AMERICAN
SPEECH-LANGUAGE-
HEARING
ASSOCIATION

Guidelines for Speech-Language Pathologists in Diagnosis, Assessment, and Treatment of Autism Spectrum Disorders Across the Life Span

Ad Hoc Committee on Autism Spectrum Disorders

This guideline document is an official statement of the American Speech-Language-Hearing Association (ASHA). It was developed by ASHA's Ad Hoc Committee on Autism Spectrum Disorders. Members of the committee were Amy Wetherby (chair), Sylvia Diehl, Emily Rubin, Adriana Schuler, Linda Watson, Jane Wegner, and Ann-Mari Pierotti (ex officio). Celia Hooper, vice president for professional practices in speech-language pathology, 2003–2005, served as the monitoring officer. A complete list of committee members with their credentials and affiliations as well as a declaration of competing interest is provided at the end of this document. The ASHA Scope of Practice in Speech-Language Pathology (ASHA, 2001) states that the practice of speech-language pathology includes providing services for individuals with disorders of pragmatics and social aspects of communication, which would include individuals with autism spectrum disorders. This also includes individuals with severe disabilities and language disabilities in general. The ASHA (2004b) Preferred Practice Patterns are statements that define universally applicable characteristics of practice. The guidelines within this document fulfill the need for more specific procedures and protocols for serving individuals with autism spectrum disorders across the life span. It is required that

individuals who practice independently in this area hold the Certificate of Clinical Competence in Speech-Language Pathology and abide by the ASHA (2003a) Code of Ethics, including Principle of Ethics II, Rule B, which states that "individuals shall engage in only those aspects of the professions that are within the scope of their competence, considering their level of education, training, and experience." This document was disseminated for select and widespread peer review to speech-language pathologists, speech-language-hearing scientists, and audiologists with expertise in autism spectrum disorders, high-functioning adults with autism, family members of children and adults with autism, graduate students in communication sciences and disorders, and related professionals. The document (LC_SLP/SLS_2-2006) was approved by ASHA's Speech-Language Pathology/Speech or Language Science Assembly of the Legislative Council on February 3, 2006. The guidelines will be reviewed and considered for revision on a regular basis (within no more than 5 years from the date of publication). Decisions about the need for revision will be based on new research, trends, and clinical practices related to autism spectrum disorders.

Executive Summary

This document provides guidelines for implementing the American Speech-Language-Hearing Association (ASHA) policy document titled *Roles and Responsibilities of Speech-Language Pathologists in Diagnosis, Assessment, and Treatment of Autism Spectrum Disorders Across the Life Span: Position Statement* (ASHA, 2006c). These guidelines summarize current knowledge derived from available empirical research that provides a basis for understanding the social communication characteristics and challenges of individuals with autism spectrum disorders (ASD) and addresses clinical questions about the critical role of the family; tools and strategies for screening, diagno-

sis, and assessment for program planning; characteristics of empirically supported intervention approaches and strategies; and decision making in selecting intervention strategies. The guidelines also address service delivery models and preparation needed by speech-language pathologists (SLPs) to work effectively with this population. This document includes conclusions and recommendations derived from available empirical evidence that were formed by consensus of the ASHA Ad Hoc Committee on Autism Spectrum Disorders through 2 face-to-face meetings and 12 phone conferences over the course of 1 year. However, SLPs recognize that in areas for which empirical evidence is lacking, extrapolations from evidence with other populations and applications of principles stemming from theoretical models, societal norms, and government mandates and regulations also are relevant for decision making. Recommended practices are expected to change as new evidence emerges. Within a collaborative context, SLPs should be able to articulate both the principles and the levels of evidence that undergird their service delivery practices. SLPs serve as an integral part of a team, including individuals with ASD and their families, that is responsible for formulating and implementing service delivery plans that meet the unique communication needs of the individuals with ASD. The recommended knowledge and skills needed by SLPs serving individuals with ASD are presented in a companion document (ASHA, 2006a). Further, a technical report providing background and a basis for understanding the social communication characteristics and challenges of individuals with ASD also was developed by the committee to provide further information and guidance on the implementation of the roles and responsibilities outlined in the position statement (ASHA, 2006b).

Core Characteristics and Challenges in ASD

The population of ASD presents with tremendous heterogeneity. However, there are common characteristics and challenges that compromise the development of critical social communication skills. The core features of ASD include impairments in social communication including aspects of joint attention (e.g., social orienting, establishing shared attention, monitoring emotional states, and considering another's intentions), social reciprocity (e.g., initiating bids for interaction, maintaining interactions by taking turns, and providing contingent responses to bids for interaction initiated by others), language and related cognitive skills (e.g., understanding and using nonverbal and verbal communication, symbolic play, literacy skills, and executive

functioning—the ability to problem solve and self-monitor future, goal-directed, behavior), and behavior and emotional regulation (e.g., effectively regulating one's emotional state and behavior while focusing attention on salient aspects of the environment and engaging in social interaction). More detail about core characteristics and challenges with supporting references is provided in the technical report (ASHA, 2006b). By their very nature, disabilities with a social component are transactional, meaning that there is interaction back and forth between the individual with ASD and his or her communication partner (Wetherby & Prizant, 2000). The core social communication deficits of individuals with ASD may create a transactional dynamic of limited social experience or social exclusion, which may contribute to impaired development and learning (Mundy & Burnette, 2005; Schuler & Wolfberg, 2000). When social communication challenges are present, those who interact with the individual also face significant challenges in learning to modify their interactive style and the environment in order to communicate successfully. Thus, challenges are evident for both the individual with ASD and his or her communication partners.

Role of Families and Navigating Resources

Family members of individuals with autism fulfill multiple roles beyond those inherent in being a member of any family (S. Cohen, 1998; National Research Council [NRC], 2001). Parents, in particular, often may find themselves becoming investigators as they search for information on autism characteristics, causes, and especially interventions; advocates for the services they believe their child needs and is entitled to receive; collaborators in assessment and diagnosis as they attempt to define their child's symptoms; cotherapists involved in organized intervention programs; service coordinators and managers of teams of interventionists involved with their child and family; financiers of nonpublicly funded services; and lobbyists for changes in laws and policies to benefit their own child as well as other individuals with ASD. Other family members, including grandparents and siblings, also may find themselves assuming some of these roles.

