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Facilitating the Identification of Autism Spectrum Disorders in School-Age Children

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Recent special education trends suggest that students with autism spectrum disorders are underrepresented in our schools' special education programs. The increased awareness and prevalence of autism, together with the clear benefits of early intervention and special education, have created an urgent need for school-based professionals to identify children who may have an autism spectrum disorder. Screening is an important first step for securing the appropriate educational services. The aim of this article is to provide school professionals with a review of five screening instruments that hold promise for identifying school-age children in need of a more in-depth diagnostic assessment.

Keywords: *autism; autism spectrum disorders; screening; early intervention*

There has been a dramatic worldwide increase in reported cases of autism over the past decade (Fombonne, 2003; Wing & Potter, 2002). Autism is much more prevalent than previously thought, especially when viewed as a spectrum of disorders. For example, a review of 37 epidemiological studies conducted in 13 different countries and regions between 1966 and 2004 concluded that the best estimate of the prevalence of all autism spectrum disorders (ASDs) in Europe and North America combined is approximately 0.6% (60 per 10,000, or 1 per 160) of the population (Fombonne, 2005). Although we do not have a representative sample for the United States, findings of the Centers for Disease Control and Prevention (CDC) Autism and Developmental Disabilities Monitoring Network indicate an average prevalence estimate of 6.7 per 1,000 children aged 8 years old or approximately 1 in 150 children identified with ASD (CDC, 2002). ASDs are the second most serious developmental disability after mental retardation or intellectual impairment and are more prevalent among children than cancer, diabetes, spina bifida, and Down syndrome (Filipek et al., 1999).

Compared to these general population estimates, special education identification has not kept pace in our schools (Safran, 2008; U.S. Department of Education, Office of Special Education Programs, Data Analysis System, 2006). Even though there has been a significant increase in the number of students identified under the Individuals with Disabilities Education Improvement Act, Part B (IDEA, 2004) criteria for autism over the past decade, there are many who remain unidentified and thus underrepresented in our special education programs (Brock, Jimerson, & Hansen, 2006; Safran, 2008). Explanations for this disparity are varied and multifaceted. For example, some children with ASDs may have been determined eligible for services in other special education categories (e.g., mental retardation, speech and language impairment, other health impaired), may attend regular classes or private schools, may be homeschooled, may have been clinically diagnosed but not receiving services, or may not have come to the attention of a professional (Yeargin-Allsopp et al., 2003). Although the IDEA definition of autism is considered broad and flexible, state identification methods and eligibility criteria can differ and further limit the degree to which higher functioning children with ASDs receive an autism special education classification (Newschaffer, Falb, & Gurney, 2005). Regardless of the reasons, the special education data significantly underestimate the actual prevalence and growth of ASDs (Brock et al., 2006; CDC, 2002; Newschaffer et al., 2005; Safran, 2008). If current estimates are translated into the approximate number of school-age children with autism, then there are substantial numbers of children who have not been identified, especially more able students with ASDs (Brock et al., 2006; Fombonne, 2003; Safran, 2008).

Early behavioral intervention is acknowledged as a critical determinant in the course and outcome of ASD (Bryson, Rogers, & Fombonne, 2003; Rogers & Vismara, 2008). Research indicates that the outcomes for children with

