

# Autism Screenings and Assessments

Public schools are required by law to identify all children with disabilities, including those with autism spectrum disorders (AU) (IDEA, 2004). Early identification is key because early treatment leads to better outcomes (Dawson & Osterling, 1997; Eikeseth, Smith, Jahr, & Eldevik, 2007). Although it is often difficult to suggest to staff and parents that a child may have an autism spectrum disorder, there is a significant risk to failing to recognize the disorder and provide intervention when it is present.

The process of evaluating for autism spectrum disorders is complex and cannot be reduced to a single score from a single test. Freeman, Cronin, and Candela (2002) highlight that “rating scales were not designed to be used in isolation to make a diagnosis. They are useful to the clinician, but are only one source of qualitative information for a comprehensive clinical assessment” (p. 148). Accurate identification of autism spectrum disorder requires analysis of both qualitative and quantitative data from a number of sources. As such, a quality assessment is dependent on the clinician – the most important component of any evaluation process.

This section discusses the importance of a thorough developmental history and reviews autism screening and assessment tools.

## ***Did You Know?***

- Autism spectrum disorders are not rare. They are more prevalent in children “than cancer, diabetes, spina bifida, and Down syndrome” (Filipek et al., 1999, p. 440).
- A growing body of research suggests that autism can be accurately diagnosed by age 2 (Bishop et al., 2008; Charman & Baird, 2002).
- Diagnosis of autism at age 2 is accurate and stable over time (Charman et al., 2005; Eaves & Ho, 2004; Lord et al., 2006; Turner et al., 2006).

## Developmental History

Autism is classified as “Pervasive Developmental Disorders” by the *Diagnostic and Statistical Manual of Mental Disorders-4th Edition, Text Revision* (American Psychiatric Association, 2000); therefore, accurate assessment **must** include a thorough developmental history.

Developmental history is best collected through an in-person interview with the child’s parents/caregivers. Indeed, Filipek et al. (1999) stress the importance of parent/caregiver input to the diagnostic process.

Critical areas to include in a developmental history are summarized in the listing below. Several autism screening and assessment tools incorporate components of a developmental history questionnaire. These are denoted with an asterisk (\*) on the assessment tool table.

- Birth History
- Family History (immediate and extended)
  - Pervasive Developmental Disorders
  - Genetic or Medical Disorders
  - Learning Disorders
  - Emotional/Behavioral Disorders
- Medical History
  - Medical Conditions (e.g., seizures, allergies, asthma, head injury/trauma)
  - Hospitalization
  - Sensory Differences
  - Medication
  - Hearing/Vision
  - Previous Evaluations/Other Diagnoses
- Developmental Milestones
  - Language/Communication
  - Social
  - Motor
  - History of Regression or Interruption of development
  - History of Interventions

## Overview of Instruments

A number of tools are available for screening and diagnosis/identification of autism spectrum disorders. This section provides an overview of such instruments and the relevant research.

Accurate screening and diagnosis/identification of autism spectrum disorders requires collecting and assimilating data from a variety of sources using multiple methods. As with all data, the information collected must subsequently be interpreted. Experienced clinicians never rely strictly on a screening or diagnostic instrument. While assessment tools can provide valuable information, no tool interprets itself.

Efforts have been made in the following to distinguish between screening and diagnostic tools. For example, Charak and Stella (2001-2002) state that, “Screening instruments are intended to help clinicians identify children who present with developmental delays and/or atypical behavior for whom a diagnosis in the autistic spectrum may be considered . . . [those] who should be referred for a more intensive diagnostic evaluation” (p. 6). The term “diagnostic” instrument is misleading because no single instrument constitutes a sufficient basis for a diagnostic decision. In practice, there is no distinct line where screening ends and diagnostic assessment begins. The information gathered during screening is incorporated in the comprehensive assessment process.

This section will provide a brief review of measures designed to capture descriptive information from parents/caregivers, staff, and the student.

### **ASPERGER SYNDROME DIAGNOSTIC SCALE (ASDS)**

The Asperger Syndrome Diagnostic Scale (ASDS; Myles, Bock, & Simpson, 2001) is a norm-referenced measure consisting of 50 yes/no items. The ASDS yields scores in five areas: cognitive, maladaptive, language, social, and sensorimotor, as well as an Asperger Syndrome Quotient (ASQ). The five subtests provide information comparing the behaviors of the individual to the behaviors of individuals diagnosed with Asperger Syndrome (AS). The ASQ

indicates the probability of Asperger Syndrome. Any individual who knows the child or adolescent well may complete the ASDS.

### **AUTISM BEHAVIOR CHECKLIST (ABC)**

The Autism Behavior Checklist (Krug, Arick, & Almond, 2008) is a 57-item questionnaire completed by parents or teachers. It is one component of the Autism Screening Instrument for Educational Planning-Third Edition (Krug et al., 2008). The ABC is divided into five subscales: sensory behavior, social relating, body and object use, language and communication skills, and social and adaptive skills.

### **AUTISM DIAGNOSTIC INTERVIEW-REVISED (ADI-R)**

The Autism Diagnostic Interview-Revised (ADI-R; Lord, Rutter, & LeCouteur, 1994) is the 1994 revision of the ADI. The interview is conducted with parents or caretakers who have knowledge about the individual's current behavior and developmental history. The questions address the triad of symptoms related to autism spectrum disorders – Language/Communication; Reciprocal Social Interactions; and Restricted, Repetitive, and Stereotyped Behaviors and Interests. The measure consists of 93 yes/no questions followed by probe questions, which are scored on a scale of 0 to 2. Using a scoring template, the scores are converted into diagnostic criteria based on the International Classification of Diseases-10<sup>th</sup> Revision (ICD-10; World Health Organization, 1993).

### **AUTISM DIAGNOSTIC OBSERVATION SCHEDULE (ADOS)/AUTISM DIAGNOSTIC OBSERVATION SCHEDULE-GENERIC (ADOS-G)**

The ADOS/ADOS-G (Lord, Rutter, DiLavore, & Risi, 2001) is a semi-structured, standardized observational assessment tool designed to assess autism spectrum disorders in children, adolescents, and adults. The ADOS-G was developed from the original ADOS (Lord et al., 1989) and the Pre-Linguistic Autism Diagnostic Observation Schedule (PL-ADOS; DiLavore, Lord, & Rutter, 1995). The ADOS-G is now commonly referred to, and marketed by the publisher, as the “ADOS.”

The new instrument consists of four modules that cover a broader age and developmental range. Each module consists of a variety of activities that provide the examiner with the opportunity to observe social and communication skills associated with autism spectrum disorders. The examiner selects a module based on the individual's expressive language skills and chronological age. The module takes approximately 30-45 minutes to administer. Observations are recorded and scored by the examiner. The ADOS provides cutoff scores to aid in interpretation.

### **AUTISM OBSERVATION SCALE FOR INFANTS (AOSI)**

The Autism Observation Scale (AOSI; Bryson, McDermott, Rombough, Brian, & Zwaigenbaum, 2000) is a semi-structured, play-based measure designed to identify early signs of autism in high-risk infants (those who have an older sibling with autism). The AOSI is intended for infants 6-18 months. Seven activities provide opportunities to observe behaviors in the following areas: visual tracking, disengagement of attention, orientation to name, reciprocal social smiling, differential response to facial emotion, social anticipation, and imitation. Currently, the AOSI is used as a research instrument. It is unpublished and is not commercially available.