The multiple roles create challenges for families who are attempting to access vast information and services through a variety of systems that may focus on different aspects of the disability or offer an overwhelming plethora of intervention options. Sources of support may include teachers, other interventionists, formal support groups, informal networking

with other caregivers of persons with ASD, and families, friends, and neighbors (NRC, 2001). Geographic location (R. L. Koegel, Symon, & Koegel, 2002) and lack of financial resources (NRC, 2001) can be constraints on access. In a study of Medicaid-eligible children with autism, for instance, Mandell, Literud, Levy, and Pinto-Martin (2002) found that African American children received diagnoses 1_ years later than Caucasian children, on average, with a mean age of diagnosis of 7.9 years for the African American children with autism. Although this study did not include a comparison group of higher income children, the relatively late mean age of diagnosis for all the Medicaid-eligible children included in the Mandell et al. study suggests that few children in low-income families received services during their preschool years, regardless of race.

Other cultural and linguistic factors may play roles in families' access to or use of services (Dyches, Wilder, Sudweeks, Obiakor, & Algozzine, 2004; Wilder, Dyches, Obiakor, & Algozzine, 2004). For example, there is variability in the rate at which children from racial and ethnic minority groups are served under the label of autism in the public schools (Dyches et al., 2004). This variability may be due to complex interactions between the values of families from different cultural backgrounds, and linguistic and cultural differences, which may contribute to an over- or underidentification of ASD among certain groups. Ultimately, the diagnostic label of an individual will influence the information and resources that will be offered to families or that the families will seek on their own. When a diagnosis of ASD is given, families will have different understandings of what the diagnosis means, views of etiology, attitudes toward the disability, and motivations regarding accessing services. Families with limited English proficiency may face linguistic barriers to navigating information and service systems in the United States. In addition, families of individuals with ASD may choose alternative forms of treatment based on individual values or cultural background. For example, one study reported that Latino families were more likely to access complementary and alternative medical treatments for their children than were Caucasian or African American families (Levy, Mandell, Merhar, Ittenbach, & Pinto-Martin, 2003).

Special Demands on Families

Families of children with autism experience many special demands, including the increased intensity of caregiving required to meet the needs of the family member with ASD, the multiple roles family members may assume beyond those of caregiver, concerns about the impact of the disability on family members other than the person with ASD, challenges in planning family events, and the responsibilities of the family as decision makers regarding services for the member with ASD (NRC, 2001). They also may face increased financial demands often combined with more limited income if a primary caregiver cuts back on or discontinues employment in order to care for the individual with autism. Families often confront problems related to obtaining an accurate diagnosis, managing extremely challenging behaviors, dealing with limited understanding or tolerance of behaviors associated with ASD, reviewing claims and information regarding intervention effectiveness, and choosing and implementing services for the individual with autism (D. E. Gray & Holden, 1992). For some families, demands are intensified by the particular behavioral patterns of the child with ASD. For example, parents of children with autism, as a group, report more sleep problems in their children than do parents of children with other developmental disabilities (DD) or parents of typically developing children (Schreck & Mulick, 2000). Sleep problems of the children may lead to more daytime behavior problems, a decrease in the effectiveness of intervention programs, and disruption of the entire family's sleep (Honomichl, Goodlin-Jones, Burnham, Gaylor, & Anders, 2002).

The nature of the demands and impacts on families of persons with ASD changes over time (Seltzer, Krauss, Orsmond, & Vestal, 2001). Families of younger children are more likely to experience stress related to obtaining a diagnosis and locating resources to meet their child's needs; later, families may become more concerned with the development of self-care skills in the child (Seltzer et al., 2001) or may be concerned with issues related to their child's isolation or experiences of bullying at school (D. E. Gray, 2002). During adolescence, concerns may include restrictions on family activities due to the challenge of managing public behavior and coping with a realization that the child's disability is permanent and will require an extension of the roles of family members as caregivers (DeMyer & Goldberg, 1983). The limited research available on families of adults with autism suggests that planning for future care is a major issue (Seltzer et al., 2001).

Given the demands and problems confronted by families of individuals with ASD, it is not surprising that a number of studies have found that parents of children with autism, especially mothers, report more stress than parents of children with other disabilities as well as parents of typically developing children (e.g., Dumas, Wolf, Fisman, & Culligan, 1991; Fisman, Wolf, & Noh, 1989; Holroyd & McArthur, 1976; Rodrigue, Morgan, & Geffken, 1990). Parents of chil-

dren with autism may be at increased risk for depression compared with parents of children with other disabilities (Gold, 1993; R. L. Koegel, Schreibman, et al., 1992). Genetic factors possibly contribute to this finding (Ghaziuddin, Ghaziuddin, & Greden, 2002), so that stress related to parenting a child with ASD may not account completely for the increased incidence of depressive symptoms.

The individual with ASD is also at increased risk for depression, anxiety disorders, and obsessive/compulsive behaviors (Ghaziuddin et al., 2002). Diagnosis of depression is more common in older, higher functioning individuals with ASD than in younger and lower functioning individuals, but this may be related to the challenges of diagnosing depression in individuals with limited communication skills. Depression may exacerbate behavior problems, leading to greater stresses on other members of the family.

More psychological problems have been reported among siblings of children with autism than in control groups (Bagenholm & Gillberg, 1991; Fisman, Wolf, Ellison, & Freeman, 2000; Fisman et al., 1996; Gold, 1993; Rodrigue, Geffken, & Morgan, 1993; Roeyers & Mycke, 1995). Suggested moderators of the adjustment for siblings of children with ASD or other DD include sibling gender, match of gender between sibling and child with ASD or DD, whether sibling is older or younger, age of sibling, and whether the child with ASD or DD resides at home; however, these variables have not proven to have strong effects on sibling adjustment (Hastings, 2003).

As in parental depression, the increase in psychological problems among siblings of children with ASD may be related to shared genetic material and expressions of the broader autism phenotype rather than being directly influenced by the presence of the child with ASD. Nevertheless, the presence of developmental or psychological problems among siblings of children with ASD, or the presence of multiple family members with ASD, can add to the demands on families and influence their ability to cope successfully with those demands.

