Autism Symptom Dimension Questionnaire (ASDQ) - Technical Manual

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1.0 Brief Overview

As part of the Child Neurobehavioral Evaluation Tool (C-NET), the Autism Symptom Dimension Questionnaire (ASDQ) is a brief (39-item), open source, freely available informant(parent)-report measure specifically developed to comprehensively capture core autism symptoms in children and adolescents. ASDQ development was informed by DSM-5 symptom criteria and recent factor analyses of autism symptom measures. The ASDQ was developed and validated through an iterative and comprehensive process, following gold standard guidelines for measurement development and validation (Boateng et al., 2018). Findings across two independent studies provide evidence that the ASDQ is psychometrically-sound instrument with good reliability of measurement across a continuous range of scores and preliminary evidence of predictive validity. The measure may thus be a useful alternative to existing autism symptom measures.

2.0 Innovative Features

The ASDQ has several innovative features that distinguish it from the most commonly used measures in the field, including a balance between brevity and exhaustive domain representation and coverage in particular with regards to capturing of Social Communication and Interaction (SCI) and Restricted and Repetitive pattern of Behaviors and interests (RRB) subdomains, robust factor structure and measurement invariance across key parameters including age, sex and diagnostic status, state-of-the-art regression based norms, online system for an easy administration and automatic scoring, and comprehensive set of clinical recommendations. A more detailed overview of the innovative features is provided below and comparison against the most widely used instruments is summarized in Table 1.

- Comprehensive domain representation and coverage of Social Communication and Interaction (SCI) and restricted and repetitive pattern of behaviors and interests (RRB) constructs. Examples: capture of sensory sensitivity and sensory interests constructs not captured by the majority of the most widely used current instruments; more comprehensive and conceptually clear capture of restricted interests and perspective taking constructs than what is possible by current general symptom severity instruments.
- Careful attention to question wording and responses to ensure that measures can be completed for unique populations - non-speaking children, children with severe cognitive or intellectual impairments, and children with motor deficits.
- Clear and replicable factor structure derived using state-of-the-art factor analytic approaches.

- Demonstrated null/very weak associations with race / ethnicity and measurement invariance across age, sex, race, and ethnicity status
- Use of IRT to demonstrate good reliability (strong measurement precision) across key score ranges.
- Use of regression-based norms accounting for linear and quadratic age effects and sex effects on score distributions.
- Use of standard scores based on large neurotypical normative populations and comparison to clinical populations where relevant.
- Online system for ease of administration, scoring, and reporting as well as longitudinal profiling for intervention monitoring.
- Careful attention to convergent and discriminant validity and inclusion of comprehensive validity indicators for each subscale.
- Clear reports with clinical recommendations for diagnostic and treatment contexts. For example, use of evidence-based assessment with probability generation and identification of longitudinal score patterns relative to the normal range.

Table 1. Comparison between ASDQ and other commonly used ASD instruments

	ASDQ	SRS-2	AIM	PDDBI	SCQ	AQ
Completion time (minutes)	7-10	12-15	15-20	30-45	8-12	10-12
Cost (per administration)	Free ($ online admin)	$$	Free?	$$$	$$	Free
Stable factor structure	Yes	Partial	Yes	Unclear	Yes	Yes
Sub-domain Coverage Overall Autism Severity	Yes	Yes	Yes	Yes	Yes	Yes
Basic Social Communication	Yes	Yes	Yes	Yes	Yes	Yes
Affiliation	Yes	Yes	Items Only	Items Only	Yes	Items Only
Perspective Taking	Yes	Yes	No	No	No	Items Only
Peer Relationships	Yes	Yes	Items Only	Items Only	Items Only	Items Only
Repetitive Motor	Yes	Yes	Items Only	Items Only	Yes	Items Only
Sensory Interests	Yes	No	1 Item	Items Only	No	Items Only
Insistence on Sameness	Yes	3 Items	1 Item	Items Only	Yes	Items Only
Sensory Sensitivities	Yes	1 Item	1 Item	Items Only	No	Items Only
Restricted Interests	Yes	3 Items	2 Items	Items Only	Items Only	Items Only
Invariance (age, sex, race, ethnicity)	Yes	Partial	Not Tested	Not tested	Not Tested	Partial
Regression-based norms	Yes	No	No	No	No	No
Online integrated platform	Yes	No	No	No	No	No
Automatically-generated guidelines (treatment recommendations, identifying intervention targets, and monitoring progress)	Yes	No	No	No	No	No

***Note*:** ASDQ=Autism Symptom Domain Questionnaire; SRS-2=Social Responsiveness Sale; AIM= Autism Impact Measure; PDDBI=PDD Behavior Inventory; SCQ=Social Communication Questionnaire; AQ=Autism Spectrum Quotient.

3.0 Development

The ASDQ was developed through a sequential process that included iterative feedback and updates to culminate in the final measure. A conceptual model for the ADSQ was created based on the examination of DSM-5 criteria and symptom exemplars from existing instruments including, but not limited to the Social Responsiveness Scale, 2nd Edition (SRS-2), the Social Communication Questionnaire (SCQ), the Autism Spectrum Questionnaire (AQ), the Autism Diagnostic Interview-Revised (ADI-R), and the Diagnostic Interview for Social and Communication Disorders (DISCO). Next, all items were written by the instrument author. The initial ASDQ included 33 items intended to provide good coverage of broad SCI and RRB domains but only brief coverage of specific autism symptom criteria (e.g., DSM-5 criterion A3: relationships or B3: restricted interests). Specifically, three to five items were generated based on key symptom exemplars and constructs embedded within DSM-5 ASD symptom criteria.

The initial item bank was reviewed by 5 clinical psychologists, one autism researcher, and two behavior therapists, all with significant clinical experience with ASD. This review included providing qualitative feedback about item readability/clarity, applicability to the full spectrum of patients seen in at-risk autism specialty clinics, and content coverage relative to DSM-5. Twelve parents of children with ASD provided qualitative feedback regarding item readability/clarity and applicability to their children. Expert and parent review of the initial version of the ASDQ was conducted in a qualitative fashion similar to the "think aloud" procedure in cognitive interviewing. After incorporation of feedback, items were further reviewed, and pilot tested with thirteen caregivers.

The pilot version of the 33-item ASDQ was tested in a sample of 1,461 youth and young adults (ages 2 to 21), including 831 with ASD, to establish the initial factor structure and psychometric properties (Please see ASDQ validation section below). Factor analysis of the pilot 33-item ASDQ yielded four specific factors that were readily interpreted as social communication/interaction (SCI; 15 items), repetitive sensory motor behavior (RSM; 5 items), insistence on sameness (IS; 7 items), and restricted interests (RI; 3 items). The ASDQ was revised by adding six items to identify separate factors corresponding to nine autism symptom dimensions identified in prior analyses. More specifically:

- Sensory sensitivities and unusual sensory interests are included together in DSM-5 criterion B4, but these have been shown to measure different constructs;
- Social interest/affiliation is alluded to in both A1 and A3 symptom exemplars and has been shown to produce a separate factor from peer relationships in both single and multi-instrument factor analyses, despite not being a separate domain in diagnostic criteria;

- Perspective taking (including understanding of others' intentions and motivations) has been suggested to be independent of basic social communication behaviors and may roughly correspond to the difference in DSM-5 socio-emotional reciprocity (A1) and non-verbal communication (A2) criteria.

Thus, two items assessing relationships, one item evaluating sensory sensitivity, two items focused on sensory interests, and one item focused on restricted interests were generated, creating the final 39-item version of the ASDQ. The Flesch-Kincaid reading level for the final measure is grade 7.9.

4.0 Validation

The ASDQ was refined and validated through two separate, independent studies. Study 1 focused on the development and factor structure of the initial (33-item version) of the ASDQ. Study 2 focused on evaluating factor structure, measurement invariance, classical test theory and item response theory-derived reliability, convergent and discriminant validity, and criterion-related (diagnostic) validity analyses of the revised (39-item) version of the ASDQ.

4.1. Study 1

4.1.1. Sample

Informant caregivers, typically biological mothers, were recruited as part of The Hartwell Foundation KidsFirst registry from multiple sources in three geographic regions (Sacramento, CA; San Francisco Bay area, CA; Cleveland, OH). Final sample included total sample included 1461 children and young adults (ages 2-21) from 929 families. The majority of the informants reported on one child/adult (*n*=567, 61.1%), while the remaining reported on two or more children/adults (2 children/adults *n*=239, 25.7%; 3 children/adults *n*=85, 9.1%, 4+ children/adults *n*=38, 4.1%). Detailed sample characteristics are presented in Table 2.