### **AUTISM SCREENING INSTRUMENT FOR EDUCATIONAL PLANNING-THIRD EDITION (ASIEP-3)**

The ASIEP-3 (Krug, Arick, & Almond, 2008) was developed to evaluate autism spectrum disorders and assist in developing and monitoring educational programs for individuals on the spectrum. The ASIEP-3 consists of the following five standardized subtests:

- Autism Behavior Checklist: A questionnaire that is designed to assess characteristics of autism
- Sample of Vocal Behavior: An assessment of spontaneous expressive language
- Interaction Assessment: Measurement of a child's social responses and reaction to requests
- Educational Assessment: Assessment of educational skills, including remaining in seat, receptive/expressive language, body concept, and imitation of speech

- Prognosis of Learning Rate: Measures rate of learning

### **AUTISM-SPECTRUM QUOTIENT (AQ)**

The AQ is a parent questionnaire designed to identify the presence of the characteristics of autism spectrum disorders. There are currently two versions of the Autism-Spectrum Quotient – the school-age adolescent version (AQ-Adol; Baron-Cohen, Hoekstra, Knickmeyer, & Wheelwright, 2006) and the children’s version (AQ-Child; Auyeung, Baron-Cohen, Wheelwright, & Allison, 2008). The AQ contains 50 items that describe five areas associated with autism spectrum disorders: social skills, attention switching, attention to detail, communication, and imagination. Parents rate each item on a range from “definitely agree” to “definitely disagree.”

### **AUTISM SPECTRUM SCREENING QUESTIONNAIRE (ASSQ)**

The Autism Spectrum Screening Questionnaire (ASSQ; Ehlers, Gillberg, & Wing, 1999) is designed to screen for symptoms related to AS and other high-functioning disorders (HFA) along the autism spectrum. The checklist consists of 27 items that are rated on a 3-point scale. The scale has been studied with individuals between the age of 6 and 17. Estimated cutoff scores are provided.

### **CHECKLIST FOR AUTISM IN TODDLERS (CHAT)**

The Checklist for Autism in Toddlers (CHAT; Baron-Cohen, Allen, & Gillberg, 1992; Baron-Cohen et al., 1996) is a brief screening questionnaire that is completed by parents and a physician during the child’s 18-month check-up. Five key items are indicative of the risk of developing autism: pretend play, protodeclarative pointing (expressing interest), following a point, pretending, and producing a point. If a child fails the initial administration of the CHAT, it is recommended that the questionnaire be readministered one month later. Any child who fails a second time should be referred for formal autism assessment.

### **CHILDHOOD ASPERGER SYNDROME TEST (CAST)**

The Childhood Asperger Syndrome Test (CAST; Scott, Baron-Cohen, Bolton, & Brayne, 2002) is a parent questionnaire designed to screen for Asperger Syndrome and other social and communication disorders. The test consists of a 37-item yes/no parent questionnaire and was designed for children 4 to 11 years old.

### **CHILDHOOD AUTISM RATING SCALE (CARS)**

The purpose of the Childhood Autism Rating Scale (CARS; Schopler, Reichler, & Renner, 1988) is to identify the presence of autism in children. Fifteen domains are rated on a 7-point Likert scale (assigned values range from 1 to 4 – 1, 1.5, 2, 2.5, 3, 3.5, 4): Relating to people; Imitative behavior; Emotional response; Body use; Object use; Adaptation to change; Visual response; Listening response; Perceptive response; Fear and anxiety; Verbal communication; Nonverbal communication; Activity level; Level and consistency of intellectual relations; and General impressions. Ratings from within normal limits to severely abnormal are based on observation, parent interview, and other records. The Total Score, generated from the 15 domains, provides a rating in one of three categories – nonautistic, mild to moderately autistic, or severely autistic.

### **DEVELOPMENTAL BEHAVIOR CHECKLIST-AUTISM SCREENING ALGORITHM (DBC-ASA)**

The Development Behavior Checklist-Autism School Algorithm (DBC-ASA; Brereton, Tonge, Mackinnon, & Einfeld, 2002) is an autism screening instrument derived from the Developmental Checklist Parent/Primary caregiver report (DBC-P). The DBC-ASA is comprised of 29 items from the original checklist and is intended for children and adolescents 4 to 18 years old.

## **DEVELOPMENTAL CHECKLIST-EARLY SCREEN (DBC-ES)**

The Developmental Checklist-Early Screen (DBC-ES; Gray & Tonge, 2005) is an autism screening instrument derived from the Developmental Checklist Parent/Primary caregiver report (DBC-P). The DBC-ES is comprised of 17 items from the original checklist and is intended for children 18 to 48 months.

## **DIAGNOSTIC INTERVIEW FOR SOCIAL AND COMMUNICATION DISORDERS (DISCO)**

The Diagnostic Interview for Social and Communication Disorders (DISCO; Wing, Leekam, Libby, Gould, & Larcombe, 2002) is an assessment tool for the diagnosis of Autistic Disorder, Asperger’s Disorder, psychiatric disorders, and other developmental disabilities. The DISCO also assists in intervention planning. The DISCO is intended to be used as part of a multidisciplinary assessment battery. Parents or other caregivers participate in an interview that takes approximately three hours. The interviewer rates items based on the informant’s responses.

## **EARLY SCREENING OF AUTISTIC TRAITS (ESAT)**

The Early Screening of Autistic Traits (ESAT; Swinkels et al., 2006) is a 14-item screening checklist for parents/caregivers. The questionnaire is designed for 14-month-old infants. The tool is designed to be administered by health practitioners at well-baby visits. Failure on three or more items suggests the need for a diagnostic evaluation.

## **GILLIAM ASPERGER’S DISORDER SCALE (GADS)**

The Gilliam Asperger’s Disorder Scale (GADS; Gilliam, 2003) is a 32-item questionnaire designed to identify individuals with Asperger’s Disorder. The tool is comprised of the following subscales: Social Interaction, Restricted Patterns, Cognitive Patterns, and Pragmatic Skills. The GADS can be completed by parents/caregivers or teachers. Respondents indicate the frequency of behaviors from “never observed” to “frequently observed.” The GADS includes a parent interview form that inquires about language and cognitive development, self-help skills,

adaptive behavior, and curiosity. There is also a section of “key questions” for parents/caregivers to complete.

### **GILLIAM AUTISM RATING SCALE-SECOND EDITION (GARS-2)**

The Gilliam Autism Rating Scale-2 (GARS-2; Gilliam, 2006) is designed for screening and diagnosis of autism in individuals aged 3 to 22. It was normed on a sample of 1,107 individuals from 48 states in the United States. The GARS-2 can be completed by parents, teachers, or other caregivers who are with the individual regularly. The GARS-2 consists of three subscales: Stereotyped Behaviors, Communication, and Social Interaction. The 42 items are rated based on frequency and can be completed in 5 to 10 minutes. The GARS-2 also includes a parent interview and questions to consider during diagnostic decision-making.

### **KRUG ASPERGER’S DISORDER INDEX (KADI)**

The Krug Asperger’s Disorder Index (KADI; Krug & Arick, 2003) is a screening instrument for Asperger Syndrome. It is also a useful tool for developing goals for intervention. Two forms, elementary (6-12 years) and secondary (12-21 years), cover a wide age range. The KADI is divided into two sections. Section 1 is a pre-screening tool. Section 2 consists of additional items, which are completed only if results of the screening tool indicate need for further assessment.