Despite the increased demands and risks for families of individuals with ASD, many families cope successfully. In some cases, the activities involved in meeting increased demands, such as learning intervention strategies or working with the child in an intervention program, are associated with reports of decreased stress by mothers of children with ASD (Bristol, Gallagher, & Holt, 1993; R. L. Koegel, Bimbela, & Schreibman, 1996). Stress also is alleviated by perceived social support from both informal networks and formal support systems (NRC, 2001).

Learning From Families

A philosophical mandate for family-centered practices has permeated both health care and educational fields. This philosophy offers a foundation for effective family–professional collaborations in assessment, diagnosis, and treatment of individuals with ASD (Prelock, Beatson, Bitner, Broder, & Ducker, 2003). Family-centered practices include careful attention to family priorities and concerns in planning interventions (e.g., Marshall & Mirenda, 2002), as well as to learning about the family system that includes an individual with autism, and developing contextualized assessments and interventions that respect the family system and preferences (Hecimovic, Powell, & Christensen, 1999; Moes & Frea, 2000). Recognition that professionals have much to learn from the families of individuals with ASD is reflected by the inclusion of family members as authors in various books and journal issues devoted to ASD (e.g., Angell, 1993; Dominigue, Cutler, & McTarnaghan, 2000). Families of individuals with ASD have assumed increasingly important roles in promoting a broader-based awareness and understanding of the disorders, and in the search for effective treatments through their collaborations with professionals to set a national research agenda, ensure the availability of research funding, and encourage participation in research (e.g., Anders, Gardner, & Gardner, 2003; Hollander, Robinson, & Compton, 2004).

Teaching Families Needed Skills

Given the nature of autism and the needs of individuals with ASD, families often become teachers and interventionists (NRC, 2001). Family involvement in teaching children with ASD has been documented since the 1960s (Turnbull, Turnbull, Erwin, & Soodak, in press), though some families today place less importance on their roles as teachers and instead want more information on varying topics (Turnbull, Blue-Banning, Turbiville, & Park, 1999). Most comprehensive programs for individuals with autism offer parents training (NRC, 2001). It is important to remember that teaching families skills is but one part of family-centered service provision (Dunlap & Fox, 1999).

Families are consistent communication partners who should be provided with opportunities to give information about their child, to learn new skills, and to receive information about available resources. How and what families are taught have been influenced by a shift from the "expert" model of parent education, in which the professional directs the parents, to a more collaborative model, in which family individuality is recognized and families define their

own needs and level of involvement (Becker-Contrill, McFarland, & Anderson, 2003; Turnbull et al., in press). SLPs should establish partnerships with families to develop meaningful learning opportunities, provide information, teach strategies, and offer feedback. Though the content and format of such teaching should be developed in partnership with families, teaching families interaction skills to support and manage behavior and the development of communication and language is important and should be ongoing (Dunlap & Fox, 1999; NRC, 2001).

Supporting Families

Families of individuals with autism benefit from support beyond the learning of new skills. They benefit from formal and informal supports as well (NRC, 2001). Formal supports emerge from collaborative partnerships between families and professionals, while informal supports include support groups, informal parent networks, and family members and friends (NCR, 2001). Support for families is an ongoing process that takes different forms with different families based on their individual concerns, priorities, and interests (Blue-Banning, Summers, Frankland, Nelson, & Beegle, 2004; Dunlap & Fox, 1999; Sandall, Hemmeter, Smith, & McLean, 2005).

SLPs can support families by ensuring that family-centered, collaborative partnerships are established (Sperry, Whatley, Shaw, & Brame, 1999). Through this partnership, support may take different forms at different times, including coordinating services for the family, procuring resources and information, teaching the family or other significant communication partners specific skills, and advocating for or with the family.

Collaborative relationships with families are appropriately incorporated into the full range of roles that SLPs assume in providing services to individuals with ASD (Diehl, 2003a). As diagnosticians, SLPs' roles include incorporating a family perspective into the assessment of an individual, effectively eliciting information from families about their concerns, beliefs, skills, and knowledge in relation to the individual being assessed. The SLP also should possess skills and personal qualities to convey information to families clearly and empathetically, with an understanding that the assessment and diagnosis process is likely to be stressful and emotion-laden for family members (Marcus, Kunce, & Schopler, 2005). The SLP also should be sensitive to the fact that families previously may have received information or arrived at conclusions about the family member of concern that create conflict or confusion when juxtaposed with the information and conclusions provided by the SLP (Marcus et al., 2005).

As interventionists, SLPs' roles with families include incorporating family priorities for adaptation of the individual with ASD and/or of significant others who interact with the individual with ASD. Diehl (2003b) recommends the collaborative development of a family vision as the first step in the communication assessment and intervention planning process. The family vision then drives the rest of the process. SLPs should be knowledgeable about intervention options and skillful in sharing with families the available evidence on different options in an objective manner, while empowering the families to make choices among those options that are most consistent with the family vision. Ideally, the SLP and the family will arrive at a collaborative plan for intervention goals and strategies. In cases where the SLP is unable to support intervention options that the family wants to pursue, the clinician needs to explain the basis for his or her disagreement without being coercive. This requires that the SLP maintain current knowledge about the evidence base for different interventions aimed at improving the social communication development and adaptation of individuals with ASD. Individuals with ASD seem to inspire more than their share of unproven but often highly promoted treatments (Diehl, 2003b), and thus the SLP working with families of individuals with ASD frequently will encounter families who want to pursue these approaches.

The SLP should assist families in evaluating the likely benefits and possible harms of different intervention approaches but also should recognize the limitations in current empirical findings, which often do not provide a clear path for families and professionals trying to make the best decisions for a particular individual (cf. Marcus et al., 2005). Levy and Hyman (2005) have provided a useful review of available evidence on some complementary and alternative medical therapies currently accessed by substantial numbers of parents with ASD. In addition, Volkmar and Wiesner (2004) have written a book for caregivers of individuals with ASD to assist them in addressing health care needs, with a section devoted to evaluating a variety of alternative treatments. The SLP can refer families to sources that discuss controversial treatments (e.g., Volkmar & Wiesner, 2004); it is particularly important that the SLP alert parents to information about reported harmful outcomes of treatments that they may be considering. In addition, as part of a multidisciplinary team, the SLP can assist families in developing a plan to assess the effectiveness of different treatments they choose for their family member with ASD. For example, if a family decides to try a dietary intervention for their child with ASD, the SLP can assist the

family in developing a plan for a trial period of having the child on the diet followed by a period off the diet, in conjunction with having some service provider who sees the child regularly, but is unaware of his or her dietary status, complete behavior ratings during both time periods.

