosis, and that future research should examine the relationship between the core features of autism (Matson & Wilkins, 2007) and support needs.

Measurement Invariance

As described in the "Method" and "Results" sections, a critical part of research examining the use of assessment tools in different populations is testing the degree to which the same indicators and measurement frameworks can be

used across differing populations (Little, 1997, 2013). In examining the SIS-C, we looked at the entire sample in developing norms (Thompson et al., in press), assuming its usefulness with individual subsets within the sample. Indeed, we found across each of the six age bands represented in the standardization sample, that the same set of indicators and parcels for the entire sample could be used to measure the seven support need domains with our large subsample of children with ID-ASD. These findings suggest that the tool can be used across populations to generate meaningful information on support needs.

Latent Differences

Although establishing measurement invariance is important, examining latent differences or the differences in the seven support need domains tells us more about differences that emerge based on disability label. What we found, when examining differences in the variances, was that children with ID-ONLY tended to show more variability across age bands in the support need domain scores. This is an interesting finding, perhaps suggesting that children with ID-ASD show more similar characteristics because of the introduction of the core deficits related to social communication and restricted, repetitive behavior in addition to deficits in intellectual functioning and adaptive behavior (Lecavalier, Snow, & Norris, 2011). Further work, however, is needed with a more representative sample of children with ASD as this may lead to more variability when the full spectrum of ASD is analyzed.

The opposite pattern was found in the correlations across support need domains, with children with ID-ONLY showing stronger intercorrelations among support need domains, perhaps reflecting that the SIS-C was developed to measure support need domains relevant to that population. Although these domains also have relevance for children with ASD, as mentioned previously, further investigation is warranted in regard to specific issues introduced by support needs related to restricted, repetitive behaviors, and examining the degree to which the items on the Social Activities domain reflect support needs related to social communication.

In examining latent means, we did find, as would be predicted, that across age bands, children with ID-ASD reported significantly higher support needs in Social Activities, suggesting the SIS-C differentiates support needs for social activities for children with autism. This finding is likely related to the core diagnostic features of ASD, suggesting that this scale may provide useful information for support teams as they are planning strategies to address involvement in social activities for children with ASD. The items in this domain reflect supports related to using social skills (e.g., maintaining conversations) as well as developing relationships (e.g., maintaining positive relationships with others) and participating effectively in social

activities (e.g., protecting self from exploitation and bullying). Each of these has been identified as critical areas in which children with autism need extraordinary support (Asselt-Goverts, Embregts, Hendriks, Wegman, & Teunisse, 2015; Bitsika & Sharpley, 2014; Chiang & Wineman, 2014; Watkins et al., 2015).

We also found that in the Health and Safety and Advocacy domains children with ID-ASD tended to experience higher intensities of support needs. This finding may reflect the fact that specific social communication skills are necessary to engage in advocacy and specific Health and Safety activities measured on the SIS-C (e.g., communicating health-related issues and medical problems, including aches and pains). Researchers have suggested the need for specific consideration of health-related support needs in people with autism (Cheak-Zamora et al., 2014; Strunk, Pickler, McCain, Ameringer, & Myers, 2014). In addition, the 15- to 16-year-old age group had significantly higher support needs in five domains (i.e., Social, Advocacy, Health and Safety, Community and Neighborhood, and School Participation), perhaps reflecting the increased social and communication demands of adolescence that uniquely challenge youth with ASD. Issues relating to the school to adult life transition as well as the special challenges in adolescence for youth with ASD have received increased attention, and suggest that this time of life may introduce specific support needs that should be considered in individualized supports planning (Shogren & Plotner, 2012; Taylor & Seltzer, 2010; Zager & Alpern, 2010).

Implications for Future Research and Practice

This study provided critical, preliminary information on the assessment of support needs in children with ID-ASD in comparison with those with ID-ONLY. The results suggested that SIS-C is a valid and reliable tool in children with ID-ASD, and can provide useful assessment information relevant to the work of teams involved in planning supports. Further research is needed to understand strategies to assess specific support needs related to autism in the domains of social communication and restricted, repetitive behavior. A suggested next step is to investigate the possibility of a subset of items across the SIS-C domains that specifically target these areas and if so, whether this subset of items could provide a valid and reliable measure of support needs in these specific areas.

Further work is also needed to examine the degree to which SIS-C scores cluster into groups, such as those proposed by the *DSM-5* for classification (very substantial support, substantial support, some support). Finally, effort is needed to inform the translation of the results of SIS-C assessment to planning for individualized supports for children with autism and ID across the life span. Assessment information, in and of itself, does not lead to the effective

provision of supports. Developing and evaluating strategies to translate support needs assessment data into support plans (Walker, DeSpain, Thompson, & Hughes, 2014) that truly address the individual needs of children with autism needs to be undertaken, and outcomes evaluated. Overall, our findings indicate the SIS-C has potential usefulness as part of a comprehensive assessment and supports planning process for children with autism and ID.

Authors' Note

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