Table 2. Demographic and clinical characteristics across autism spectrum disorder (ASD), developmental disability (DD), and neurotypical (NT) controls in the Study 1 initial 33-item ASDQ sample.

	NT *n (%)*	DD *n (%)*	ASD *n (%)*	X^2 / *F (p)*
Number of Children	299	331	831	
Referral Source (n, %)				79.9 (<.001)
Mind Institute	82 (13%)	168 (27%)	385 (60%)	
CWRU	18 (24%)	11 (15%)	45 (61%)	
Rainbow Hospital	29 (20%)	49 (34%)	65 (46%)	
Metro Hospital	20 (31%)	7 (11%)	37 (58%)	
Stanford University	82 (35%)	35 (15%)	120 (50%)	
Autism Research Institute	20 (21%)	15 (16%)	60 (63%)	
Website / Other	48 (23%)	46 (21%)	119 (56%)	
Informant (n, %)				23.6 (<.001)
Biological mother	268 (90%)	267 (81%)	654 (79%)	
Biological father	26 (9%)	46 (14%)	151 (18%)	
Other	5 (1%)	18 (5%)	26 (3%)	
Time Living with the Informant				85.8 (<.001)
<25%	18 (6%)	16 (5%)	13 (2%)	
25-49%	2 (1%)	51 (15%)	133 (16%)	
50-74%	7 (2%)	29 (9%)	79 (10%)	
75-100%	272 (91%)	235 (71%)	606 (73%)	
Highest Parental Education (n, %)				34.6 (<.001)
Less than HS	0 (0%)	3 (1%)	3 (1%)	
High school or GED	25 (8%)	24 (7%)	57 (7%)	
Some college	63 (21%)	108 (33%)	303 (37%)	
College graduate	100 (33%)	106 (26%)	250 (30%)	
Graduate degree or higher	111 (37%)	87 (26%)	215 (26%)	
Unknown	0 (0%)	3 (1%)	3 (1%)	
Household Income (n, %)				48.2 (<.001)
<$25,000	16 (5%)	26 (8%)	64 (8%)	
$25,000-$34,999	26 (9%)	32 (10%)	95 (11%)	
$35,000-$49,999	33 (11%)	61 (18%)	204 (25%)	
$50,000-$74,999	48 (16%)	57 (17%)	146 (18%)	
$75,000-$99,999	42 (14%)	35 (11%)	82 (6%)	
$100,000-$149,999	64 (21%)	58 (18%)	113	

			(14%)	
$150,000-$199,999	22 (7%)	23 (7%)	42 (5%)	
$200,000 and above	34 (11%)	22 (7%)	56 (7%)	
Unknown	14 (5%)	17 (5%)	29 (4%)	
Child Age (M, SD)	10.4 (5.5)	11.1 (4.5)	9.8 (4.1)	10.6 (<.001)
Child Biological Sex (n, % male)	144 (48%)	167 (49%)	605 (73%)	95.3 (<.001)
Race				
White / Caucasian (n, %)	256 (86%)	283 (86%)	631 (76%)	20.8 (<.001)
Black / African American (n, %)	30 (10%)	48 (15%)	113 (14%)	3.2 (.199)
Middle Eastern (n, %)	5 (2%)	3 (1%)	12 (1%)	0.8 (.683)
East Asian (n, %)	12 (4%)	7 (2%)	35 (4%)	3.0 (.220)
South Asian (n, %)	10 (3%)	0 (0%)	20 (2%)	9.9 (.007)
Pacific Islander (n, %)	5 (2%)	7 (2%)	18 (2%)	0.3 (.872)
Native American (n, %)	8 (3%)	8 (2%)	26 (3%)	0.5 (.785)
Unknown race (n, %)	8 (3%)	10 (3%)	36 (4%)	2.2 (.326)
Hispanic or Latino (n, %)	51 (17%)	43 (13%)	130 (16%)	2.1 (.342)
Child Relationship to Caregivers (n, %)				30.8 (<.001)
Full biological	267 (89%)	283 (86%)	779 (94%)	
Step-father	20 (7%)	22 (7%)	26 (3%)	
Step-mother	8 (3%)	11 (3%)	5 (1%)	
Unrelated	4 (1%)	15 (5%)	21 (3%)	
Non-ASD Diagnoses (n, %)				
Intellectual disability / global delay	-	35 (11%)	110 (13%)	1.5 (.215)
Speech/language disorder	-	130 (39%)	207 (25%)	23.7 (<.001)
Attention-deficit/hyperactivity disorder	-	137 (41%)	222 (27%)	23.9 (<.001)
Oppositional defiant / conduct disorder	-	21 (6%)	51 (6%)	0.1 (.895)
Anxiety disorder	-	96 (29%)	173 (21%)	8.9 (.003)
Specific learning disorder	-	37 (11%)	73 (9%)	1.6 (.208)
Motor / coordination disorder	-	16 (5%)	46 (6%)	0.2 (.631)
Depressive disorder	-	30 (9%)	35 (4%)	10.6 (.001)
Bipolar disorder / mania	-	7 (2%)	9 (1%)	1.9 (.173)
Obsessive compulsive disorder	-	11 (3%)	37 (5%)	0.8 (.383)
Tic disorder	-	8 (2%)	10 (1%)	2.3 (.131)
Feeding / eating disorder	-	11 (3%)	39 (5%)	1.1 (.299)
Elimination disorder	-	6 (2%)	11 (1%)	0.4 (.531)

Note: NT=neurotypical controls, DD=non-ASD developmental disability, ASD=autism spectrum disorder. CWRU=Case Western Reserve University. Non-ASD diagnoses do not sum to 100% because children could be diagnosed with more than one condition.

4.1.2. *Measures*

In addition to the 33-item version of the ASDQ, the following additional information was collected:

- Demographic information: Informants provided age, sex, race, ethnicity, time spent living with the informant, household income, highest level of parental education, and reported all prior clinical diagnoses for each participant.
- Autism Spectrum Quotient – 10-item Short Form (AQ-10): a 10-item version of the original 50-item AQ scale that includes 10 questions about social and non-social aspects of autism (Allison et al., 2012).

4.1.3. *Findings*

4.1.3.1. *Factor Structure*

In the exploratory sub-sample (*n*=731), exploratory structural equation models (ESEM) with 1-6 factors were estimated. ESEM models suggested improvements in fit through the four-factor solution (comparative fit index [CFI]= .981 Tucker–Lewis index [TLI]= .975, root mean square error of approximation [RMSEA]= .052 [95% CI: .048, .055], standardized root mean residual [SRMR]= .021) with communication/interaction (SCI; 15 items), repetitive sensory motor behavior (RSM; 5 items), insistence on sameness (IS; 7 items), and restricted interests (RI; 3 items) factors. In the confirmatory sample (*n*=731), a confirmatory factor analysis (CFA) model based on the ESEM 4-factor solution, including item loadings >.20 and all other loadings set to 0, fit the data well (CFI= .964, TLI= .960, RMSEA= .063 [95% CI: .060, .066], SRMR= .040). Extensions of simple correlated factor model to include a general ASD factor (higher-order or bifactor) indicated that the CFA 4-factor model with a bifactor that included all items fit better than the CFA with a higher-order factor. Further examination of the bifactor model indicated that nearly all of the items loaded strongly on the ASD bifactor, indicating a well-determined general factor.

4.1.3.2. *Convergent Validity*

ASDQ total scores showed strong correlations with AQ-10 total scores and with reported ASD diagnosis. As can be seen from Table 3, the patterns expected for convergent validity and discriminant validity held.

Table 3. Convergent and discriminant validity of the initial and revised ASDQ total score.