Marcus et al. (2005) outlined several different strategies that may be used in providing support to families of individuals with ASD. All of these are possible services and support activities that SLPs can incorporate into their work with families. These approaches include (a) education, or providing information from the professional literature on topics such as ASD, child development, learning principles, and intervention approaches to family members; (b) cotherapy, in which the professionals and family members play complementary roles in developing intervention goals and providing direct intervention to the person with ASD; (c) behavioral approaches, in which family members learn and apply specific behavior-shaping strategies in intervention with the person with ASD; (d) relationship enhancement, in which family members learn to attend to the interests of the child with ASD and to incorporate child-directed intervention strategies into their interactions; (e) cognitive approaches, in which family members develop such skills as problem solving, cognitive restructuring, and setting realistic expectations; (f) emotional support, in which professionals provide empathetic listening and problem-solving strategies for family-identified concerns; (g) instrumental support, in which professionals assist family members in case coordination and access to resources and services; and (h) advocacy training and support, in which professionals assist families in learning to advocate for the services and system changes that the individual with ASD requires to meet his or her needs across the lifespan. Although research indicates that having families play a critical role in the intervention process is an important part of effective programs (NRC, 2001), research is not available yet to indicate which of these services and support strategies or what combination is most effective.

Summary of Recommendations

SLPs should form partnerships with families in assessment and intervention with individuals with ASD, as effective programs have active family involvement. SLPs should consider how cultural, linguistic, and socioeconomic factors affect families' access to or use and selection of services. SLPs should provide counseling, education and training, coordination of services, and advocacy for families using practices that incorporate family preferences and address family priorities.

Screening and Diagnosis

The Important Role of the SLP

Given the importance of social communication in the diagnosis of ASD, the SLP can play an important role in both screening and diagnosis. The Child Neurology Society and American Academy of Neurology formed a multidisciplinary consensus panel to determine practice parameters for screening and diagnosis of ASD (Filipek et al., 1999). The panel included representatives from the disciplines of psychiatry, neurology, pediatrics, psychology, speech-language pathology, audiology, and occupational therapy, as well as from autism advocacy organizations, with liaisons from the National Institutes of Health. The panel concluded that all professionals involved in early health care, including SLPs, need to be able to recognize the symptoms of ASD and use autism-screening tools to make decisions about appropriate referrals for further evaluations (Filipek et al., 1999). This panel emphasized the importance of interdisciplinary collaboration in assessing and diagnosing ASD, due to the complexity of these disorders, the varied aspects of functioning affected, and the need to distinguish it from other disorders or medical conditions. Further, Filipek et al. stressed that professionals involved in diagnosis of ASD must be knowledgeable and experienced in using guides such as the *Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (*DSM–IV*; American Psychiatric Association, 1994, 2000) along with results of various diagnostic assessment tools to make clinical judgments about these types of disorders. A comprehensive interdisciplinary assessment is important not only for diagnosis but also for intervention planning. Thus, ideally the diagnostic role of the SLP would be as a key member of an interdisciplinary team with the appropriate individual and collective expertise in ASD. In some cases, however, there may be no appropriate team accessible to a family. As Filipek et al. (1999) stated, "Language pathologists are independent health care providers who have responsibilities at the levels of screening (Level 1), diagnosis and evaluation (Level 2) of autism" (p. 461). The SLP who has been trained in the clinical criteria for ASD, as well as in the use of reliable and valid diagnostic and assessment tools for individuals with ASD, and who is experienced in diagnosis of developmental disorders, may be qualified to diagnose these disorders as an independent professional. It would be incumbent upon the SLP to ensure that diagnostic findings are interpreted in relation to measures of nonverbal developmental level or IQ and to make appropriate referrals to other professionals to obtain a thorough assessment of the individual's needs and determina-

tion of any comorbid diagnoses that lie outside the expertise of the SLP. The SLP plays a critical role in referring children suspected of possible ASD to an audiologist to confirm or rule out a hearing loss. Furthermore, the SLP should play a primary role in the diagnosis of speech and language impairments that can co-occur with ASD, including, but not limited to, features of specific language impairment, apraxia, and dysarthria. The SLP should be aware that some state laws or regulations may restrict the scope of practice of licensees, however, and prohibit the SLP from providing such diagnoses.

Designation of a student with a disability within school settings must be made within the team decision-making process as designated by the Individuals with Disabilities Education Improvement Act of 2004 (IDEA, 2004). Within a public school setting, eligibility for services under the disability category of autism is based on the definition provided in the IDEA, as provided below:

> Autism means a developmental disability significantly affecting verbal and nonverbal communication and social interaction, generally evident before age 3, which adversely affects a child's educational performance. Other characteristics often associated with autism are engagement in repetitive activities and stereotyped movements, resistance to environmental change or change in daily routines, and unusual responses to sensory experiences. The term does not apply if a child's educational performance is adversely affected primarily because the child has an emotional disturbance as defined by IDEA criterion.

> A child who manifests the characteristics of "autism" after age 3 could be diagnosed as having "autism" if the criteria in the preceding paragraph are met. (34 C.F.R. § 300.7 [c] [1])

Individuals diagnosed with an ASD or pervasive developmental disorder by means of other sources of clinical criteria, such as the *DSM–IV–TR* (American Psychiatric Association, 2000), are likely to be eligible for special education services under the category of autism as defined above, due to the common challenges and deficits in social communication functioning across the various disorders on the autism spectrum.