ASDs can be significantly enhanced by early intensive intervention (Bryson et al., 2003; Filipek et al., 1999). Thus, it is critically important to identify those children in need of further assessment so as to reduce the time between symptom appearance and diagnosis (Goin-Kochel, Mackintosh, & Myers, 2006). The importance of early identification and specialized intervention programs for ASD is also emphasized in the practice parameters published by the American Academy of Pediatrics (American Academy of Pediatrics, Committee on Children With Disabilities, 2001), the National Academy of Sciences (National Research Council, 2001), and a consensus panel representing multiple professional societies (Filipek et al., 1999). Even though significant progress has been made in identifying young children with typical or classic autism, it is not unusual for the milder forms of autism (e.g., without mental retardation or noticeable language delay) to go undiagnosed until the child enters the new and demanding setting of the classroom (Filipek et al., 1999). In fact, most elementary school–age children with ASDs are identified by school resources (Brock et al., 2006; Bryson et al., 2003; Yeargin-Allsopp et al., 2003). For example, recent statistics indicate that the largest group of school-age children identified under the IDEA special education category of autism is 7 to 9 years of age (Safran, 2008; U.S. Department of Education, Office of Special Education Programs, Data Analysis System, 2006). This age range is also reflected in the surveys of parents of higher functioning children with ASDs (e.g., Asperger syndrome) who report a concern with the timeliness of identification and frustration with the wait to secure services (Bryson et al., 2003; Goin-Kochel et al., 2006). Therefore, it is essential that school professionals, particularly school-based educational support personnel (e.g., special educators, school counselors, speech and language pathologists, and school psychologists), devote increased attention to screening and early identification to ensure that children with ASDs are receiving the appropriate intervention services (Brock et al., 2006). According to the National Research Council (2001), children identified with ASDs, regardless of subtype or level of severity, should be considered eligible for special education services under the IDEA educational category of autism.

The ASDs

There is international and cross-disciplinary agreement on the primary characteristics and validity of autism as a diagnostic category (Ozonoff, Goodlin-Jones, & Solomon, 2005; Tidmarsh & Volkmar, 2003). The *Diagnostic and Statistical Manual of Mental Disorders* (4th ed., text rev.; *DSM–IV-TR*; American Psychiatric Association, 2000) and the 10th edition of the *International Classification of Diseases* (*ICD-10*; World Health Organization, 1993) list categories of pervasive developmental disorders (PDDs), which include autism and four other associated disorders. The terms *pervasive developmental disorder* and *autism spectrum disorder* are both used to describe this overarching group of disorders characterized by delays or atypicality in social development, communication, neurocognition, and behavior that vary in severity of symptoms, age of onset, and association with other childhood disorders (National Research Council, 2001). The five PDDs or ASDs are (a) Autistic Disorder, (b) Asperger syndrome, (c) Rett's Disorder, (d) Childhood Disintegrative Disorder, and (e) Pervasive Developmental Disorder–Not Otherwise Specified (PDD-NOS). As continuous and generally lifelong disorders, all have serious clinical implications for personal, social, educational, and other important areas of functioning. Of these disorders, Rett's Disorder and Childhood Disintegrative Disorder are rare conditions. They are also considered nonautistic PDDs in terms of course and outcome (Volkmar & Klin, 2005). Throughout this article, the terms *autism, autistic,* and *autism spectrum disorder* refer to more able children with Autistic Disorder (high-functioning autism), Asperger syndrome, and PDD-NOS. These disorders are the ones most frequently observed among school-age children and those with the greatest relevance for school professionals.

Purpose

School personnel are now more likely to be asked to participate in the screening and identification of students with ASD than at any other time in the past. Support professionals should be prepared to recognize the presence of risk factors and/or early warning signs of ASD, be ready to engage in case finding, and be familiar with screening tools to identify students in need of further evaluation. The primary aim of this article is to provide school professionals with a review of five screening instruments with promising psychometric properties for identifying school-age children who are most likely to have an ASD and thus necessitate a comprehensive assessment.

Screening for ASDs

Developing screening tools to identify the milder forms of autism tends to be especially difficult because the autism spectrum is composed of a heterogeneous phenotype with imprecise boundaries (Wing, 2005). Until recently, there were few validated screening measures

available to assist school professionals in the identification of students with the constellation of behaviors characteristics of the broader autistic phenotype or ASD (Campbell, 2005; Lord & Corsello, 2005). Likewise, the use of screening instruments has not been widespread in our schools (Yeargin-Allsopp et al., 2003). However, our knowledge base is rapidly expanding, and we now have more promising instruments to efficiently and accurately screen and evaluate children with ASDs (Yeargin-Allsopp et al., 2003). Parent and teacher screening tools are especially ideal instruments for identifying children who are in need of a more comprehensive evaluation. They yield important information from individuals who know the child the best and are relatively easy to administer and score (Wiggins, Bakeman, Adamson, & Robins, 2007).