	Initial 33-item ASDQ Study 1		**Revised 39-Item ASDQ Study 2**	
	r	*(p)*	*R*	*(p)*
Strong Convergent Validity				
AQ-10	.83	(<.001)	-	-
SCQ Total	-	-	-.59	(<.001)
Stanford Social Dimensions Scale	-	-	-.53	(<.001)
ASD Diagnosis	.71	(<.001)	.60	(<.001)
Moderate Convergent Validity				
Executive Functioning	-	-	.47	(<.001)
SDQ-Internalizing	-	-	.46	(<.001)
SDQ-Externalizing	-	-	.50	(<.001)
Daily Living Skills	-	-	-.39	(<.001)
Weak Convergent Validity				
Sex	.25	(<.001)	.12	(<.001)
Intellectual disability / global delay	.24	(<.001)	.13	(<.001)
Speech/language disorder	.28	(<.001)	.16	(<.001)
Attention-deficit/hyperactivity disorder	.11	(<.001)	.22	(<.001)
Anxiety disorder	.16	(<.001)	.16	(<.001)
Obsessive compulsive disorder	.14	(<.001)	.12	(<.001)
Discriminant Validity				
Age	-.14	(<.001)	-.10	(<.001)
Sex (ASD sub-sample only)	.11	(.002)	.04	(.655)
Race – white vs. other	-.05	(.046)	.08	(.002)
Ethnicity – Hispanic vs. other	-.02	(.519)	.04	(.161)
Oppositional defiant / conduct disorder	.09	(<.001)	.14	(<.001)
Specific learning disorder	.10	(<.001)	.05	(.040)
Motor / coordination disorder	.13	(<.001)	.07	(.005)
Depressive disorder	.01	(.598)	.07	(.004)
Bipolar disorder / mania	.03	(.339)	.08	(.003)
Tic disorder	.03	(.312)	.04	(.127)
Feeding / eating disorder	.17	(<.001)	.06	(.026)
Elimination disorder	.08	(.001)	-	-

4.2. Study 2

4.2.1. Sample

Informants were recruited using the Prolific online data collection service (https://prolific.co/). Final sample included 1467 children (ages 2-17). Detailed characteristics of the sample are shown in Table 4.

Table 4. Demographic and clinical characteristics across autism spectrum disorder (ASD), developmental disability (DD), and neurotypical (NT) controls in the Study 2 revised 39-item ASDQ sample.

	NT *n (%)*	DD *n (%)*	ASD *n (%)*	X^2 / *F (p)*
N	1012	351	104	
Informant (n, %)				58.5 (<.001)
Biological mother	548 (54.2%)	237 (67.5%)	80 (76.9%)	
Biological father	434 (42.9%)	97 (27.6%)	19 (18.3%)	
Other / not reported	30 (2.9%)	17 (4.9%)	5 (4.8%)	
Informant Age (M, SD)	37.5 (7.9)	39.7 (8.5)	40.5 (7.2)	13.7 (<.001)
Highest Parental Education (n, %)				26.8 (.003)
Less than HS	6 (0.6%)	2 (0.6%)	1 (1.0%)	
High school or GED	90 (8.9%)	38 (10.8%)	11 (10.6%)	
Some college	178 (17.6%)	94 (26.8%)	32 (30.8%)	
College graduate	427 (42.2%)	132 (37.6%)	40 (38.5%)	
Graduate degree or higher	295 (29.2%)	80 (22.8%)	18 (17.3%)	
Unknown	16 (1.6%)	5 (1.4%)	2 (1.9%)	
US Region				10.9 (.205)
Northeast	188 (18.6%)	51 (14.5%)	16 (15.4%)	
Midwest	215 (21.3%)	69 (19.7%)	23 (22.1%)	
South	402 (39.8%)	168 (47.9%)	50 (48.1%)	
West	203 (20.1%)	62 (17.7%)	15 (14.4%)	
Other / chose not to respond	4 (0.4%)	1 (0.3%)	0 (0.0%)	
Household Income (n, %)				43.1 (<.001)
<$25,000	70 (6.9%)	36 (10.3%)	17 (16.3%)	
$25,000-$34,999	65 (6.4%)	31 (8.8%)	15 (14.4%)	
$35,000-$49,999	105 (10.4%)	50 (14.4%)	14 (13.5%)	
$50,000-$74,999	224 (22.1%)	80 (22.8%)	23 (22.1%)	
$75,000-$99,999	178	55 (15.7%)	14	

	(17.6%)		(13.5%)	
$100,000-$149,999	238 (23.5%)	58 (16.5%)	12 (11.5%)	
$150,000-$199,999	80 (7.9%)	29 (8.3%)	7 (6.7%)	
$200,000 and above	48 (4.7%)	9 (2.6%)	2 (1.9%)	
Unknown	4 (0.4%)	3 (0.9%)	0 (0.0%)	
Child Age (M, SD)	8.1 (4.6)	10.9 (4.6)	9.8 (4.7)	49.4 (<.001)
Child Biological Sex (n, % male)	546 (54.0%)	194 (55.3%)	79 (76.0%)	21.6 (<.001)
Race				
White / Caucasian (n, %)	849 (83.9%)	311 (88.6%)	87 (83.7%)	4.7 (.096)
Black / African American (n, %)	124 (12.3%)	36 (10.3%)	20 (19.2%)	6.0 (.050)
Middle Eastern (n, %)	5 (0.5%)	3 (0.9%)	0 (0.0%)	1.2 (.538)
East Asian (n, %)	43 (4.2%)	15 (4.3%)	2 (1.9%)	1.3 (.512)
South Asian (n, %)	28 (2.8%)	4 (1.1%)	0 (0.0%)	5.7 (.057)
Pacific Islander (n, %)	7 (0.7%)	4 (1.1%)	0 (0.0%)	1.5 (.461)
Native American (n, %)	18 (1.8%)	8 (2.3%)	1 (1.0%)	0.8 (.657)
Unknown race (n, %)	2 (0.2%)	1 (0.3%)	0 (0.0%)	0.3 (.849)
Chose not to respond (n, %)	12 (1.2%)	3 (0.9%)	1 (1.0%)	0.3 (.868)
Hispanic or Latino (n, %)	117 (11.6%)	40 (11.4%)	11 (10.6%)	1.5 (.824)
Non-ASD Diagnoses (n, %)				
ID/GDD	-	10 (2.8%)	6 (5.8%)	2.1 (.150)
Speech/language disorder	-	75 (21.4%)	16 (15.5%)	1.7 (.193)
ADHD	-	146 (41.6%)	29 (27.9%)	6.1 (.014)
ODD/CD	-	25 (7.1%)	5 (4.9%)	0.7 (.415)
Anxiety disorder	-	111 (31.6%)	19 (18.4%)	6.8 (.009)
Specific learning disorder	-	33 (9.4%)	3 (2.9%)	4.6 (.032)
Motor / coordination disorder	-	16 (4.6%)	2 (1.9%)	1.4 (.231)
Depressive disorder	-	50 (14.2%)	8 (1.8%)	3.0 (.083)
Bipolar disorder / mania	-	7 (2.0%)	1 (1.0%)	0.5 (.488)
Obsessive compulsive disorder	-	11 (3.1%)	5 (4.9%)	0.7 (.405)
Tic disorder	-	6 (1.7%)	1 (1.0%)	0.3 (.593)
Feeding / eating disorder	-	16 (4.6%)	0 (0.0%)	4.9 (.029)

Note: NT=neurotypical controls, DD=non-ASD developmental disability, ASD=autism spectrum disorder. ID/GDD=Intellectual disability/global developmental delay, ADHD=Attention-Deficit/Hyperactivity disorder; ODD/CD=oppositional defiant disorder/conduct disorder. Non-ASD diagnoses do not sum to 100% because children could be diagnosed with more than one condition. Cognitive level information was only completed for n=886.

4.2.2. *Measures*

In addition to the 39-item version of the ASDQ, we collected:

- Demographic and health information: Informants provided age, sex, race, ethnicity, time spent living with the informant, household income, highest level of parental education, and reported all prior clinical diagnoses for each participant.
- Stanford Social Dimension Scale (SSDS): a 71-item informant-report questionnaire that captures different aspects of social functioning (Phillips et al., 2019). For the present study, a total score was used.
- Social Communication Questionnaire (SCQ): a 40-item rating scale based on DSM-IV-TR symptoms. Lifetime ratings referenced the child's behavior throughout their developmental history, increasing diagnostic validity (Rutter et al., 2003).
- Strengths and Difficulties Questionnaire (SDQ): a 25-item informant-report measure designed to capture internalizing and externalizing symptoms (Goodman et al., 1998). Internalizing and Externalizing problems scores were used.
- Daily Living Skills scale (DLS): a 89-item newly developed scale designed to capture multiple daily living content areas. DLS total score is strongly correlated with the Vineland Daily Living Skills scale (r=.90). Total DLS score was used [see C-NET Daily Living Skills (DSL) manual].
- Executive Functioning Skills scale (EFS): a 70-item scale designed to capture different aspects of executive functioning (Frazier et al., 2022). Total EFS score is strongly correlated with the 24-item Behavior Rating Inventory of Executive Functioning (r=.85). Total EFS score was used.

4.2.3. *Findings*

4.2.3.1. *Factor Structure*

ESEM models suggested improvements in fit through the 10-factor ESEM solution, however, the increases in CFI and TLI and decreases in RMSEA beyond nine factors tended to be modest (<.005). Thus, the ESEM model with 9 factors resembling hypothesized subscales was considered the optimal model (Figure 1) The CFA model based on the ESEM 9-factor solution fit adequately in spite of not estimating minor item cross-loadings (CFI= .969, TLI= .962, RMSEA= .052 [95% CI: .049, .055], SRMR= .034). This model was used to evaluate measurement invariance, model reliability, and variance accounted for by the specific and general ASD factors.