Screening for ASD

Early indicators of ASD are observable by age 12 months (Baranek, 1999; Osterling & Dawson, 1994, 1999; Wetherby et al., 2004; Zwaigenbaum et al.,

2005), and ASD can be reliably diagnosed as early as age 24 months by experienced and knowledgeable diagnosticians (Filipek et al., 1999). The main characteristics that differentiate ASD from other developmental disorders in young children include difficulties in eye gaze, orienting to one's name, pointing to or showing objects of interest, pretend play, imitation, nonverbal communication, and language development. It is important to consider cultural diversity of social communication when examining these areas. In addition, loss of language or social skills at any age should be considered grounds for screening (Filipek et al., 1999). Because children with ASD are often initially suspected of having a hearing problem, audiologists are in a critical role to spot possible signs of ASD in children whose hearing they are testing and to make appropriate referrals for screening and diagnosis of ASD.

Screening for ASD may utilize broadband screeners designed to detect developmental delays in the general pediatric population or autism-specific screening tools designed for either the general population or high-risk populations such as children referred to the early intervention system. Any screening tool should have strong psychometric features to support its accuracy in identifying at-risk children who need further evaluation. The following proportions provide particularly important information about the accuracy of a screening tool:

- **sensitivity, or true positives**—the percentage of children identified as at risk (i.e., receiving a positive screen or evaluation result) who failed the follow-up testing or received a diagnosis of ASD. The percentage of true positives added to the percentage of **false negatives** (i.e., the proportion of children identified as no risk, by receiving a negative screen or evaluation result, who failed the follow-up testing or received a diagnosis of ASD) equals 100%. Thus, a lower false negative rate means a higher true positive rate.

- **specificity, or true negatives**—the proportion of children identified as no risk (i.e., receiving a negative screen or evaluation result) who passed the follow-up testing or for whom ASD was ruled out. The percentage of true negatives added with the percentage of **false positives** (i.e., the proportion of children identified as at risk, by receiving a positive screen or evaluation result, who passed the follow-up testing or for whom ASD was ruled out) equals 100%. Thus, a lower false positive rate means a higher true negative rate.

- **positive predictive value—**the proportion of children identified as at risk who fail the follow-up testing out of the total number of children identified as at risk.

- **negative predictive value—**the proportion of children identified as no risk who pass the follow-up testing out of the total number of children identified as no risk.

To be considered psychometrically sound, a screening tool would minimally need to report sensitivity and specificity. Meisels (1989) recommended that cutoffs for both sensitivity and specificity be set at no less than 80% for developmental screening of young children; however, he noted that a "75% sensitivity ratio is considerably less favorable than a 75% specificity proportion" (p. 579). It is also important to consider the positive predictive value; however, this is related to the base rate of a disorder. That is, the higher the prevalence rate of the disorder, the greater the probability that a positive result will be correct and the higher the positive predictive value. In screening a general population for relatively low incidence disorders such as ASD, even an instrument with a sensitivity and specificity of .80 will yield a poor positive predicative value. In other words, the lower the prevalence rate of a disorder, the lower the probability that an individual has the disorder given a positive screen result. As Clark and Harrington (1999) point out, screening tools are intended to identify individuals who may be at risk for a disorder rather than to serve as "gold standards" for determining a diagnosis. Thus, professionals must not assume that failing a screening means that an individual has an ASD and must instead complete thorough assessments before providing a diagnosis.

There is currently very limited research on the accuracy of broadband screeners to identify young children at risk for ASD. The First Signs program (www.firstsigns.org), a national nonprofit organization whose goal is to improve early identification of ASD, has assembled a set of psychometrically sound broadband screeners based on parent report that include the Ages and Stages Questionnaire (Squires, Potter, & Bricker, 1999), the Parents' Evaluation of Developmental Status (Glascoe, 1997), and the Communication and Symbolic Behavior Scales Developmental Profile (CSBSDP) Infant Toddler Checklist (ITC; Wetherby & Prizant, 2002). All three of these broadband screeners have sensitivity and specificity at or near 80% for identifying children with developmental delays from a general pediatric population. The ITC is the only broadband screener that has preliminary validation data showing it has high sensitivity and specificity (both 88.9%) for catching toddlers at risk for ASD and other developmental delays using a prospective sample of more than 3,000 children (Wetherby et al., 2004).

Autism-specific screeners use parent report and/or interactive observational measures. Because of the challenge of identifying very young children with ASD, there is limited research on the accuracy of autism-specific screeners. Some of the tools have been validated on children referred to health care or education agencies because autism was suspected or from children who already have been identified as having developmental delays or disabilities. However, it is important also to validate autism-specific screeners, either as an initial screener or follow-up to a broadband screener, on a general population sample, since this is ultimately how they will be used clinically. This is particularly critical for higher functioning children who may be more easily missed and not be referred into the system. Following are autism-specific screening tools that have some published psychometric information, including sensitivity and specificity.

Checklist for Autism in Toddlers (CHAT; Baird et al., 2000; Baron-Cohen, Allen, & Gillberg, 1992; Baron-Cohen et al., 1996). The CHAT consists of 9 items reported by parents and 5 items observed by a health professional at the 18-month developmental checkup. Baron-Cohen and colleagues screened more than 16,000 children using the CHAT and identified 19 children at 18 months who were later diagnosed with ASD based on failure of the following 3 key items: (a) protodeclarative pointing, (b) pretend play, and (c) gaze monitoring. However, at follow-up at age 7 years, 94 cases of ASD were identified. These findings indicate that the CHAT has a specificity of 98% but a sensitivity of 38% (Baird et al., 2000) and missed many children at 18 months who were later diagnosed with ASD. While the validity of the CHAT is disappointing, it indicates that some children with ASD can be identified at 18 months and provides clues to early indicators of ASD, based on the children they were able to identify early. The poor sensitivity indicates that it should not be relied on as an accurate screener and likely does not merit the time in a pediatric practice.

Modified Checklist for Autism in Toddlers (M-CHAT; Robins, Fein, Barton, & Green, 2001). The M-CHAT is an expanded version of the original CHAT. The M-CHAT has 23 questions using the original 9 items from the CHAT as a basis. The M-CHAT is currently in its final stages of testing and validation and has not yet been validated for general population screening. Preliminary results, however, have suggested that it has improved sensitivity compared with

the CHAT. The M-CHAT has demonstrated validity in identifying the majority of children with ASD and developmental delay from age 24 months in a study in which most of the at-risk children had been referred already to early intervention programs due to developmental concerns. Follow-up data for children who were not found to be at risk on the M-CHAT have not been published yet; thus, the extent to which the M-CHAT may miss children who will later be diagnosed with ASD is still unknown. The M-CHAT is available in both Spanish and English.