### **MODIFIED CHECKLIST FOR AUTISM IN TODDLERS (MCHAT)**

The Modified Checklist for Autism in Toddlers (MCHAT; Robbins, Fein, Barton, & Green, 2001) is a 23-item yes/no questionnaire for parents and caregivers. It is designed to screen for autism in infants 16 to 30 months. The MCHAT was based on the CHAT (Baron-Cohen, Allen, & Gillberg, 1992; Baron-Cohen et al., 1996); however, it does not include items that require observation/administration by a physician. The authors of the MCHAT indicate that the instrument purposefully yields more false-positives. A follow-up questionnaire helps screen those who require further evaluation.

## **MONTEIRO INTERVIEW GUIDELINES FOR DIAGNOSING ASPERGER'S SYNDROME (MIGDAS)**

The Monteiro Interview Guidelines for Diagnosing Asperger's Syndrome (MIGDAS; Monteiro, 2008) is a qualitative assessment tool designed for use by school-based evaluation teams to assess Asperger Syndrome in children and adolescents. The MIGDAS consists of three tools: Pre-Interview Checklist, Parent and Teacher Interview, and Diagnostic Student Interview. Together, these tools help teams to gather qualitative information to assist in the diagnostic process. Teams first complete the Pre-Interview Checklist, a brief yes/no questionnaire, to help determine the need for an evaluation. The remaining interviews (teacher, parent, and student) are completed only when a need has been identified. After completion of the evaluation, teams discuss their qualitative observations and interpret the results.

## **PERVASIVE DEVELOPMENTAL DISORDERS SCREENING TEST-SECOND EDITION (PDDST-II)**

The Pervasive Developmental Disorders Screening Test-Second Edition (PDDST-II; Siegel, 2004) is a questionnaire designed to screen for autism in young children from 12 to 48 months. Three versions were developed for different settings, referred to as stages: Stage 1: Primary Care Screener; Stage 2: Developmental Clinic Screener; and Stage 3: Autism Clinic Severity Screener. Stage 1 is intended for primary care settings. Stage 2 is intended for children who are receiving developmental services, and Stage 3 is designed to help differentiate autism from other pervasive developmental disorders. The PDDST-II may be administered to parents/caregivers as a questionnaire or given in an interview format. Results are interpreted by a clinician.

## **SOCIAL COMMUNICATION QUESTIONNAIRE (SCQ)**

The Social Communication Questionnaire (SCQ; Rutter, Bailey, Lord, & Berument, 2003) is an instrument for screening for autism in individuals over the age of 4 with a mental age over 2 years. The SCQ contains 40 yes/no items, which can be completed in less than 10 minutes by a parent or other caregiver. The SCQ has two forms – the Lifetime Form, which focuses on behavior throughout development, and the Current Form, which focuses on behavior during

the most recent three months. The instrument yields a Total Score for comparison to defined cutoff points.

### **SOCIAL RESPONSIVENESS SCALE (SRS)**

The Social Responsiveness Scale (SRS; Constantino & Gruber, 2005) is a 65-item questionnaire used to assist in screening and diagnosis of autism. The tool can be completed by parents/caregivers or teachers who are familiar with the student. Questions are rated on a 4-point Likert scale. The test provides an overall score and five treatment subscales that can be used for program planning: Social Awareness, Social Cognition, Social Communication, Social Motivation, and Autistic Mannerisms.

### **SCREENING TOOL FOR AUTISM IN TWO-YEAR-OLDS (STAT)**

The Screening Tool for Autism in Two-Year-Olds (STAT; Stone, Coonrod, & Ousley, 2000) is an instrument for screening for autism in children between the ages of 24 and 36 months. This instrument consists of 12 interactive activities administered within the context of play. Behaviors in four social-communicative domains – play, motor imitation, requesting and directing attention – are assessed, and performance on each item is rated as Pass, Fail, or Refuse, based on specified criteria. The STAT may be given by a wide range of professionals, but training in administration and scoring is required. Administration time is approximately 20 minutes.

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## Autism Spectrum Screening and Diagnostic/Identification Tools

Autism screening and diagnostic/identification tools are summarized in the following table. This list includes the best known and most widely used instruments available. Charak and Stella (2001-2002) identified seven instruments as screeners (ABC, ASIEP, CHAT, PDDST, STAT, ASQ, and the SCQ) and four instruments as diagnostic (ADOS, CARS, GARS, and the ASDS).

The current versions of these tools are identified accordingly in the Screening/Diagnostic column in the table. Instruments not included in Charak and Stella's selective review are identified as screening or diagnostic based on the authors' description. Several autism screening and diagnostic/identification tools incorporate components of a developmental history questionnaire. These are denoted with an asterisk (\*).

**Note:** All summary and research tables in the remainder of this section are from Grossman, B. G., Aspy, R., & Myles, B. S. (2009). *Interdisciplinary evaluation of autism spectrum disorders: From diagnosis through program planning*. Shawnee Mission, KS: Autism Asperger Publishing Company. Used with permission.

## Summary of Screening and Diagnostic/Identification Tools

Name of Tool and Author	Screening/ Diagnosis	Age Range (in years except where noted)	Method of Administration/Format	Approx. Time to Administer	Subscales	Availability
*Asperger Syndrome Diagnostic Scale (ASDS) Myles, Bock, & Simpson (2001)	D	5-18	Parent/teacher/caregiver questionnaire 50 items rated for presence or absence of behaviors related to Asperger Syndrome Yields standard scores and percentiles for the five subscales. Raw scores from the subscales are summed to create the Asperger Syndrome Quotient (ASQ), which is a standard score. The ASQ indicates the probability of the diagnosis of AS based on scores of a normative sample of individuals diagnosed with AS.	10-15 min.	Cognitive Maladaptive Language Social Sensorimotor	Pearson <a href="http://www.pearsonassessments.com/HAIWEB/Cultures/en-us/Productdetail.htm?Pid=076-1618-384&amp;Mode=summary">http://www.pearsonassessments.com/HAIWEB/Cultures/en-us/Productdetail.htm?Pid=076-1618-384&amp;Mode=summary</a>
Autism Behavior Checklist (ABC) Krug, Arick, & Almond (2008)	S	3 to 14	Subtest of the ASIEP-3 A 57-item questionnaire; yes/no format Parent or teacher may complete Yields cutoff score ranges based on different diagnoses	10-20 min.	Sensory behavior Social relating Body and object use Language and communication skills Social and adaptive skills	Pro-Ed <a href="http://www.proedinc.com/customer/default.aspx">http://www.proedinc.com/customer/default.aspx</a>
Autism Diagnostic Interview-Revised (ADI-R)** Lord, Rutter, & LeCouteur (1994)	D	Over 2	Structured interview 93 items in three functional domains Responses are coded in eight content areas Yields algorithm cutoff scores	1.5-2.5 hrs.	Early development Language and communication Reciprocal social interactions Restricted, repetitive, and stereotyped behaviors and interests	Western Psychological Services <a href="http://portal.wpspublish.com/qportal/page?_pageid=53.53086&amp;_dad=portal&amp;_schema=PORTAL">http://portal.wpspublish.com/qportal/page?_pageid=53.53086&amp;_dad=portal&amp;_schema=PORTAL</a>