The screening measures selected for review in this article include three commercially published instruments, the *Children's Communication Checklist–Second Edition* (CCC-2; Bishop, 2003), the *Social Communication Questionnaire* (SCQ; Rutter, Bailey, & Lord, 2003), and the *Social Responsiveness Scale* (SRS; Constantino & Gruber, 2005), and two validated research questionnaires, the *Autism Spectrum Screening Questionnaire* (ASSQ; Ehlers, Gillberg, & Wing, 1999) and the *Childhood Autism Spectrum Test* (CAST; Scott, Baron-Cohen, Bolton, & Brayne, 2002). The author conducted literature searches and consulted test catalogues in selecting commercially available screening measures. Literature reviews and validity studies were used to locate questionnaires specifically designed to identify the more subtle impairments associated with high-functioning ASD. Selection criteria included (a) documentation of satisfactory technical properties, (b) sensitivity to the core features of ASD, (c) validation by an established diagnostic instrument, (d) appropriate age range, (e) ease of administration, (f) brevity, and (g) training needs. All measures selected reported sound psychometric properties and were strongly related to a well-researched diagnostic instrument, appropriate for school-age children (5 to 11 years of age), and time efficient (10 to 20 minutes to complete). Training needs were considered minimal, and the instruments required little or no specific guidance to administer or complete. However, interpretation of results presumed familiarity with the respective screening measure and some experience in administering, scoring, and interpreting tests.

Measures reviewed but not included in this article include the *Gilliam Autism Rating Scale* (Gilliam, 1995), the *Asperger Syndrome Diagnostic Scale* (Myles, Brock, & Simpson, 2001), the *Gilliam Asperger's Disorder Scale* (Gilliam, 2001), the *Autism Behavior Checklist* (Krug, Arick, & Almond, 1988), and the *Childhood Autism Rating Scale* (Schopler, Reichler, & Renner, 1988). All demonstrated significant weaknesses, including the underidentification of higher functioning ASD, questions concerning standardization and norming procedures, and a lack of correspondence with *DSM–IV* and *ICD-10* diagnostic frameworks (Campbell, 2005; Coonrod & Stone, 2005; Lord & Corsello, 2005; Mazefsky & Oswald, 2006; Ozonoff et al., 2005; Williams & Brayne, 2006). Autism-specific measures for very young preschool children such as the *Checklist for Autism in Toddlers*, the *Modified Checklist for Autism in Toddlers*, and the *Pervasive Developmental Disorders Screening Test II* were not reviewed as they were not designed to screen elementary school–age children.

Psychometric Characteristics

The psychometric characteristics most frequently considered when evaluating screening measures are *sensitivity* and *specificity.* Both are important validity statistics that describe how well a test can identify true cases of a disorder. Sensitivity is the probability that a child with ASD will screen positive. Specificity is the probability that a child without ASD will screen negative. Sensitivity and specificity levels of .80 or higher are generally recommended (Coonrod & Stone, 2005). False negatives (children with a disorder who screen negative) decrease sensitivity, whereas false positives (children without a disorder who screen positive) decrease specificity. An efficient screening tool should minimize false negatives as these are children with likely ASDs who remain unidentified (Bishop, 2006; Goin-Kochel et al., 2006; Johnson, Meyers, & Council on Children With Disabilities, 2007; National Research Council, 2001). It is also important to recognize that a screening instrument's predictive power will depend on the prevalence of the disorder in the population or group under consideration. For example, a screening measure may be expected to have a higher positive predictive value when utilized with a known group of high-risk children who exhibit signs or symptoms of developmental delay, social skills deficits, or language impairment.

Screening Tools for School-Age Children

This section provides the reader with a summary description and review of each screening measure. Table 1 shows the ASD screening instruments, together with information regarding format, administration time, validity, and applicable age ranges.