Social Communication Questionnaire (SCQ; Rutter, Bailey, Lord, & Berument, 2003). The SCQ is a 40-item parent report screening tool for ASD and is a component of the Autism Diagnostic Interview, described below. The SCQ is an autism-specific screening tool; that is, the intended use of the SCQ is for screening individuals previously identified with developmental concerns. The SCQ yields a total score with 0 indicating no risk for ASD and 15 or higher indicating risk for ASD. The SCQ has been validated as a screening tool for ASD in children age 4 and older, as well as adults, and has good sensitivity and specificity. Preliminary research indicates that the specificity and sensitivity of the SCQ are slightly poorer for younger children based on 112 children between age 2 and 5 compared with 181 individuals over age 5 (Corsello, Cook, & Leventhal, 2003). Therefore, caution should be taken in using this with younger children; however, further research is needed on children under 4.

Pervasive Developmental Disorders Screening Test, Second Edition (PDDST–II; Siegel, 2004). Research on the PDDST–II has been presented at several conferences but has not yet appeared in the peer-reviewed literature. The PDDST–II is a clinically derived self-administered parent questionnaire divided into three stages. PDDST–II Stage 1 is intended for use in the primary care setting with items ordered developmentally from birth to age 36 months. The cutoff score for Stage 1 was derived by comparing results for 197 very low birth-weight children with those for 380 children referred due to concerns about possible ASD (some of whom were later diagnosed with ASD, and some of whom did not receive ASD diagnoses). The sensitivity and specificity were 85% and 71%, respectively, in identifying those children in need of further evaluation for possible ASD. The questionnaire has not been validated with a general population sample, however. The PDDST–II Stage 2 screener is intended to aid in differentiating a possible diagnosis of ASD from other disorders such as developmental language delay, mental retardation, or ADHD. In a study involving 260 children with ASD and 120 children with other developmental disorders, different cutoff scores yielded sensitivity ranging from 69% to 88% and specificity ranging from 25% to 63%. The purpose of the PDDST–II Stage 3 is to assist in differentiating children with autistic disorder from those with other pervasive developmental disorders and to provide information on symptom severity. The author is continuing research and development on this instrument, but the preliminary results suggest it has utility for screening and diagnosing young children.

Screening Test for Autism in Two-Year-Olds (STAT; Stone, Coonrod, & Ousley, 2000; Stone, Coonrod, Turner, & Pozdol, 2004; Stone & Ousley, 1997). The STAT is a direct observational scale designed for children from age 24 to 35 months. The purpose of the STAT is to serve as a Level 2 tool to screen for autism among young children referred for developmental concerns. The 20-minute play interaction includes 12 activities that sample 3 main developmental areas: play, motor imitation, and nonverbal communication. Stone et al. (2004) reported a sensitivity of 92% and specificity of 85% for this instrument in identifying children between the ages of 24 and 35 months with autistic disorder. The sensitivity of the instrument in screening for other variants of ASD was lower. As the authors point out, underidentification of children with milder symptoms is an issue for other screening tools and procedures as well. The authors also reported results indicating that the STAT has good interobserver and test–retest reliability, as well as concurrent validity with clinical diagnoses of autistic disorder and results of independent assessment on the Autism Diagnostic Observation Schedule (ADOS; Lord, Rutter, DiLavore, & Risi, 1999; see below).

Systematic Observation of Red Flags (SORF; Wetherby et al., 2004). The SORF consists of an observational rating of 29 potential "red flags" for ASD that can be scored from video of the CSBS DP Behavior Sample (Wetherby et al., 2004). The Behavior Sample uses a standard set of systematic procedures designed to encourage spontaneous behaviors that range in degree of structure provided. Thirteen of the items on the SORF have been shown to discriminate toddlers who later are diagnosed with ASD from toddlers younger than age 2 with typical development and those with developmental delay in which ASD had been ruled out, with an accuracy of 94.4% (Wetherby et al., 2004). This indicates strong sensitivity and specificity on a preliminary sample of 18 children later diagnosed with ASD identified from a general population screen of about 3,000 children. The following red flags distinguished the children with ASD from children who were developmentally delayed in which ASD was ruled out and who were typically developing in the second year of life: (a) lack of appropriate gaze; (b) lack of warm, joyful expressions with gaze; (c) lack of sharing enjoyment or in-

terest; (d) lack of response to name; (e) lack of coordination of gaze, facial expression, gesture, and sound; (f) lack of showing; (g) unusual prosody; (h) repetitive movements or posturing of body, arms, hands, or fingers; and (i) repetitive movements with objects. The following red flags distinguished the children with ASD and developmental delay from the typically developing children: (a) lack of response to contextual cues; (b) lack of pointing; (c) lack of vocalizations with consonants; and (d) lack of playing with a variety of toys conventionally.

Diagnosis of ASD

An early accurate diagnosis can assist in earlier access to needed services and appropriate treatment. Diagnosis also can provide a common language across multidisciplinary teams and can lead to some sense of relief for families and caregivers who are provided with a framework within which to understand their child's difficulties. Any diagnosis of ASD, particularly of young children, should be periodically reviewed, as diagnostic categories and conclusions may change as the child develops.

The following information should be gathered in a diagnostic evaluation of children at risk for ASD: (a) review of relevant background information to guide the diagnostic evaluation and the selection of appropriate tools; (b) caregiver interview to gather health, developmental, and behavioral history of the child and medical and mental health history of the family; and (c) direct behavior observation. A medical evaluation should be completed based on the recommendations of the American Academy of Pediatrics on the role of the pediatrician in the diagnosis and management of ASD (American Academy of Pediatrics, 2001a, 2001b). A medical evaluation for a child at risk for ASD should consist of a general physical and neurodevelopmental examination, including evaluations of vision and hearing. In addition, if there is a family history of mental retardation or genetic conditions sometimes associated with ASD (e.g., fragile X, tuberous sclerosis), or if the child exhibits physical features suggestive of a possible genetic syndrome, then a recommendation for genetic testing would be appropriate. If the child exhibits symptoms such as lethargy, cyclic vomiting, pica, or seizures, then selective metabolic testing may be appropriate (Filipek et al., 1999).