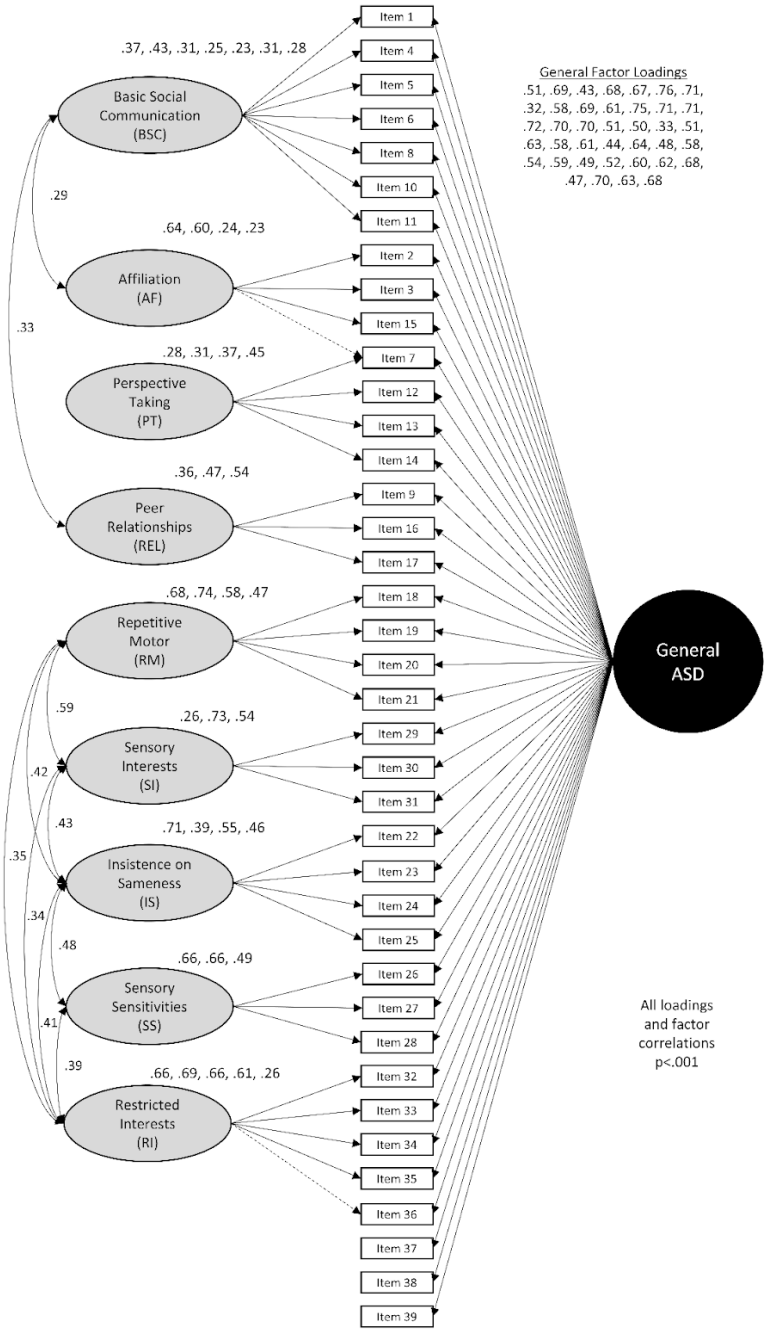

Figure 1. Exploratory bifactor model with nine specific factors and a general ASD factor in the revised 39-item ASDQ sample.

Note. For the general ASD factor, loadings are listed in order, from top to bottom, for each item. Solid lines depict primary loadings and dotted lines depict secondary loadings >.24. BSC=Basic Social Communication, AF=Affiliation, PT=Perspective Taking, PR=Peer Relationships, RM=Repetitive Motor, SI=Sensory Interests, IS=Insistence on Sameness, SS=Sensory Sensitivities, RI=Restricted Interests.

4.2.3.2. *Measurement Invariance*

The CFA model described above showed evidence of measurement invariance of factor loadings, thresholds, and residual variance (strict invariance) across sex, age, race, and ethnicity.

Table 5. Measurement invariance analyses for the final ASDQ factor model across sex, age, race, and ethnicity.

(M, F)

		Fit					*Difference Testing*					
Model	Par	X^2	*df*	RMSEA	CFI	TLI	X^2	*df*	*p*	ΔRMSEA	ΔCFI	ΔTLI
Configural	482	3247	988	.056	.962	.954	-	-	-	-	-	-
Metric	432	3102	1038	.052	.965	.960 **Sex**	192	50	<.0001	-.004	+.003	+.006
Scalar	327	3239	1143	.050	.965	.963	279	105	<.0001	-.002	.000	+.003
Strict	292	3177	1178	.048	.966	.966	139	35	<.0001	-.002	+.001	+.003

Age (2-4, 5-8, 9-12, 13-17)

		Fit					*Difference Testing*					
Model	Par	X^2	*df*	RMSEA	CFI	TLI	X^2	*df*	*p*	ΔRMSEA	ΔCFI	ΔTLI
Configural	974	3878	1966	.051	.969	.963	-	-	-	-	-	-
Metric	794	3906	2146	.047	.972	.969	408	180	<.0001	-.004	+.003	+.006
Scalar	479	4541	2461	.048	.967	.968	814	315	<.0001	+.001	-.005	-.001
Strict	374	4781	2566	.049	.965	.967	401	105	<.0001	+.001	-.002	-.001

Race (Caucasian, Other)

		Fit					*Difference Testing*					
Model	Par	X^2	*df*	RMSEA	CFI	TLI	X^2	*df*	*p*	ΔRMSEA	ΔCFI	ΔTLI
Configural	482	3383	988	.057	.958	.949	-	-	-	-	-	-
Metric	432	2845	1038	.049	.968	.964	93	50	.0002	-.008	+.010	+.015
Scalar	327	2929	1143	.046	.969	.967	240	105	<.0001	-.003	+.001	+.003
Strict	292	2802	1178	.043	.971	.971	81	35	<.0001	-.003	+.002	+.004

Ethnicity (Hispanic, non-Hispanic)

		Fit					*Difference Testing*					
Model	Par	X^2	*df*	RMSEA	CFI	TLI	X^2	*df*	*p*	ΔRMSEA	ΔCFI	ΔTLI
Configural	482	2626	988	.048	.973	.968	-	-	-	-	-	-
Metric	432	2270	1038	.040	.980	.977	69	50	.0381	-.008	+.007	+.009

Scalar	327	2232	1143	.036	.982	.982	138	105	.0178	-.004	+.002	+.005
Strict	292	2272	1178	.036	.982	.982	155	35	<.0001	.000	.000	.000

4.2.3.3. *Scale and Model Reliability*

Model reliability was high for the general ASD factor (ω=.97) and specific factors (ω≥.85). Using item scores, internal consistency reliability was excellent for the total scale (α=.95) and at least adequate for all subscale scores (α≥.75; Table 6).

Table 6. Reliability statistics for final 39-item ASDQ total scale and subscales.

	# of Items	Internal Consistency α	Θ-Total Raw *r*	Model Reliability Ω
General ASD	39	.95	.97	0.97
Basic Social Communication (BSC)	7	.84	.97	0.90
Affiliation (AF)	3	.75	.92	0.85
Perspective Taking (PT)	4	.85	.98	0.90
Peer Relationships (PR)	3	.86	.98	0.91
Repetitive Motor (RM)	4	.83	.98	0.88
Sensory Interests (SI)	3	.85	.97	0.91
Insistence on Sameness (IS)	4	.80	.98	0.85
Sensory Sensitivities (SS)	3	.82	.98	0.87
Restricted Interests (RI)	4	.91	.98	0.94

Note. Θ-Total Raw is the correlation between item response theory-derived latent trait (Θ) scores and total raw scores. Model reliability is the omega coefficient derived from the CFA bifactor model 9b computed in the total sample.

4.2.3.4. *Conditional Reliability (IRT)*

Conditional reliability estimates indicated excellent reliability (≥.90) for the total ASD scale from very low (θ=-2.1) to extremely high (θ=+4.0) scores. Adequate or better reliability (≥.70) was present for subscale scores in the range from low average (θ=-1.0) to very high scores (θ=+2.6) (Figure 2). Theta scores showed strong correlations with ASDQ total scores (r=.97) and subscales (r=.92-.98).