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Name of Tool and Author	Screening/ Diagnosis	Age Range (in years except where noted)	Method of Administration/Format	Approx. Time to Administer	Subscales	Availability
Autism Diagnostic Observation Schedule (ADOS/ ADOS-G)** Lord, Rutter, DiLavore, & Risi (2001)	D	2-adult	Clinician administers to individual Interactive play-based format Yields algorithm cutoff scores for autism and autism spectrum	30-45 min.	Communication Reciprocal Social Interaction Imagination/Creativity or Play Stereotyped Behaviors and Restricted Interests	Western Psychological Services <a href="http://portal.wpspublish.com/portal/page?_pageid=53_53086&amp;_dad=portal&amp;_schema=PORTAL">http://portal.wpspublish.com/portal/page?_pageid=53_53086&amp;_dad=portal&amp;_schema=PORTAL</a>
Autism Observation Scale for Infants (AOSI)** Bryson, McDermott, Rombough, Brian, & Zwaigenbaum (2000)	S	.5-1.5	18-item direct observational measure Seven activities administered in an interactive, play-based format Yields indication of the presence or absence of skill in each of the areas assessed	20 min.	Visual Tracking Disengagement of Attention Orientation to Name Reciprocal Social Smiling Differential Response to Facial Emotion Social Anticipation Imitation	Bryson, S. E., McDermott, C., Rombough, V., Brian, J., & Zwaigenbaum, L. (2000). <i>The autism observation scale for infants</i> [Unpublished Scale]. Toronto, ON.
Autism Screening Instrument for Educational Planning (ASIEP-3)** Krug, Arick, Almond (2008)	S	2-14	Test consists of five components (one subtest is administered to a parent/teacher while the remaining four subtests are administered to the individual). Choice of subtests depends on the results from the Autism Behavior Checklist and the purpose of the assessment Yields standard scores and percentile ranks	Varies	Autism Behavior Checklist Sample of vocal behavior Interaction assessment Educational assessment Prognosis of learning rate	Pro-Ed <a href="http://www.proedinc.com/customer/default.aspx">http://www.proedinc.com/customer/default.aspx</a>

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Autism-Spectrum Quotient (AQ)-Adolescent version Baron-Cohen, Hoekstra, Knickmeyer, & Wheelwright (2006)	S	9.8-15.4	Parent report questionnaire 50 items, from “definitely agree” to “definitely disagree” Yields cutoff scores	Approx. 20 min.	Five subdomains: - Social skills - Attention switching - Attention to detail - Communication - Imagination	Autism Research Centre <a href="http://www.autismresearchcentre.com/tests/aq_adolescent_test.asp">http://www.autismresearchcentre.com/tests/aq_adolescent_test.asp</a>
Autism-Spectrum Quotient (AQ)-Child version, Auyeung, Baron-Cohen, Wheelwright, & Allison (2008)	S	4-11	Parent report questionnaire 50 items, from “definitely agree” to “definitely disagree” Yields cutoff scores	Approx. 20 min.	Five subdomains: - Social skills - Attention switching - Attention to detail - Communication - Imagination	Autism Research Centre <a href="http://www.autismresearchcentre.com/tests/aq_child.asp">http://www.autismresearchcentre.com/tests/aq_child.asp</a>

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Autism Spectrum Screening Questionnaire (ASSQ) Ehlers, Gillberg, & Wing (1999)	S	6-17	Questionnaire for parents or teachers 27 items, 3-point scale Yields cutoff scores	10 min.	Social Communicative behavioral impairments Restricted intellectual interests	Ehlers, S., Gillberg, C., & Wing, L. (1999). A screening questionnaire for Asperger Syndrome and other high-functioning autism spectrum disorders in school-age children. <i>Journal of Autism and Developmental Disorders</i> , 29, 129-141.

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<p>Checklist for Autism in Toddlers (CHAT)** Baron-Cohen et al. (1992, 1996)</p>	<p>S</p>	<p>1.5</p>	<p>A screening tool administered through parent interview and observation 14 items (9 items asked to the parents and 5 observation items administered by the physician) 5 key items are used to identify risk of developing autism: pretend play, protodeclarative pointing, following a point, pretending, producing a point Yields cutoff scores. Failure on all 5 key items suggests high risk of developing autism while failure on two specific items suggests a “medium risk” Children who fail the initial screening should be screened again after one month. Those who fail the second screening should be referred for formal testing</p>	<p>5-10 min.</p>	<p>Joint attention Pretend play</p>	<p style="text-align: center;">The National Autistic Society <a href="http://www.autism.org.uk/en-gb/working-with/health/screening-and-diagnosis/checklist-for-autism-in-toddlers-chat.aspx">http://www.autism.org.uk/en-gb/working-with/health/screening-and-diagnosis/checklist-for-autism-in-toddlers-chat.aspx</a></p>

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Childhood Asperger Syndrome Test (CAST) (Scott, Baron-Cohen, Bolton, & Brayne, 2002)	S	4-11	Parent questionnaire 37 yes/no items Yields cutoff score	Approx. 20 min.	N/A	Autism Research Centre <a href="http://www.autismresearchcentre.com/tests/cast-test.asp">http://www.autismresearchcentre.com/tests/cast-test.asp</a>
Childhood Autism Rating Scale (CARS)** Schopler, Reichler, & Renner (1988)	D	Children 2 and over	15 items are rated on a 7-point scale based on observation, parent report, and other records Yields a total score with three classifications: Not autistic, mild or moderately autistic, or severely autistic	60-90 min. to interview parents; 10-15 min. to rate items	Relating to people Imitative behavior Emotional response Body use Object use Adaptation to change Visual response Listening response Perceptive response Fear and anxiety Verbal communication Nonverbal communication Activity level Level and consistency of intellectual relations General impressions	Western Psychological Services <a href="http://portal.wpspublish.com/portal/page?_pageid=53_53086&amp;_dad=portal&amp;_schema=PORTAL">http://portal.wpspublish.com/portal/page?_pageid=53_53086&amp;_dad=portal&amp;_schema=PORTAL</a>

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Developmental Behavior Checklist-Autism Screening Algorithm (DBC-ASA) Brereton, Tonge, Mackinnon, & Einfeld (2002)	S	4-18	The DBC-ASA is a subset of items derived from the DBC-P (Developmental Checklist-Parent/primary caregiver report) Yields cutoff score	5-10 min.	N/A	Western Psychological Services <a href="http://portal.wpspublish.com/portal/page?_pageid=53,53086&amp;_dad=portal&amp;_schema=PORTAL">http://portal.wpspublish.com/portal/page?_pageid=53,53086&amp;_dad=portal&amp;_schema=PORTAL</a>
Developmental Checklist-Early Screen (DBC-ES) Gray, K. M., & Tonge, B. J. (2005)	S	1.5-4	The DBC-ES is a subset of items derived from the DBC-P (Developmental Checklist-Parent/primary caregiver report) Yields cutoff score	5-10 min.	N/A	Western Psychological Services <a href="http://portal.wpspublish.com/portal/page?_pageid=53,53086&amp;_dad=portal&amp;_schema=PORTAL">http://portal.wpspublish.com/portal/page?_pageid=53,53086&amp;_dad=portal&amp;_schema=PORTAL</a>

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<p>*Diagnostic Interview for Social and Communication Disorders (DISCO)** Wing, Leekam, Libby, Gould, &amp; Locombe (2002)</p>	D	All ages and all levels of ability	Semi-structured interview schedule Respondents are parents or other caregivers Provisional diagnostic algorithms are provided for autism; responses on specific items are used to assist in diagnosis of autism	3 hrs.	Infancy Age of recognition Developmental: Gross-motor skills Self-care Communication Social interaction Imitation Imagination Skills: Visuo-spatial Other: Untypical behavior not directly related to a specific developmental domain	Eliot House, National Autistic Society <a href="http://www.autism.org.uk/en-gb/our-services/diagnosing-complex-needs/the-diagnostic-interview-for-social-and-communication-disorders-disco.aspx">http://www.autism.org.uk/en-gb/our-services/diagnosing-complex-needs/the-diagnostic-interview-for-social-and-communication-disorders-disco.aspx</a>
<p>Early Screening of Autistic Traits (ESAT)** Swinkels, Dietz, van Daalen, Kerkhof, van Engeland, &amp; Buitelaar (2006)</p>	S	1	14-item screening checklist for parents/caregivers Administered by health practitioner Yes/no responses Yields cutoff score	10-15 min.	Pretend play Joint attention Interest in others Eye contact Verbal and nonverbal communication Stereotypes Preoccupations Reaction to sensory stimuli Emotional reaction Social interaction	Swinkels, S. H., Dietz, C., van Daalen, E., Kerkhof, I. H., van Engeland, H., & Buitelaar, J. K. (2006). Screening for autistic spectrum in children aged 14 to 15 months. I: The development of the Early Screening of Autistic Traits Questionnaire (ESAT). Journal of Autism and Developmental Disorders, 36(6), 723-732.