Table 1
Autism Spectrum Disorders Screening Instruments

Instrument	Age Range	Format	No. of Items	Sensitivity	Specificity	Time to Complete (Minutes)
ASSQ[a]	7 to 16	Questionnaire—Parent and/or teacher	27	0.91	.86	10
CAST[b]	4 to 11	Questionnaire—Parent	37	1.0	.97	10
CCC-2[c]	4 to 16.11	Questionnaire—Parent or professional	70	0.89	.97	10 to 15
SCQ[d]	4 to adult	Questionnaire—Parent	40	0.96	.80	10
SRS[e]	4 to 18	Questionnaire—Parent and/or teacher	65	0.85	.75	10 to 20

Note: ASSQ = *Autism Spectrum Screening Questionnaire*; CAST = *Childhood Autism Spectrum Test*; CCC = *Children's Communication Checklist*; SCQ = *Social Communication Questionnaire*; SRS = *Social Responsiveness Scale*.
a. Availability: Ehlers, Gillberg, and Wing (1999, appendix).
b. Availability: Scott, Baron-Cohen, Bolton, and Brayne (2002, appendix); Williams et al. (2005, appendix); http://www.autismresearchcentre.com/tests/cast_test.asp.
c. Availability: Psychological Corporation (purchase).
d. Availability: Western Psychological Services (purchase).
e. Availability: Western Psychological services (purchase).

Autism Spectrum Screening Questionnaire

The ASSQ is a parent and teacher questionnaire composed of 27 items designed to discriminate between more able children with ASDs and typically developing peers. The ASSQ has been widely used as a screening instrument in the United Kingdom and across northern Europe. The items address social interaction, verbal and nonverbal communication, restricted and repetitive behaviors, motor clumsiness, and associated symptoms. The respondent rates behavioral descriptions on a 3-point scale, *not true* (0), *sometimes true* (1), and *certainly true* (2). Parent scores greater than 19 and teacher scores greater than 22 were considered as optimal cutoff points for identifying likely ASD cases in a clinical setting (Ehlers et al., 1999). These threshold scores correspond to sensitivity values of .62 for parent ratings and .70 for teacher ratings and specificity values of .90 (parent) and .91 (teacher) in the original validation sample. Children with these sensitivity levels were 5.5 and 7.5 times more likely to have an ASD than another neurodevelopmental disorder. A lower cutoff threshold of greater than 13 for parents and greater than 11 for teachers increases sensitivity values to .91 and .90, respectively. This threshold is recommended for use when it is essential to minimize the risk of missing mild autism cases (Ehlers et al., 1999; Posserud, Lundervold, & Gillberg, 2006). A recent validation study found the ASSQ to be an effective screening tool for identifying ASD and the broader autism phenotype in a general population sample (e.g., public schools) of 7- to 9-year-old children. Analyses indicated an optimal cutoff score of greater than 17 on either the parent or teacher questionnaire for discriminating between ASD and non-ASD cases. Combining the results for both informants and using this cutoff score provided the most efficient screening results, with a sensitivity value of .91 and a specificity value of .86 (Posserud, Lundervold, & Gillberg, in press). The ASSQ demonstrates strong test–retest reliability, acceptable interrater reliability, good internal consistency, and a stable three-factor structure (Posserud et al., 2008).

Childhood Autism Spectrum Test

The CAST, formerly titled the *Childhood Asperger Syndrome Test*, is a parent questionnaire based on *DSM–IV* (American Psychiatric Association, 1994) and the *ICD-10* core features and behavioral indicators for autism, especially the milder variants such as high-functioning autism and Asperger syndrome. The CAST has a total of 37 items, of which 31 are key items that are summed to yield a total score (maximum possible score of 31). The remaining 6 items are control questions on general development and are not scored. The CAST demonstrates a sensitivity value of 1.0 and a specificity value of .97 when using a cutoff score of greater than 15 in a general population sample of children with a consensus diagnosis of ASD (Williams et al., 2005). Validation studies have also reported a strong correlation with both the *Autism Diagnostic Observation Schedule* (ADOS; Lord, Rutter, DiLavore, & Risi, 2001) and the *Autism Diagnostic Interview–Revised* (ADI-R; Rutter, Le Couteur, & Lord, 2003), recognized "gold standard" instruments for the assessment and diagnosis of autism. Research has indicated that the CAST has good test–retest reliability and that it is a robust screening tool for identifying possible ASD cases in school-age populations (Allison et al., 2007; Williams et al., 2006).