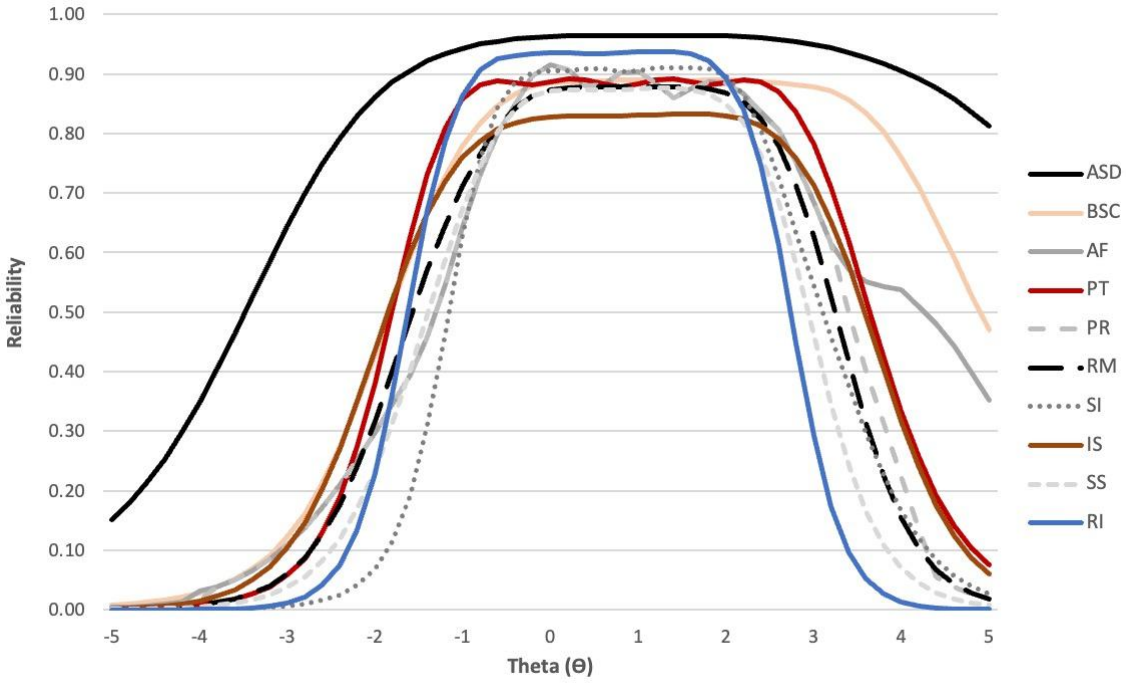

Figure 2. Item response theory-derived conditional reliability across the latent trait for the total ASD scale and subscales.

Note. BSC=Basic Social Communication, AF=Affiliation, PT=Perspective Taking, PR=Peer Relationships, RM=Repetitive Motor, SI=Sensory Interests, IS=Insistence on Sameness, SS=Sensory Sensitivities, RI=Restricted Interests.

4.2.3.5. Test-Retest Reliability

A sample of 87 participants with a wide range of cognitive and functional presentations was used to evaluate 1-month test-retest reproducibility of the ASDQ total score and SCI and RRB domain scores. The sample included 56 patients with neurodevelopmental genetic syndromes (32 with and 24 without ASD), 8 idiopathic developmental disability controls (1 with ASD and 7 with other developmental disorders), and 22 neurotypical controls. Median follow-up was 39 days (IQR = 27-48). Of the 39 items in the final ASDQ, only 12 of the 17 SCI items were collected and only 14 of the 19 RRB items were collected due to the need for brevity of data collection in this unique sample. In spite of this small number of items collected, the SCI and RRB scales had very good test-retest reproducibility (.93, and .94, respectively). Combining these into a total score (equivalent to the ASDQ total item average

score) and examining the correlation of baseline and 1-month follow-up yielded excellent test-retest reproducibility (r=.95).

4.2.3.6. Convergent and Discriminant Validity

ASDQ total scores showed strong correlations with SCQ and SSDS total scores and with reported ASD diagnosis (Table 3). Moderate correlations (|r|=.39-.50) were observed between the ASDQ and SDQ internalizing and externalizing, executive functioning, and adaptive functioning measures. The expected patterns for convergent and discriminant validity were observed.

4.2.3.7. Potential Screening and Diagnostic Accuracy

Across all four methods and sampling divisions, potential screening accuracy (testing sub-sample) was very good (89.6 - 94.9%) with excellent areas under the curve (AUC = .924 - .933). The optimal cutpoint (Youden's J) was 2.7 for screening (sensitivity = .88, specificity = .91) and 2.9 for diagnostic (sensitivity = .83, specificity = .89) accuracy. Scores greater than 3.2 had high specificity, occurring in nearly half (55.8%) of ASD cases but only 5.4% of DD and 0.3% of NT participants. Figure 3 below shows group distribution separation on the ASDQ total item average score, indicating good separation supporting screening and diagnostic accuracy.

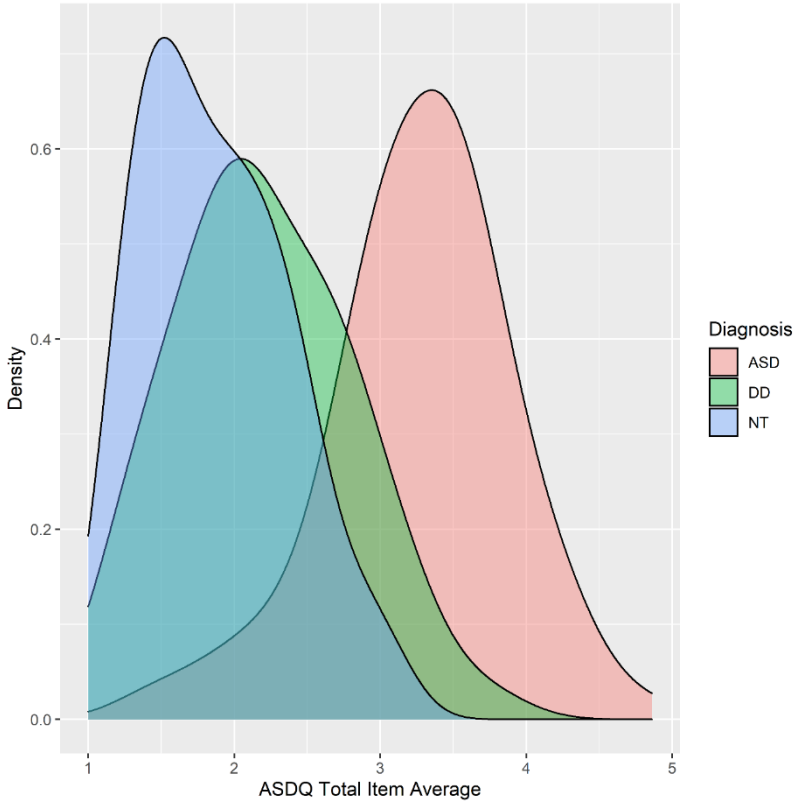

Figure 3. Kernel density plot of ASDQ total item average scores in three groups: neurotypical (blue), other developmental disabilities (green), and autism spectrum disorder (pink).

The figure below shows estimated screening (A) and diagnostic (B) accuracy for the ASDQ Total score and three machine learning algorithms using all ASDQ items as inputs.

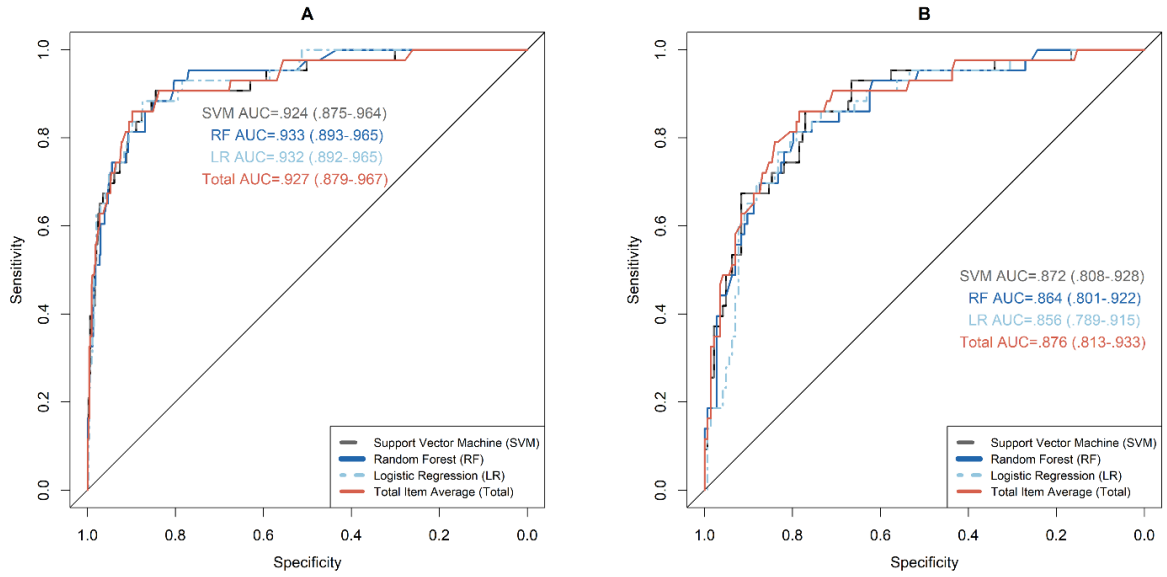

Figure 4. Receiver operating characteristic (ROC) curves depicting the prediction of ASD diagnosis in the test sub-sample using three statistical learning methods and the revised 39-item ASDQ total item average score, separately in all cases (A) and at-risk (B) cases.