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Name of Tool and Author	Screening/ Diagnosis	Age Range (in years except where noted)	Method of Administration/Format	Approx. Time to Administer	Subscales	Availability
*Gilliam Asperger's Disorder Scale (GADS) Gilliam (2003)	S	3-22	32-item parent/caregiver, teacher questionnaire Includes a parent interview form to gather information about language and cognitive development, self-help skills, adaptive behavior, and curiosity Yields standard scores and percentiles	5-10 min.	Social Interaction Restricted Patterns Cognitive Patterns Pragmatic Skills	Pro-Ed <a href="http://www.proedinc.com/customer/default.aspx">http://www.proedinc.com/customer/default.aspx</a>
*Gilliam Autism Rating Scale-Second Edition (GARS-2) Gilliam (2006)	D	3-22	42 items: 3 subscales Items rated on frequency of occurrence based on direct observation and parent interview Yields standard scores and percentiles for the subscales as well as the total "Autism Index"	5-10 min.	Stereotyped behaviors Communication Social interaction	Pro-Ed <a href="http://www.proedinc.com/customer/default.aspx">http://www.proedinc.com/customer/default.aspx</a>
Krug Asperger's Disorder Index (KADI)-Elementary form/Secondary form Krug & Arick (2003)	S	6-11/12-21	32-item parent/caregiver, teacher questionnaire Respondents first complete the prescreening scale Additional items are completed based on the results of this scale Yields standard scores and percentiles	15-20 min.	N/A	Pro-Ed <a href="http://www.proedinc.com/customer/default.aspx">http://www.proedinc.com/customer/default.aspx</a>
Modified Checklist for Autism in Toddlers (M-CHAT) Robbins, Fein, Barton, & Green (2001)	S	1.5-2.5	23-item yes/no parent/caregiver questionnaire Designed to screen for autism Yields cutoff score	10-15 min.	N/A	University of Georgia <a href="http://www2.gsu.edu/~psyd/rlr/DianaLRobbins/Office/al_M-CHAT_Website.html">http://www2.gsu.edu/~psyd/rlr/DianaLRobbins/Office/al_M-CHAT_Website.html</a>

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Name of Tool and Author	Screening/ Diagnosis	Age Range (in years except where noted)	Method of Administration/Format	Approx. Time to Administer	Subscales	Availability
*Monteiro Interview Guidelines for Diagnosing Asperger's Syndrome (MIGDAS)** Monteiro (2008)	D	School-aged children and teens, as well as verbal preschoolers	The MIGDAS provides guidelines for conducting the parent interview, teacher interview, and student diagnostic interview. The MIGDAS consists of three parts: Pre-Interview Checklist is a yes/no questionnaire for professionals to complete Parent and Teacher Interview – semi-structured interview Student Diagnostic Interview – provides prompts for the evaluators and guidelines for observations Yields qualitative descriptions in each of these areas: Language and communication, social relationships and emotional responses, and sensory use and interests	-Pre-Interview Checklist: 15-30 min.  Parent Interview: 60-90 min.  Teacher Interview: 30-45 min.  Student Diagnostic Interview: 45-60 min.	Pre-Interview Checklist Cognitive Level Academic Achievement Language and Communication History Preoccupations and Interests Organizational Skills Physical Coordination Anxiety Level Affective Vocabulary Social Skills Sensory Issues Previous and Current Diagnoses	Western Psychological Services  <a href="http://portal.wpspublish.com/portal/page?_pageid=53.53086&amp;_dad=portal&amp;_schema=PORTAL">http://portal.wpspublish.com/portal/page?_pageid=53.53086&amp;_dad=portal&amp;_schema=PORTAL</a>
Pervasive Developmental Disorders Screening Test, Second Edition (PDDST-II) Siegel (2004)	S	1-4	Parent/caregiver questionnaire Stage 1-Primary Care Screener (Stage 1-PCS), 22 items Stage 2-Developmental Clinic Screener (Stage 2-DCS), 14 items Stage 3-Autism Clinic Severity Screener (Stage 3-ACSS), 12 items 41 supplemental items Yields cutoff scores	15 min.	N/A	Pearson  <a href="http://www.pearsonassessments.com/haiweb/cultures/en-us/productdetail.htm?pid=076-1635-106&amp;mode=summary">http://www.pearsonassessments.com/haiweb/cultures/en-us/productdetail.htm?pid=076-1635-106&amp;mode=summary</a>

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Name of Tool and Author	Screening/ Diagnosis	Age Range (in years except where noted)	Method of Administration/Format	Approx. Time to Administer	Subscales	Availability
*Social Communication Questionnaire (SCQ) Rutter, Bailey, Lord, & Berument (2003) [formerly the Autism Screening Questionnaire (ASQ)]	S	Over 4	40-item parent questionnaire Additional Lifetime Form that examines developmental history Yields total score with cutoff points	10-15 min.	Reciprocal Social Interaction Language & Communication Stereotyped Patterns of Behavior	Western Psychological Services <a href="http://portal.wpspublish.com/portal/page?_pageid=53.53086&amp;.dad=portal&amp;.schema=PORTAL">http://portal.wpspublish.com/portal/page?_pageid=53.53086&amp;.dad=portal&amp;.schema=PORTAL</a>
Social Responsiveness Scale (SRS) Constantino & Gruber (2005)	S/D	4-18	65-item parent/caregiver, teacher questionnaire Respondents answer questions on a 4-point scale from “not true” to “almost always true” Yields T-scores for a total (overall score) and five treatment subscales	15-20 min.	Social Awareness Social Cognition Social Communication Social Motivation Autistic Mannerisms	Western Psychological Services <a href="http://portal.wpspublish.com/portal/page?_pageid=53.53086&amp;.dad=portal&amp;.schema=PORTAL">http://portal.wpspublish.com/portal/page?_pageid=53.53086&amp;.dad=portal&amp;.schema=PORTAL</a>
Screening Tool for Autism in Two-Year-Olds (STAT)** Stone, Coonrod, & Ousley (2000)	S	2-3	Interactive play-based Yields scores on four domains	20 min.	Play Motor imitation Requesting Directing attention	Vanderbilt Kennedy Center <a href="http://kc.vanderbilt.edu/triad/training/page.aspx?id=821">http://kc.vanderbilt.edu/triad/training/page.aspx?id=821</a>

\*Instrument includes information related to developmental history.

\*\*Instrument requires special training to administer.

## Research on Screening and Assessment Instruments

The following table summarizes the research on autism screening and assessment tools reviewed in this section.