A diagnostic evaluation to confirm or rule out a diagnosis of autism or ASD should be performed only by professionals who have specific expertise in the evaluation and treatment of autism (Filipek et al., 1999; NRC, 2001). Diagnostic tools for ASD include parent or caregiver report (i.e., interview or questionnaire) as well as diagnostic observation instruments.

Following are diagnostic tools for ASD that have some published psychometric information including evidence of reliability and validity.

The *ADOS* (Lord et al., 2000) is a semistructured observational assessment in four modules that includes activities designed to evaluate communication, reciprocal social interaction, play, stereotypic behavior, restricted interests, and other abnormal behaviors in individuals with ASD across the age range from preschool to adulthood and covering language skills from nonverbal to conversational. The ADOS consists of four modules developed for individuals with varying levels of linguistic ability; each module includes a set of activities that press for different behaviors that contribute to a diagnosis of autism or ASD. Administration requires 30–45 minutes, thus making the ADOS a feasible diagnostic tool in many clinical settings. As indicated in a recent review of autism diagnostic tools (Lord & Corsello, 2005), research has documented excellent interrater reliability for ADOS total scores (following substantial training and practice) and excellent internal consistency for the two major domains of social communication behaviors and restricted-repetitive behaviors. The ADOS scores also have a high degree of accuracy when compared with expert clinical diagnoses using *DSM–IV* criteria. Lord et al. (2000) reported that the sensitivity of the four modules ranged from 90% to 97%, and the specificity ranged from 87% to 93% in identifying individuals with ASD versus individuals with other DD who were outside the autism spectrum. The ADOS does not perform particularly well in discriminating between individuals diagnosed with autistic disorder versus pervasive developmental disorders not otherwise specified (PDD-NOS), however. Lord and Corsello (2005) note that ADOS scores slightly overinclude young children with mental retardation in the autism spectrum and slightly underinclude older children and adults with milder impairments and relatively high verbal skills.

The *Childhood Autism Rating Scale* (CARS; Schopler, Reichler, & Renner, 1988) is a 15-item structured interview and observation instrument that is suitable for use with children above age 24 months only. Each of the 15 items uses a 7-point rating scale to indicate the degree to which the child's behavior deviates from an age-appropriate norm. It also distinguishes between mild-to-moderate and severe presentations of ASD. The CARS is recognized widely and used as a reliable instrument for the diagnosis of ASD (e.g., Morgan, 1988; Sevin, Matson, Coe, Fee, & Sevin, 1991). The examiner rates the child based on observation of behaviors exhibited during other assessment activities. The CARS takes approximately 15 minutes to complete but should be based on op-

portunities to observe the child across at least a 1-hour time period *and* across a variety of types of activities and interactions. It can be used reliably with relatively limited training and is available in a number of languages other than English. In a recent review of diagnostic instruments for autism, Lord and Corsello (2005) conclude that the evidence across several studies indicates the CARS may overidentify children as falling into the autism spectrum, particularly when the children have low verbal skills and/or low cognitive levels. For this reason, they do not recommend the exclusive use of the CARS in identifying or classifying participants for research purposes. Although the CARS was originally developed to correspond to the *DSM, Third Edition* (*DSM–III*; American Psychiatric Association, 1980), a recent study reported 100% agreement between clinical diagnoses of autistic disorder (vs. other disorders including Asperger's and PDD-NOS) using *DSM–IV* criteria and a classification that was based on the CARS cutoff score (Rellini, Tortolani, Trillo, Carbone, & Montecchi, 2004), suggesting that the CARS continues to have clinical utility in identifying children with autistic disorder, but not for diagnosing children with other ASD.

The *Autism Diagnostic Interview—Revised* (ADI–R; Rutter, LeCouteur, & Lord, 2003) is a comprehensive structured parent interview that probes for symptoms of ASD in the areas of social relatedness, communication, and ritualistic or perseverative behaviors. With this tool, information about the developmental history of the individual is combined with information about current behaviors and used in a scoring algorithm to indicate whether the person meets the *DSM–IV* criteria for autism or a related disorder. Administration takes approximately 2 to 3 hours and requires specific training and validation procedures. Due to the length of the ADI–R, it is used relatively infrequently in purely clinical settings. In reviewing research on the instrument, Lord and Corsello (2005) noted that with training, high interrater reliabilities have been achieved for each of the three subscales of the ADI–R (social reciprocity, communication, and restricted-repetitive behaviors). Internal consistency is also excellent within the three subscale domains. The tool also has performed extremely well in differentiating individuals with autism and those with other DD. Like some of the other autism diagnostic instruments, the ADI–R tends to slightly overinclude individuals with mental ages less than or equal to 18 months. The evidence regarding individuals who are high-functioning and verbal has been inconsistent with respect to whether the tool is under- or overinclusive.

The *Parent Interview for Autism* (PIA; Stone & Hogan, 1993) is a structured interview designed to gather relevant diagnostic and symptom severity information from parents of young children (under age 6) suspected of having ASD. The PIA targets 11 relevant areas, including social behavior, communication, repetitive activities, and sensory behaviors. Internal consistency and test–retest reliability are adequate, and concurrent validity with the *DSM–III, Revised* (American Psychiatric Association, 1987) and CARS (Schopler et al., 1988) was demonstrated; however, concurrent validity examining clinical diagnoses or tools using current diagnostic criteria has not been published. More recently, Stone and colleagues (Stone, Coonrod, Pozdol, & Turner, 2003) have reported similar psychometric properties for a shorter clinical version of the PIA used with a sample of children under the age of 3.

The *Gilliam Autism Rating Scale* (GARS; Gilliam, 1995) is a checklist designed to be used by parents, teachers, and professionals to help identify and estimate the severity of symptoms of ASD, but it is only normed from age 3. There is an optional subtest, however, that describes development in the first 3 years of life. The tool provides a global rating of ASD symptomatology using 56 items that are grouped into four subtests. The GARS has been standardized such that the total score yields an "autism quotient" with a mean of 100 and a standard deviation of 10. In the author's published research, quotients above 90 were associated with a high risk of autism, scores in the 70 to 90 range were associated with a moderate risk, and scores below 70 with a limited risk for autism. Despite strong psychometric properties reported in the initial research on the GARS, a recent independent study found that the GARS had a sensitivity of only 48% in identifying children with autism who had been diagnosed using *DSM–IV* criteria, with diagnoses verified using the ADOS and the ADI–R (South et al., 2002). As noted above, underdiagnosis of the disorder is of considerable concern in clinical settings. South and colleagues noted that a revision of the GARS was in progress at the time of their report.