Children's Communication Checklist–Second Edition

The CCC-2 is a measure designed to assess the communication skills of children 4 to 16.11 years of age. Although not specifically developed as a screening tool, the CCC-2 has shown utility in identifying children who may require further assessment for an ASD. Initially developed in the United Kingdom, the CCC-2 has been adapted for use in the United States (Bishop, 2006). A Caregiver Response Form is completed by an adult who has regular contact with the child, usually a parent, teacher, therapist, or other professional. The CCC-2 consists of 70 items that are divided into 10 scales, each with 7 items. The first 4 scales focus on specific aspects of language and communications skills (content and form). The next 4 scales assess the pragmatic aspects of communication. The last 2 scales measure behaviors that are usually impaired in children with ASDs. The respondent rates the frequency of the communication behavior described in each item from 0 (*less than once a week or never*) to 3 (*several times a day or always*). Interpretation is based on a General Communication Composite (GCC) and the Social Interaction Difference Index (SIDI). A significantly depressed communicative competence score, coupled with a score of less than 11 on the SIDI, suggests a profile of ASD and the need for further evaluation. The CCC-2 reports a sensitivity value of .89 and a specificity value of .97 for identifying children with autistic symptomatology and pragmatic social impairment (Bishop, 2006). Previous versions of the CCC-2 have been strongly associated with the ADI-R total score and *ICD-10* diagnostic criteria (Charman et al., 2007; Verte et al., 2006).

Social Communication Questionnaire

The SCQ, previously known as the *Autism Screening Questionnaire*, was initially designed as a companion screening measure for the ADI-R. The SCQ is a 40-item, parent or caregiver screening measure that identifies the symptomatology associated with disorders on the autism spectrum. Each item is scored 0 or 1 according to a yes–no response format. There are two separate versions available: Lifetime and Current. The Lifetime form is suitable for diagnostic screening purposes, and the Current form is useful for evaluating changes over time in children previously diagnosed with ASD. The questionnaire is appropriate for individuals of any chronological age older than 4 years. The total score obtained from the Lifetime form is interpreted with reference to a cutoff criterion. A score of greater than 15 is used as an indication of a possible ASD and the need for a comprehensive evaluation. Comparing autism to other diagnoses (excluding mental retardation), this cutoff threshold resulted in a sensitivity value of .96 and a specificity value of .80 in a large population of children with autism and other developmental disorders. A somewhat lower threshold may be considered if other risk factors are reported (e.g., sibling with autism or language impairment). A recent study of the properties of the SCQ in a cohort of children with ASDs confirmed the utility of the SCQ as an efficient screener for at-risk groups of school-age children (Chandler et al., 2007).

Social Responsiveness Scale

The SRS is a brief quantitative measure of autistic behaviors in 4- to 18-year-olds. This 65-item rating scale was designed to be completed by an adult (teacher and/or parent as respondent) who is familiar with the child's current behavior and developmental history. The questionnaire focuses on the child's reciprocal social interactions, a core impairment in all PDDs. The SRS items tap the dimensions of social awareness, social information processing, reciprocal social communication, social anxiety or avoidance, and stereotypic behavior or restricted interests. Each item is scored from 1 (*not true*) to 4 (*almost always true*). Interpretation is based on a single score reflecting the sum of responses to all 65 questions. An SRS total raw score of greater than 75 was associated with a sensitivity value of .85 and specificity value of .75 for any ASD (Autistic Disorder, Asperger syndrome, or PDD-NOS). The SRS demonstrates strong reliability across informants and acceptable internal consistency and correlates highly with the ADI-R (Constantino et al., 2003; Lord & Corsello, 2005). The SRS also affords the potential to reliably measure the severity of social impairment in the most common (and subtle) of autistic disorders, PDD-NOS (Constantino & Gruber, 2005).

Discussion

The screening instruments reviewed in this article have demonstrated utility for identifying children across the broad autism spectrum that are in need of further diagnostic assessment. School-based professionals might consider the following algorithm for screening students who demonstrate risk factors and/or warning signs of atypical development or where caregiver concerns strongly suggest the presence of ASD symptoms.