### Asperger Syndrome Diagnostic Scale (ASDS)

Author (Year)	Age Range (in years)	Sample Size	Topic Addressed	Outcome <i>r</i> = correlation
Boggs, Gross, & Gohm (2006)	5-17	76	Divergent and convergent validity  Discriminative validity	Weak correlation between ASQ and AS ( $r = 0.23$ ); AU group $r = 0.65$ , Intellectually Gifted $r = 0.49$ , No Ruling group $r = 0.51$ ; Prediction accuracy rate: 93.2% for AS and Non-AS, 72.7% for AS and AU, 87.9% for AS and AU when all three measures were used; ASQ and SSRS scores significantly highly inversely related ( $-0.76$ ); ASQ is able to discriminate between clinical and non-clinical groups: $t$ -test = $-17.41$

### Autism Behavior Checklist (ABC)

Author (Year)	Age Range (in years except where noted)	Sample Size	Topic Addressed	Outcome <i>r</i> = correlation
Eaves & Williams (2006)	Mean age = 101.32 mos.	198	Reliability and construct validity	Alpha coefficients: Reliability for Total Score – adequate for screening: Krug, Arick, & Almond (1993): Total Score $r = 0.89$ ; Miranda-Linné & Melin (2002) scores: Total Score $r = 0.86$ Reliability for scales – not reliable: Krug, Arick, & Almond (1993): Sensory $r = 0.59$ , Relating $r = 0.75$ , Body & Object Use $r = 0.76$ , Language $r = 0.60$ , Social & Self-Help $r = 0.57$ ; Miranda-Linné & Melin (2002): Nonresponsive Behavior $r = 0.81$ , Infant-like Behavior $r = 0.68$ , Aggressive Behavior $r = 0.66$ , Stereotypical Behavior $r = 0.63$ , Echolalic Speech $r = 0.74$ Alternate factors identified
Eaves, Campbell, & Chambers (2006)	Mean age Autistic – 96.81 mos. Nonautistic – 126.09 months	107	Criterion-related and construct validity	Validity between ABC and PDDRS (partial coefficients) Total = 8.80; Sensitivity of ABC = 77% Specificity of ABC = 91% Overall Classification Accuracy = 80% (two x two matrix); When compared with PDDRS classifications, overall agreement = 85% with phi coefficient for nominal classifications = 0.68

<b>Author (Year)</b>	<b>Age Range (in years except where noted)</b>	<b>Sample Size</b>	<b>Topic Addressed</b>	<b>Outcome <i>r</i> = correlation</b>
Rellini, Tortolani, Trillo, Carbone, & Montecchi (2004)	1.5-11	65	Criterion validity	Sensitivity = 54% False negatives = 46%
Miranda-Linné & Melin (2002)	5-22	383	Factor analysis	No data reported for the five factors

### Autism Diagnostic Interview-Revised (ADI-R)

<b>Author (Year)</b>	<b>Age Range (in years)</b>	<b>Sample Size</b>	<b>Topic Addressed</b>	<b>Outcome</b>
Lecavalier, Aman, Scahill, McDougle, McCracken, et al. (2006)	5-17	226	Validity	Internal consistency (coefficient alpha) of domain scores = 0.54-0.84 Convergent validity (Spearman-ranked correlation coefficients) – Social and total ADI-R had highest correlations to other instruments, range = -0.29 to 0.35, depending on scale and domain
Risi, Lord, Gotham, Corsello, Chrysler, et al. (2006)	1.5-14	1,297	Diagnostic sensitivity and specificity	Strict autism criteria used in combination with ADOS – 80% or higher for U.S. sample, 75% or higher for Canadian sample; lower for single use and use for other PDDs

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Author (Year)	Age Range (in years)	Sample Size	Topic Addressed	Outcome
Saemundsen, Magnússon, Smári, & Sigurdardóttir (2003)	2-9.5	54	Concurrent validity	ADI-R definition for autism used – 66.7% with CARS
Wiggins & Robins (2008)	1.5-3	142	Concurrent validity	Agreement improved with removal of Behavioral Domain of ADI-R (percent agreement with other measures): ADOS: AU class = 0.790, non-AU class = 0.701 CARS: AU class = 0.708 , non-AU class +0.753
LeCouter, Haden, Hammal, & McConachie (2008)	2-4	101	Concurrent validity	Agreement with ADOS: AU Social Interaction = 78% , AU Communication = 74%; Above/below AU cutoff = 81%, Above/below spectrum cutoff = 78%
Ventola, Kleinman, Pandey, Barton, Allen, Green, Robins, & Fein (2006)	1.5-2.5	45	Concurrent validity	Cohen’s kappa: ADOS and clinical judgment = 0.593 ADOS and CARS = 0.619 CARS and clinical judgment = 0.691 ADI-R and ADOS = 0.066 ADI-R and CARS = 0.095 ADI-R and clinical judgment = 0.153
Constantino, Davis, Todd, Schindler, Gross, et al. (2003)	AU Group – mean age = 8.0, Asperger PDD-NOS – mean age = 11.4 Non-PDD – mean age = 13.2	61	Concurrent validity	Pearson’s coefficient correlation: SRS and ADI-R or DSM criteria = 0.7

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Author (Year)	Age Range (in years)	Sample Size	Topic Addressed	Outcome
Mazefsky & Oswald (2006)	1.75-8	78	Discriminative validity	73% agreement with team diagnoses; improved to 77% with team diagnoses when PDD-NOS and ASP removed
Mildenberger, Sitter, Noterdaeme, & Amorosa (2001)	Mean age of 9	Group 1 – 16 children Group 2 – 11 children	Discriminative validity	2 of 27 subjects were misclassified: one subject with infantile autism did not meet cutoff scores on all three dimensions, one subject with severe receptive language disorder was classified as autistic on all three dimensions
Gray, Tonge, & Sweeney (2008)	1.5-4.5	209	Discriminative validity	ADI-R and AU = 0.46 ADOS and AU = 0.73 ADSO and AU = 0.62 ADI-R and ADOS = 0.35 (Cohen's kappa)
Frazier, Youngstrom, Kubu, Sinclair, & Rezai (2008)			Factor analysis	Mixed; subscales need revision
Moss, Magiati, Charman, & Howlin (2008)	Time 1 – 2.3-4.5 Time 2 – 9.1 – 12.1	35	Test-retest reliability	80% for all three domains; Pearson correlation = 0.59
Cicchetti, Lord, Koenig, Klin, & Volkmar (2008)	3.5	1	Interrater reliability	94-96% with weighted kappas between 0.80 and 0.88

Author (Year)	Age Range (in years)	Sample Size	Topic Addressed	Outcome
deBildt, Sytema, Ketelaars, Kraijer, Mulder, et al. (2004)	5-20	184	Criterion validity and reliability	Sensitivity: PDD: ADOS-G = .874 PDD: ADI-R = .716 AD: ADOS-G = .917 AD: ADI-R = .771 Specificity: PDD: ADOS-G = .472 PDD: ADI-R = .787 AD: ADOS-G = .647 AD: ADI-R = .632 Agreement (percentage): Age 5-8 = 83.4 for AD, 81.0 for PDD Age 8+ = 57.8 for AD, 58.5 for PDD Total = 63.6 for AD, 63.6 for PDD