4.2.3.8. ASDQ has a continuous score distribution roughly approximating a normal distribution

Figure 5 below shows that in a large neurotypical sample, the ASDQ total score shows a continuous distribution. This further demonstrates that total scores have sufficient range for monitoring across a wide range of score levels (trait levels).

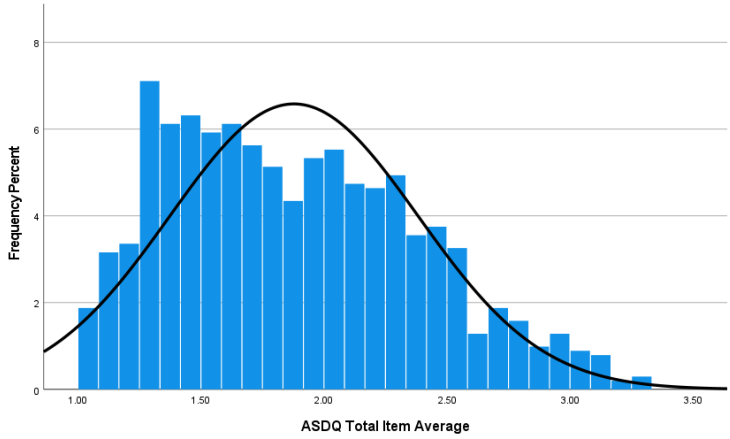

Figure 5. ASDQ total item average score distribution in neurotypical participations.

5.0 Administration

5.1. Response Scales

The full ASDQ instrument is presented below. Different instruction sets for SCI and RRB items are used to assist informants in switching between positively and negatively-worded items. All items were rated using a 5-point Likert frequency scale (1=Never, 2=Rarely, 3=Sometimes, 4=Often, 5=Very Often). In addition, participants are given the option to select "not applicable or not able to rate" for any item. This was done in response to feedback from caregivers of young and more impaired children.

5.2. Rating Frames

No time frame was included on the instructions because the original intention of the measure was to assist in ASD identification and data suggest that time intervals do not substantially influence diagnostic accuracy for child psychopathology. Moreover, prior work has suggested that providing no specific time interval produces responses that are closer to shorter intervals (3 days to 1 week) and approximate current status.

Please indicate how frequently the person you are rating engages in each of the following behaviors. Please consider expectations for behavior given the person's age when responding to each question. **If the question is not applicable to the person you are rating because they are too young, are not verbal, or you feel you do not have enough information to rate the behavior, select the last column (Not Applicable or Not Able to Rate).** How often does this person…	Never	Rarely	Sometimes	Often	Very Often	Not Applicable or Not Able to Rate
1. Start interactions with others without prompting?	☐	☐	☐	☐	☐	☐
2. Prefer to be with family or friends rather than alone?	☐	☐	☐	☐	☐	☐
3. Try to be physically and emotionally-connected to family and friends?	☐	☐	☐	☐	☐	☐
4. Make expected eye contact? (not too brief, too intense, or looking past people)	☐	☐	☐	☐	☐	☐
5. Use gestures to communicate? *(ex. wave, point, nod, shake head)*	☐	☐	☐	☐	☐	☐
6. Communicate clearly so that other people know how they feel?	☐	☐	☐	☐	☐	☐
7. Offer comfort to others when they are upset or sick?	☐	☐	☐	☐	☐	☐
8. Share enjoyment about interests or activities with other people?	☐	☐	☐	☐	☐	☐
9. Engage in back and forth play with same-age peers? *(ex: playing tag or cops-and-robbers by exchanging roles and allowing others to win OR in adolescents/adults playing turn-taking games or activities that require reciprocal give-and-take)*	☐	☐	☐	☐	☐	☐

10. Respond appropriately when others approach them? *(ex. smiling, nodding, saying something back)*	☐	☐	☐	☐	☐	☐
11. Have a back and forth conversation about <u>another person's</u> interests and activities, not just their own?	☐	☐	☐	☐	☐	☐
12. Read social cues? *(ex. facial expressions, gestures, body language)*	☐	☐	☐	☐	☐	☐
13. Understand that expected behavior varies by social situation? *(ex: behave differently at the library than at a party)*	☐	☐	☐	☐	☐	☐
14. Seems to understand what others are thinking or feeling?	☐	☐	☐	☐	☐	☐
15. Show that relationships are important to them?	☐	☐	☐	☐	☐	☐
16. Seek out playful interactions, playmates, or friendships?	☐	☐	☐	☐	☐	☐
17. Engage with two or more close friends?	☐	☐	☐	☐	☐	☐
The following set of questions examines unexpected behaviors. How often does this person…						
18. Flap or move their hands in an unusual way? *(ex. claps or flaps their hands or flicks their fingers when they are excited)*	☐	☐	☐	☐	☐	☐
19. Repetitively jump, rock their body, spin in circles, or do other whole-body motions?	☐	☐	☐	☐	☐	☐
20. Repeat sounds, words, or lines from videos?	☐	☐	☐	☐	☐	☐
21. Repetitively play with objects or repeat actions without a purpose? *(ex. lining up toys, spinning wheels, opening and closing doors, turning lights on and off, etc.)*	☐	☐	☐	☐	☐	☐
22. Insist on keeping a consistent daily schedule? *(ex. gets upset with changes in the routine)*	☐	☐	☐	☐	☐	☐
23. Have difficulty transitioning from one activity to another?	☐	☐	☐	☐	☐	☐
24. Want to follow strict rules, rituals, or sequences? *(ex. taking the same route to a destination, touching things in a certain sequence, eating foods in a certain order, playing a game a certain way, or performing activities until they are "just right")*	☐	☐	☐	☐	☐	☐
25. Have trouble changing their mind and being flexible?	☐	☐	☐	☐	☐	☐
26. Appear overly sensitive to loud noises?	☐	☐	☐	☐	☐	☐
27. Get upset in crowded or busy places?	☐	☐	☐	☐	☐	☐
28. Dislike certain lights, sounds, textures, foods, or smells?	☐	☐	☐	☐	☐	☐
29. Prefer to engage with specific parts of objects rather than the whole object? *(ex. parts of a toy, small pieces of a game, or parts of electrical equipment)*	☐	☐	☐	☐	☐	☐
30. Appear fascinated by sensory experiences? *(ex. staring at lights, fans, running water, symmetrical patterns, street signs, falling or dangling objects, textures, smells, etc.)*	☐	☐	☐	☐	☐	☐
31. Become preoccupied with visual patterns or sounds? *(ex. fascination with the way something looks or moves, excessive focus on certain sounds or videos)*	☐	☐	☐	☐	☐	☐
32. Think or talk about the same topic over and over?	☐	☐	☐	☐	☐	☐
33. Seem overly fixated on one interest or activity?	☐	☐	☐	☐	☐	☐

34. Spend too much time on a game or subject that is not interesting to others?	☐	☐	☐	☐	☐	☐
35. Seem too focused on an interest that is highly specific or narrow in scope?	☐	☐	☐	☐	☐	☐
36. Prefer to make lists, memorize facts, or learn about technical subjects?	☐	☐	☐	☐	☐	☐
37. Stand too close or show unexpected body language when interacting with others? *(ex: a facial expression that doesn't match what the person is saying or having their body turned away during conversation)*	☐	☐	☐	☐	☐	☐
38. Take things too literally? *(ex: not understanding when people are sarcastic, joking, or using figures of speech such as "It's raining cats and dogs!" Or "A leopard can't change his spots!")*	☐	☐	☐	☐	☐	☐
39. Speak with an unusual volume, tone, rhythm, or rate of speech?	☐	☐	☐	☐	☐	☐

Figure 6. ASDQ paper-pencil version.