Step 1

The ASSQ or CAST can be utilized as an initial screen for students who present with elevated developmental risk factors and warning signs of autism. Both questionnaires are useful in identifying the presence of the more broadly defined symptoms of higher functioning ASD in general population settings. However, as with all screening tools, there will be some false negatives. Thus, children who screen negative but who have a high level of risk and where caregiver and/or teacher concerns highly suggest ASD symptoms might be given serious consideration for further screening or assessment (Filipek et al., 1999; Johnson et al., 2007). All children who exhibit developmental variations and behaviors consistent with an autism-related disorder should continue to be monitored, regardless of screening results.

Step 2

Children who meet the threshold criteria on the ASSQ or CAST can be screened further with the CCC-2, SCQ, and/or SRS to quantify the degree of ASD symptomatology. These instruments afford the ability to measure the approximate level of symptom severity impairment in the domains of reciprocal social behavior, pragmatic language and communication, and stereotypical behavior and restricted range of interests (Bishop, 2003; Constantino & Gruber, 2005; Rutter et al., 2003). As with the initial screening, students who screen negative but display concerns in the social behavior and communication domains should continue to be observed and monitored.

Step 3

Students who meet the threshold criteria in Step 2 may then be referred for an in-depth assessment. Because the CCC-2, SCQ, and SRS are strongly related to the well-established and researched ADI-R, the results from these screening measures can be used in combination with a multidisciplinary assessment of social behavior, language and communication, adaptive behavior, motor skills, sensory issues, and cognitive functioning to help determine eligibility for special education services (Corsello et al., 2007; National Research Council, 2001; Ozonoff et al., 2005).

Limitations

It is important to recognize that these tools are not without limitations. As with any screening instrument, some students who screen positive will not be diagnosed with ASDs. On the other hand, some children who were not initially identified will go on to meet the diagnostic criteria (false negative). Therefore, it is especially important to carefully monitor those students who screen negative so as to ensure access to intervention services (Bryson et al., 2003). Gathering information from family and school resources during screening will also facilitate identification of possible cases (Posserud et al., 2006; Posserud et al., in press).

An additional limitation involves the use of these screening instruments with young preschool children. Although the CAST, CCC-2, SCQ, and SRS report an applicable age range that includes 4-year-old children, there is a paucity of studies examining their effectiveness in identifying very young children with ASD. For example, the CAST has been validated with 5- to 11-year-old children but not with younger children (Williams et al., 2005). Although there is some early research on the usefulness of the SCQ and SRS with preschool children, further investigation is needed to examine their efficiency with this population (Lee, David, Rusyniak, Landa, & Newschaffer, 2007; Pine, Luby, Abbacchi, & Constantino, 2006; Wiggins et al., 2007).

A further caveat involves identification of the various ASD subtypes. None of the screening measures reviewed here can differentiate among the ASDs. A screening tool's efficiency will also be influenced by the practice setting in which it is used. Practitioners must weigh the disadvantages of an inaccurate classification against the consequences of a delayed or missed diagnosis (Goin-Kochel et al., 2006). Given the benefits of early intervention, it may be more useful to overrefer children for assessment than to underrefer and potentially postpone identification and intervention (Coonrod & Stone, 2005). It is important to note that autism-specific tools are not currently recommended for the universal screening of typically developing school-age children (Allison et al., 2007; Johnson et al., 2007). Focusing on referred children with identified risk factors and developmental delays increases predictive values and results in more efficient screening (Coonrod & Stone, 2005; Lee et al., 2007). Finally, there continues to be a need for developing brief, precise, and validated screening tools for identifying more subtle autistic symptoms in both preschool and school-age children.

Conclusion

Epidemiological studies indicate a dramatic increase in the prevalence of ASDs over the past decade. Compared to population estimates, children with ASDs appear to be

an underrepresented population in our schools' special education programs (Safran, 2008). Research indicates that outcomes for children on the autism spectrum can be significantly enhanced with the delivery of intensive intervention services (Bryson et al., 2003). However, special education services can be implemented only when the child is identified. Screening is the initial step in this process. School personnel can play a vital role by participating in case finding and screening activities to ensure children with ASDs are being identified and provided with the appropriate programs and services (Rogers & Vismara, 2008).

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