## Autism Diagnostic Observation Schedule (ADOS)

Author (Year)	Age Range (in years)	Sample Size	Topic Addressed	Outcome
Gray, Tonge, & Sweeney (2008)	1.5-4.5	209	Discriminative validity	ADI-R and AU = 0.46 ADOS and AU = 0.73 ADSO and AU = 0.62 ADI-R and ADOS = 0.35 (Cohen's kappa)
Gotham, Risi, Pickles, & Lord (2007)	1.2-16	1,630	Diagnostic validity	Use of new algorithms: Sensitivity: AU vs. Non-Spectrum = 85-96 Non-AU AU vs. Non-Spectrum = 61-90; Specificity: AU vs. Non-Spectrum = 50-97 Non-AU AU vs. Non-Spectrum = 12-79 (lowest for Module 1 – no words) New algorithms increase specificity 12-31% in classifying Non-AU AU in lower-functioning subjects

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Author (Year)	Age Range (in years)	Sample Size	Topic Addressed	Outcome
Lord, Risi, Lambrecht, Cook, Leventhal, et al. (2000)	Module 1 – 1.25-10	54	Interrater and test-retest reliability and discriminative validity	(Interclass correlations, weighted kappas) Interrater: Social = 0.93 Communication = 0.84 Social Communication = .92 Restricted Repetitive = 0.82 Test-Retest: Social = 0.78 Communication = 0.73 Social Communication = .82 Restricted Repetitive = 0.59 Discriminative Validity: 95% for AU 92% for Non-Spectrum 33% for PDD-NOS as having Non-AU AU (53% of PDD-NOS fell in the AU range); Specificity: AU vs. PDD-NOS and Non-Spectrum = 68-79, AU and PDD-NOS vs Non-Spectrum = 87-94, AU to Non-Spectrum = 93-100, PDD-NOS to Non-Spectrum = 88-94; Sensitivity: AU vs. PDD-NOS and Non-Spectrum = 87-100, AU and PDD-NOS vs. Non-Spectrum = 90-97, AU to Non-Spectrum = 93-100, PDD-NOS to Non-Spectrum = 80-94
	Module 2 – 2-7	55		
	Module 3 – 3-20	59		
	Module 4 – 10-40	45		
		(223 t-total)		

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Author (Year)	Age Range (in years)	Sample Size	Topic Addressed	Outcome
deBildt, Sytema, Ketelaars, Kraijer, Molder, et al. (2004)	5-20	184	Criterion validity and reliability	Sensitivity: PDD: ADOS-G = .874 PDD: ADI-R = .716 AD: ADOS-G = .917 AD: ADI-R = .771 Specificity: PDD: ADOS-G = .472 PDD: ADI-R = .787 AD: ADOS-G = .647 AD: ADI-R = .632 Agreement (percentage): Age 5-8 = 83.4 for AD, 81.0 for PDD Age 8+ = 57.8 for AD, 58.5 for PDD Total = 63.6 for AD, 63.6 for PDD
Overton, Fielding, & Garcia (2008)	1.67-16	26	ADOS algorithm scores compared to new algorithm scores	+/- Revised algorithm resulted in better accuracy for more severe group
LeCouter, Haden, Hammal, & McConachie (2008)	2-4	101	Concurrent validity	Agreement with ADOS: AU Social Interaction = 78% , AU Communication= 74%; Above/below AU cutoff = 81%; Above/below spectrum cutoff = 78%
Risi, Lord, Gotham, Corsello, Chrysler, et al. (2006)	1.5-14	1,297	Diagnostic sensitivity and specificity	Strict autism criteria used in combination with ADI-R: 80% or higher for U.S. sample, 75% or higher for Canadian sample; lower for single use and use for other PDDs
Mazefsky & Oswald (2006)	2-8	78	Discriminative validity	77% agreement with team diagnosis

### Autism Observation Scale for Infants (AOSI)

Author (Year)	Age Range (in years)	Sample Size	Topic Addressed	Outcome <i>r</i> = correlation
Bryson, Zwaigenbaum, McDermott, Rombough, & Brian (2008)	.5	32	Interrater reliability	Good to Excellent at 6 (0.74), 12 (0.93), and 18 months (0.94) for total scores; Across ages = 0.92 (unweighted kappas)
	1	34		
	1.5	26	Test-retest reliability	Acceptable at 12 months (0.61) (intra-class correlations)

### Autism Spectrum Quotient-Child Version (AQ-Child)

Author (Year)	Age Range (in years)	Sample Size	Topic Addressed	Outcome <i>r</i> = correlation
Auyeung, Baron-Cohen, Wheelwright, & Allison (2008)	4-9	1,225 control	Discriminative validity	Clinical groups scored significantly higher than typically developing, but not significantly different from each other; significant sex differences in control group, but not in clinical group
	Mean age 7.58	348 AS/HFA		
	Mean age 9.31	26 PDD-NOS	Specificity	95%
	No age reported	4 atypical	Internal consistency	Cronbach's alpha coefficient = 0.97, subscales = 0.83-0.93
	No age reported	AU	Factor analysis	Support for four of five subscales
			Test-retest reliability	<i>r</i> = 0.85

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Author (Year)	Age Range (in years)	Sample Size	Topic Addressed	Outcome <i>r</i> = correlation
Wakabayashi, Baron-Cohen, Uchiyama, Yoshida, Tojo, et al. (2007)	AS/HFA: mean age of 10.4  PDD-NOS: mean age of 10.10  Controls: mean age of 10.9	81  22  372	Cross-cultural comparison: UK to Japan Reliability  Validity	Cronbach's alpha coefficient = 0.84, subscales = 0.7-0.8; AS/HFA and PDD-NOS scored higher than control group (27.083 and 12.189, respectively); AS/HFA scored higher ( $t = 2.688$ ) than PDD-NOS; males scored higher than females in control group ( $t = 2.209$ ), but no difference in clinical group (Group 1: $t = 1.585$ ; Group 2: $t = 1.791$ ); results similar to UK data, although mean AQ score in Japan was lower

### Autism Spectrum Screening Questionnaire (ASSQ)

Author (Year)	Age Range (in years)	Sample Size	Topic Addressed	Outcome <i>r</i> = correlation
Ehlers, Gillberg, & Wing (1999)	6-17	110	Divergent validity  Test-retest reliability  Interrater reliability	Pearson correlation: Parent: 0.75 with Rutter scale; 0.58 with Conners Teacher: 0.77 with Rutter scale; 0.70 with Conners  Very high (Pearson <i>r</i> ): Teachers = 0.94 Parents = 0.96  Good (Pearson <i>r</i> ): 0.66
Posserud, Lundervold, & Gillberg (2006)	7-9	9,430	Interrater reliability  Distribution of autistic features	Low to moderate (Cohen's kappa) - Teachers and Parents: Boys = 0.48, Girls = 0.34  Boys scored higher; parents reported more symptoms than teachers, especially for girls
Posserud, Lundervold, Steijnen, Verhoeven, Stormark, & Gillberg (2008)	7-9	9,430	Factor analysis	Three-factor structure: social difficulties, tics/motor/OCD, autistic style

### Checklist for Autism in Toddlers (CHAT)

Author (Year)	Age Range (in years)	Sample Size	Topic Addressed	Outcome
Scambler, Hepburn, & Rogers (2006)	Time 1 – 2-3.5 Time 2 – 4-5  Time 1 – 2-3.75 Time 2 – 4-6	AU group – 19  Developmental disabilities group – 11	Test-retest reliability	Original CHAT authors' criteria = 83% Denver modification of CHAT criteria = 93%
Scambler, Rogers, & Wehner (2001)	2-3	44	Discriminative validity	Original CHAT authors' criteria: Sensitivity = 65% Specificity = 100% Slightly altered criteria: Sensitivity = 85% Specificity = 100%
Baird, Charman, Baron-Cohen, Cox, Swettenham, et al. (2000)	1.5 3 5	16,235	Discriminative validity	Sensitivity = 38% Specificity = 98% PPV: High risk = 26.3%, All PDDs = 28.9%