6.0 Scoring

Items 1-17 are reverse scored. Total ASDQ score is calculated as the sum of items 1-39. Table 7 below provides a list of items that constitute nine distinct ASDQ subscales.

Table 7. Subscale content

Subscale	Items
Social Communication Interaction Subdomains	
Basic Social Communication	1, 4, 5, 6, 8, 10, 11
Affiliation	2, 3, 15
Perspective Taking	7, 12, 13, 14
Peer Relationships	9, 16, 17
Repetitive Behaviors Subdomains	
Repetitive Motor Behaviors	18, 19, 20, 21
Sensory Interests	29, 30, 31
Insistence on Sameness	22, 23, 24, 25
Sensory Sensitivities	26, 27, 28
Restricted Interests	32, 33, 34, 35

7.0 Interpretation and clinical guidance

The ASDQ automatic scoring system provides a separate set of guidelines and recommendations for screening and diagnostic evaluation, cross-sectional monitoring, general intervention approach, treatment target selection, and child strengths. These recommendations are generated through the evidence-based scoring algorithms built into the online administration and scoring platform and are produced in the form of report. For each individual assessment, the interpretation process involves the following steps:

1. Checking the validity of the scores;
2. Examination and interpretation of the total score;
3. Examination and interpretation of subscale scores; and
4. Identifying specific actions, recommendations, treatment targets.
5. Identify child social communication and interaction strengths.

Through each of the described steps, the clinician is guided by the specific recommendations generated by the automatic scoring system. Abbreviated examples of the screening and diagnostic evaluation interpretative output, cross-sectional monitoring

interpretative output, general intervention approach interpretations, treatment targets, and child strengths are provided below.

7.1. Example Interpretation for Screening or Diagnostic Evaluation

	Item Average	***SS***	***90% CI (+/-)***	***Percentile (%)***	***Descriptive Code***
ASDQ Total	3.00	136	5.5	99.3	***Very High (SS≥130)***
SCI Index	3.00	137	6.5	99.4	***Very High (SS≥130)***
RBR Index	3.00	127	6.3	96.6	***High (SS=115-129***

Post-Test Probability: ***0.58***

Recommendation: ***Level 4 (High Risk)***

- The ASDQ Total standard score falls into the Very High range.
- Assuming an elevated initial probability of ASD, based on referral to this clinic (pre-test probability = .14), the final probability after accounting for the ASDQ total score falls into the High-Risk range (post-test probability = .58).
- Inspection of the ASDQ items indicates that the following DSM-5 symptom criteria had one or more items endorsed:

DSM-5 Criteria	***Number of Items Endorsed***
A1: Reciprocity	*5*
A2: Non-verbal communication	*9*
A3: Relationships	*6*
B1: Repetitive motor and speech	*4*
B2: Need for Sameness	*4*
B3: Restricted interests	*5*
B4: Sensory sensitivity and interests	*6*

The reporting system outputs how specific DSM-5 criteria were met:

A1: Reciprocity criteria were met by elevated ratings for: lower frequency of offering comfort to others, lower ability to read social cues, limited understanding of expected social behavior, less understanding of others' thoughts and feelings, taking things too literally.
A2: Non-verbal Communication criteria were met by elevated ratings for: elevated frequency of wanting to be alone, reduced use of gestures, problems with communicating feelings clearly, lower frequency of offering comfort to others, lower engagement in back and forth play with peers, lower amount or quality of back and forth conversation about others' interests, lower ability to read social cues, unexpected social distance or body language, unusual voice characteristics.
A3: Relationships criteria were met by elevated ratings for: elevated frequency of wanting to be alone, reduced frequency of staying connected to others, lower engagement in back and forth play with peers, limited showing of the importance of relationships, less seeking of playful interactions with friends or playmates, less engagement with two or more close friends.
B1: Repetitive Motor criteria were met by elevated ratings for: unusual hand movements, repetitive whole-body motions, repeating sounds words or lines, repetitive play with objects or repeating actions.
B2: Need for Sameness criteria were met by elevated ratings for: insisting on a consistent routine, difficulty with transitioning from one activity to another, wanting to follow strict rules or rituals, difficulty changing their mind, sensitivity to noises.
B3: Restricted Interests criteria were met by elevated ratings for: talking about the same topic over and over, fixation on one interest or activity, spending excessive time on a game or subject that others are not interested in, over-focused on a narrow or specific interest, preferring facts or technical subjects.
B4: Sensory Sensitivity and Interests criteria were met by elevated ratings for: sensitivity to noises, upset in crowed or busy places, disliking certain lights, sounds, textures, foods, or smells, preferring to engage with parts of objects, fascination with sensory experiences, preoccupation with patterns or sounds.

The reporting system also outputs social communication and interaction strengths to facilitate clinicians emphasizing both symptoms/weaknesses and behavioral strengths to provide a balanced perspective to parents/caregivers during the screening and evaluation process.

The following strengths were noted in the ASDQ:
starting interactions, staying connected to others, appropriate use of gestures, offering comfort to others, engagement in back and forth play with peers, showing appropriate social distance and body language, understanding non-literal language, showing appropriate voice when communicating

7.2. Example Interpretation for Cross-Sectional Monitoring

	Item Average	Developmental Score	SS	90% CI (+/-)	Percentile (%)	Descriptive Code
ASDQ Total	***3.82***		***161.7***	5.5	100.0	***Very High (SS≥130)***
SCI Index	2.88	-1.97	134.0	6.5	98.8	***Very High (SS≥130)***
RBR Index	4.47		161.9	6.3	100.0	***Very High (SS≥130)***
Specific Problem Scales	**Item Average**		**SS**	**90% CI (+/-)**	**Percentile (%)**	**Descriptive Code**
Perspective Taking	3.00	-1.3	125.1	9.6	96.9	***High (SS=115-129)***
Basic Social Communication	2.71	-1.8	128.0	9.9	70.6	***High (SS=115-129)***
Affiliation	2.00	-0.5	108.1	12.3	95.3	***Average (SS=100-114)***
Relationships	4.00	-3.2	155.1	9.6	100.0	***Very High (SS≥130)***
Repetitive Motor	4.00		136.2	10.2	99.2	***Very High (SS≥130)***
Insistence on Sameness	4.00		143.3	11.0	100.0	***Very High (SS≥130)***
Restricted Interests	5.00		150.1	7.4	99.8	***Very High (SS≥130)***
Sensory Sensitivity	4.33		144.7	10.5	99.9	***Very High (SS≥130)***
Sensory Interests	5.00		160.0	9.6	100.0	***Very High (SS≥130)***

The above results are also presented visually to the clinician in the online system using a graph that displays the SS and the 90% confidence interval. Figure 7 below provides an example of the cross-sectional monitoring graph for ASDQ total and subscale scores.

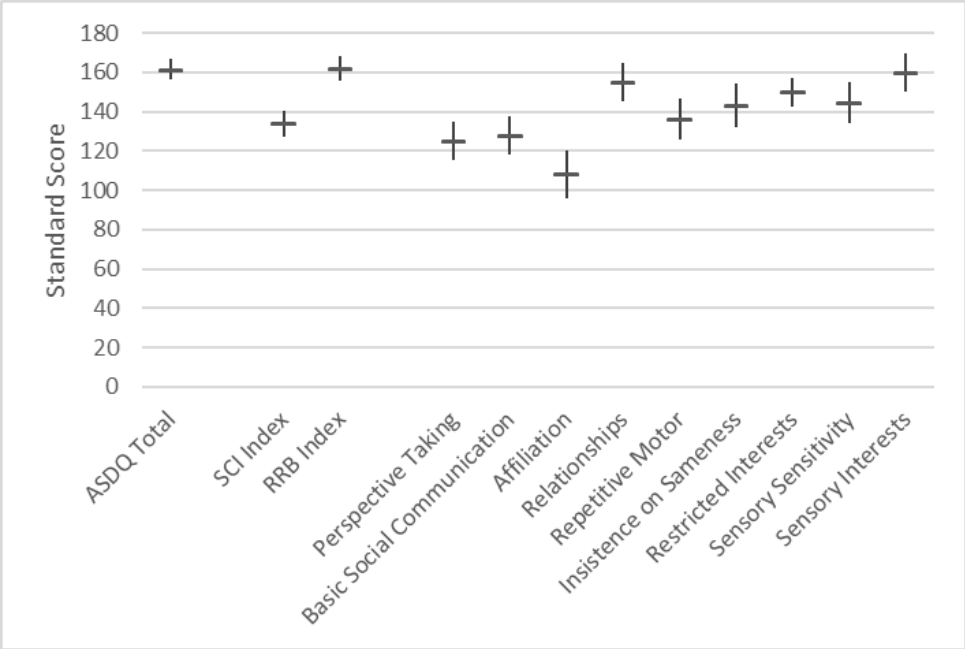

Figure 7. Example of cross-sectional monitoring display for ASDQ total and subscale scores.
Note. The above figure presents the Standard Score and a 90% confidence interval for this score. SS≥115 but <130 indicate High symptom levels and SS >130 are Very High symptom levels.