### Childhood Asperger Syndrome Test (CAST)

Author (Year)	Age Range (in years)	Sample Size	Topic Addressed	Outcome
Scott, Baron-Cohen, Bolton, & Brayne (2002)	4-11	Pilot – 13 with AS; 37 neurotypical Main study – 174	Discriminative validity	Pilot: ANOVA = 150.13; significant difference between clinical sample and controls Main: (cutoff at 15) AS-PPV = 0.82, Specificity = 0.99; AS and AU Spectrum- PPV = 0.64, Specificity = 0.98
Williams, Scott, Stott, Allison, Bolton, Baron-Cohen, & Brayne (2005)	5-11	1,925	Accuracy  Validity -predictive criterion validity  Test-retest reliability	Sensitivity = 100% Specificity = 97%  PPV = 50%  Scores rarely increase over time, many decrease
Allison, Williams, Scott, Stott, Bolton, Baron-Cohen, & Brayne (2007)	5-9	73	Test-retest reliability	Moderate – 0.67 (Spearman’s rho)

### Childhood Autism Rating Scale (CARS)

Author (Year)	Age (in years except where noted)	Sample Size	Topic Addressed	Outcome <i>r</i> = correlation
Rellini, Tortolani, Trillo, Carbone, & Montecchi (2004)	1.5-11	65	Criterion validity	Sensitivity for AU = 100% False negatives = 0
DiLalla & Rogers (1994)	2-6	69	Factor analysis	Yields three factors: social impairment, negative emotionality and distorted sensory response
Pilowsky, Yirmiya, Shulman, & Dover (1998)	1.5-3.4	83	Concurrent validity	Agreement with ADI-R = 85.7%
Saemundsen, Magnússon, Smári, & Sigurdardóttir (2003)	1.8-9.5	54	Concurrent validity	Agreement with ADI-R = 66.7% when ADI-R AU definition is used
Magyar & Pandolfi (2007)	1.5-6.5	164	Factor analysis	Four factors identified: social communication, social interaction, stereotypes and sensory abnormalities, emotional regulation
Perry, Condillac, Freeman, Dunn-Geier, & Belair (2005)	2-6	274	Discriminative validity	88% agreement between CARS and clinical diagnosis; Sensitivity = 0.94; Specificity = 0.85; CARS negatively correlated with cognitive ( $r = -0.67$ ) and adaptive ( $r = -0.69$ ); ANOVA = 157.97; AU group mean > PDD-NOS > MR > Developmental delay and other groups

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Author (Year)	Age (in years except where noted)	Sample Size	Topic Addressed	Outcome <i>r</i> = correlation
Stella, Mundy, & Tuchman (1999)	AU mean of 71.32 months; PDD-NOS mean of 50.54	90	Factor analysis	Five-factor structure: disturbances in social orienting, communication and behavioral flexibility, emotional reactivity, consistency of cognitive performance and response to environment, odd sensory experiences

**Developmental Behavior Checklist-Autism Screening Algorithm (DBC-ASA)**

Author (Year)	Age Range (in years)	Sample Size	Topic Addressed	Outcome <i>r</i> = correlation
Brereton, Tonge, Mackinnon, & Einfeld (2002)	4-18	180	Discriminative validity	Sensitivity = 0.86 Specificity = 0.69
Witwer & Lecavalier (2007)	8.3-10.2	49	Discriminative validity Concurrent validity	Sensitivity = 0.94 Specificity = 0.46 (decreased when behavior problems present) <i>r</i> = 0.53

### Diagnostic Interview for Social and Communication Disorders (DISCO)

Author (Year)	Age Range (in years)	Sample Size	Topic Addressed	Outcome
Wing, Leekam, Libby, Gould, & Larcombe (2002)	3-11	82	Interrater reliability	Kappa coefficient or intra-class correlation at 0.75 or higher for over 80% of interview items
Leekam, Libby, Wing, Gould, & Taylor (2002)	3-11.5	91	Interrater reliability	Kappas for both algorithms at 0.82

### Gilliam Autism Rating Scale-Second Edition (GARS-2)

Author (Year)	Age Range (in years)	Sample Size	Topic Addressed	Outcome
Mazefsky & Oswald (2006)	2-8	78	Discriminative validity	Mean developmental delay score and mean AU Quotient did not significantly differ

**Screening Tool for Autism in Two-Years-Olds (STAT)**

Author (Year)	Age Range (in years)	Sample Size	Topic Addressed	Outcome
Stone, Coonrod, Turner, & Pozdol (2004)	2-3	52	Discriminative validity  Concurrent validity  Interrater reliability	Cutoff of 2: Sensitivity = 0.92 Specificity = 0.85 PPV = 0.86 NPV = 0.92  Cohen's kappa = 0.95  Inter-observer agreement = 1.00 (Cohen's kappa); Test-retest = 0.90 (Cohen's kappa)

### Social Communication Questionnaire (SCQ)

Author (Year)	Age Range (in years)	Sample Size	Topic Addressed	Outcome <i>r</i> = correlation
Allen, Silove, Williams, & Hutchins (2007)	2-6	81	Discriminative validity	Cutoff of 11: Good for screening in 3- to 5-year-olds; Sensitivity = 100% Specificity = 62%; poor in 2- to 3-year-olds Sensitivity = 93% Specificity = 58%
Chandler, Charman, Baird, Simonoff, Loucas, et al. (2007)	9.8 to 14.5	255	Discriminative validity	AU and non-AU: Sensitivity = 0.88 Specificity = 0.72 AU and non-AU: Sensitivity = 0.90 Specificity = 0.86
Wiggins, Bakeman, Adamson, & Robins (2007)	1.5-3.75	37	Discriminative validity	Cutoff 15: Sensitivity = 0.47 Specificity = 0.89 Cutoff 11: Sensitivity = 0.89 Specificity = 0.89
Eaves, Wingert, Ho, & Mickelson (2006)	5 (mean)	151	Discriminative validity	Sensitivity = 0.71 Specificity: Preschool clinic = 0.62 AU clinic = 0.53
Witwer & Lecavalier (2007)	8.3 (mean)	49	Discriminative validity  Concurrent validity	Sensitivity = 0.92 Specificity = 0.62 <i>r</i> = .53

### Social Responsiveness Scale (SRS)

Author (Year)	Age Range (in years)	Sample Size	Topic Addressed	Outcome
Constantino, Davis, Todd, Schindler, Gross, et al. (2003)	AU Group: mean age = 8.0 Asperger PDD-NOS: mean age = 11.4 Non-PDD: mean age = 13.2	61	Discriminative validity  Interrater reliability	Pearson's coefficient correlation: SRS and ADI-R or DSM criteria = 0.7  Teacher and father = 0.75; Mother = 0.91

### Misconceptions

Myth	Reality
Autism is a medical diagnosis.	Currently no medical tests can be used to diagnose an autism spectrum disorder. The disorder is identified behaviorally.
If a student can pass the state exam and make passing grades, he/she does not have an educational need for special education.	Educational need extends beyond academics and includes communication, social, emotional, and adaptive skills.
Asperger Syndrome means that an individual is high functioning and, therefore, does not require special education support and services.	Individuals with Asperger Syndrome have a pervasive developmental disorder. It is impossible to have a "pervasive" disorder and not be significantly impacted. While many of these individuals are highly intelligent and articulate, they do have significant impairments and most often require supports and services in order to make educational progress.

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