Interpretative Text

- The total ASDQ score, SCI Index score and RRB Index score all indicated a Very High level of autism symptoms, falling at or above the 98th percentile of neurotypical children.

- Subscale scores and interpretation are as follows:
    - The perspective taking symptom subscale score fell in the High (SS=115-129) range. Scores in this range on the perspective taking subscale are associated with greater than expected problems with interpreting other people's intentions, motivations, and feelings, particularly in complex situations. Children who score in this range tend to have greater problems than most other children with engaging in expected social behavior, including changing their responses depending on context and reading social cues.
    - The basic social communication subscale score fell in the High (SS=115-129) range. Scores in this range on the basic social communication symptom subscale are associated with greater than expected difficulties in using basic skills such as using gestures, making consistent eye contact, and responding appropriately to others approaches.
    - The affiliation subscale score fell in the Average (SS=100-114) range.

- The relationships subscale score fell in the Very High (SS≥130) range. Scores in this range on the relationships subscale are associated with much lower than expected levels of relationship building, playful interactions, and/or friendship development.

- The repetitive motor subscale score fell in the Very High (SS≥130) range. Scores in this range on the repetitive motor subscale are associated with very high levels of repetitive motor mannerisms such as hand flapping, finger flicking, repetitive jumping or spinning, etc.

- The insistence on sameness subscale score fell in the Very High (SS≥130) range. Scores in this range on the insistence on sameness subscale are associated with very high need for the routine, schedule, and environment to remain the same and can be associated with emotional responses when these things change.

- The restricted interests subscale score fell in the Very High (SS≥130) range. Scores in this range on the restricted interests subscale are often associated with a pattern of very intense over-focus on one or two areas of interest, often with emphasis on details and lack of emphasis on possible social or interactive aspects.

- The sensory sensitivity subscale score fell in the Very High (SS≥130) range. Scores in this range on the sensory sensitivity subscale are often associated with one or more situations where sensory information is very overwhelming and distressing or is noticed when most people do not notice it and is often associated with distress.

- The sensory interests subscale score fell in the Very High (SS≥130) range. Scores in this range on the sensory interests subscale are often associated with preoccupations with multiple sensory situations that are highly unusual in intensity or focus (e.g. running water, flashing lights, certain visual patterns, etc.

7.3. Example Longitudinal Monitoring

The longitudinal monitoring function of C-NET permits plotting of data for each measure collected. For the ASDQ, this plot defaults to include the ASDQ Total, SCI, and RRB symptom standard scores. The plot allows the clinician to visualize progress and (if desired) send it to the family so that they also can see intervention success. ASDQ subscales can also be plotted.

Figure 8 below shows an example plot of ASDQ Total, SCI, and RRB standard scores from baseline to 18-month follow-up during the course of behavioral intervention. This child is making good intervention progress and the scores are approaching a range where the clinician may decide to decrease the intensity of treatment, shift social communication targets into maintenance, and/or emphasize other treatment targets.

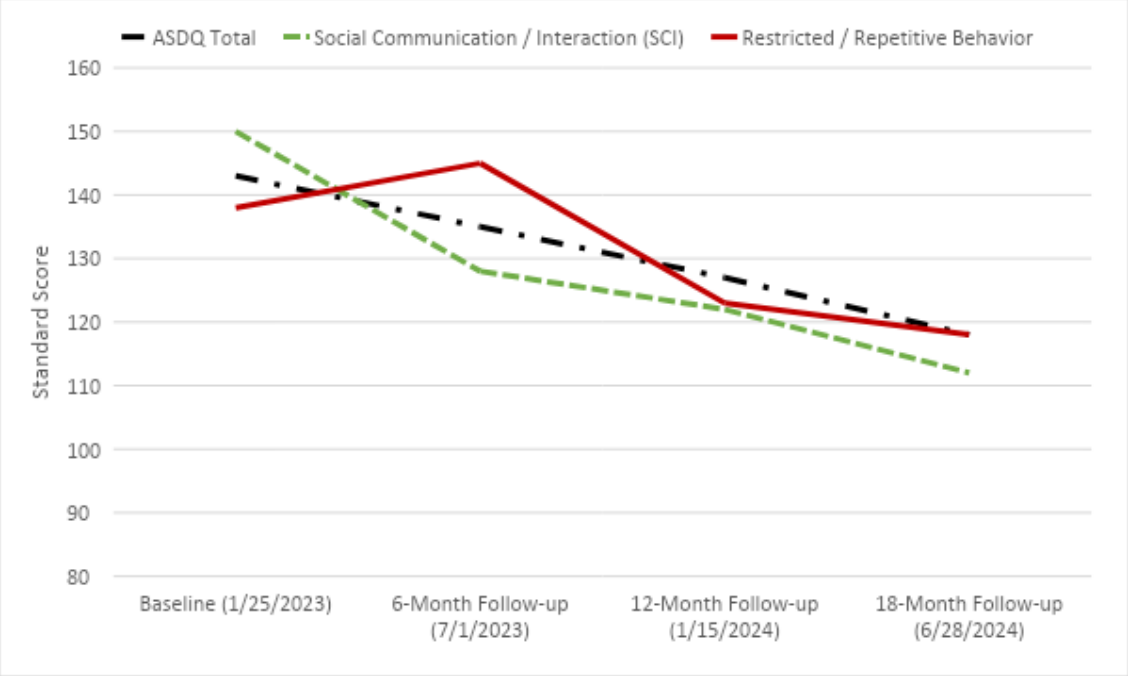

Figure 8. Example longitudinal monitoring plot for the ASDQ.

7.4. Example General Intervention Recommendations

- Based on the pattern of subscale scores, the following general recommendations are offered to inform future intervention planning:
- Prompt and reinforce interest in others and peer interaction;
- SLP and Behavioral Intervention to improve basic social communication skills (such as using and following gestures, joint attention, eye contact, etc.);
- If appropriate per age and cognitive level, consider social cognitive intervention (such as teaching expected behavior across social situations, compromising, major versus minor problems, social distance, etc.;
- If appropriate per age and cognitive level, include intervention focus on building friendships, closeness with family and friends, understanding others interests, etc.;
- Focus on accommodating repetitive motor behaviors as these may be enjoyable or soothing. If impairing, consider identifying functional replacement behaviors to reduce any negative impact of these behaviors on social interaction or functional independence;
- Focus on accommodating sensory interests as they may be enjoyable or soothing. If impairing, consider identifying sensory replacements to

reduce any negative social or functional impact and/or shape to more expected sensory engagement behaviors;
- Increase ability to tolerate change, including using a daily schedule with possible alterations, warnings for transitions, practicing new routines, etc.;
- Consider accommodations for sensory sensitivity, including headphones for loud environments, removal of tags from clothing, etc.;
- Consider expanding interest repertoire through exposure and reinforcement, increasing social aspects of the interest, and teach appropriate conversation regarding interests, etc.

7.5. Example Social Communication Treatment Targets

Given parent responses to the ASDQ, the following treatment targets might be considered as part of future intervention planning:

Near-term targets:
- Gain attention for needs
- Point to express interest / initiate joint attention
- Follows a clear point toward a highly interesting object or other stimulus
- Use gestures to get something they want (ex. picked up, get food or a toy they cannot reach)
- Smile in response to familiar voice or sound

Medium-term targets:
- Interpret common gestures
- Respond with sound or gesture when approached by another person
- Use greetings (hi!, fist bump, etc.)
- Identify at least 3 facial expressions (ex. happy, sad, mad)
- Use eye contact when responding to name being called
- Understand at least 2 common gestures (wave, nod, shake, clapping hands, etc.)
- Gain attention for interests

Longer-term targets:
- Use common gestures
- Use eye contact when gaining another person's attention
- Match facial expressions to situation in stimuli
- identify at least 6 facial expressions (happy, excited, surprised, sad, scared, mad, disgusted/gross, disappointed/contempt, shame/guilt)

- understand at least 3 more complex gestures (finger over lips - shush!, come here with an inward wave, shoulder shrug, etc.)

7.6. Example Strengths to Consider

The following social communication / interaction strengths were noted in the ASDQ:

- wanting to be with others
- staying connected to others
- making expected eye contact
- communicating feelings clearly
- offering comfort to others
- sharing enjoyment

References

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