A clinical diagnosis of one of the subcategories of PDD can be made using the *DSM–IV* criteria based on information gathered from the diagnostic evaluation along with one or more ASD diagnostic tools. The current "gold standard" measures for the diagnosis of ASD in research protocols are the ADI–R and the ADOS (Filipek et al., 1999; Lord & Corsello, 2005) because of their strong psychometric features. It is important for the team working with the child to continue to provide information and support to parents after a diagnosis has been made. The goal of this support is to help families understand the nature of the disorder, where their child falls on the spectrum of ASD, how to access appropriate support and services,

and how to choose between the options available. Ongoing assessment also is important to monitor intervention effects on the changing needs of the child and possible changes in diagnosis.

Similar Diagnostic Categories and Differential Diagnosis

Although there is general conceptual agreement regarding the core deficits of ASD, the variability seen in this spectrum of disorders presents a number of challenges to reliable diagnoses of ASD and other disorders that may overlap or be confused with ASD. For example, different diagnostic systems tend to converge in specifying criteria for the diagnosis of autistic disorder, but as Volkmar, Lord, Bailey, Schultz, and Klin (2004) pointed out, there are multiple widely circulated definitions of Asperger's disorder. This situation undoubtedly contributes to divergent findings in research, stemming from the varying diagnostic criteria used to select participants. Of particular relevance to the SLP, a primary difference in criteria for Asperger's disorder versus autistic disorder in the *DSM–IV* is the stipulation that individuals diagnosed with Asperger's disorder will show no clinically significant delay in language development (defined as having single words by age 2 and phrase speech by age 3). But as Filipek et al. (1999) pointed out, the language in Asperger's disorder "is clearly not typical or normal" (p. 447). Mayes, Calhoun, and Crites (2001) found that after grouping children with Asperger's disorder and autistic disorder who had normal intelligence based on a positive or negative history of early language delay, the groups were not different from each other on any of 71 variables investigated. Thus, they questioned the meaningfulness of this criterion for differential diagnosis. More recently, Howlin (2003) has reported similar findings and further noted that both groups exhibited low language scores as adults, calling into question the assumption that language development in Asperger's disorder (aside from pragmatic development) is essentially normal.

Despite existing criteria for differential diagnoses of Asperger's disorder and autistic disorder, Macintosh and Dissanayake (2004) concluded from their literature review that there is insufficient evidence that Asperger's disorder is a syndrome distinct in meaningful ways from high-functioning autism. Some researchers have reported differing cognitive profiles between individuals with Asperger's disorder and those with high-functioning autism. Asperger's disorder is more often associated with a higher verbal IQ than performance IQ, contrasting with the opposite pattern in high-functioning autism (e.g., Klin, Volkmar, Sparrow, Cicchetti, & Rourke, 1995; Volkmar et al., 2004). Thus, in these studies, individuals with Asperger's disorder reportedly demonstrated strengths in verbal language and verbal memory despite relative weaknesses in visually based tasks involving nonverbal concept formulation, the perception of visuospatial information, and memory of visual images. The converse was reported in individuals with high-functioning autism. Findings have been inconsistent, however. In two studies using *DSM–IV* criteria for differential diagnosis of Asperger's disorder and high-functioning autism, researchers found that as a group, the individuals with Asperger's disorder had higher verbal IQs and full-scale IQs than the individuals with high-functioning autism (Ghaziuddin & Mountain-Kimchi, 2004; J. N. Miller & Ozonoff, 2000). At the individual level, however, varying cognitive profiles were found in each group, and findings of normal language development histories, motor delays, and high verbal relative to performance IQs were not specific to the groups with Asperger's disorder.

The question of whether individuals with Asperger's disorder represent a distinct subgroup from individuals of normal intelligence with autistic disorder continues to generate considerable interest and controversy. One possibility is that the current diagnostic criteria do not serve to reliably discriminate between the two groups and that improvements in identifying and operationalizing the key criteria will yield meaningful subgroups (Klin, McPartland, & Volkmar, 2005), whereas another possibility is that individuals currently diagnosed with Asperger's disorder represent the highest IQ end of a continuous spectrum that cannot be subdivided meaningfully (J. N. Miller & Ozonoff, 2000). The existing research serves to inform us clinically of the varying neuropsychological and developmental profiles existing among persons with ASD, and it reminds us of the importance of careful individualized assessments for the purposes of intervention planning.

Rett's disorder offers a contrasting situation (Jellinger, 2003; A. M. Kerr, 2002; A. M. Kerr, Belichenko, Woodcock, & Woodcock, 2001). The disorder is observed overwhelmingly in females, in contrast to autism, Asperger's disorder, childhood disintegrative disorder, and PDD-NOS, all of which occur at higher rates in males. Rett's disorder involves regression in social, cognitive, and psychomotor development after an early period of development that appears normal to caregivers (although retrospective analyses of infant videotapes suggest there may be subtle indicators of the disorder during the first year, according to A. M. Kerr, 2002). The social regression along with the appearance of repetitive behaviors increases the chance of a misdiagnosis of autism early

on; across time, however, social interest and interactions develop that are consistent with the overall developmental level of the children (although this is frequently quite low). Identification of a common genetic anomaly in the vast majority of children meeting the behavioral criteria for diagnoses of Rett's disorder in 1999 has led to opportunities for more refined study of the developmental course of children with a known etiology for Rett's disorder. Although most of the diagnosed individuals present with severe developmental delays across all areas, research since 1999 has demonstrated a broad range of developmental outcomes among girls with the characteristic genetic anomaly, with some individuals developing functional single word or phrase speech, and occasional individuals functioning within the normal range (A. M. Kerr, 2002). The degree of impairment appears to be related to the number of cells in which the mutated gene is active.

A number of diagnostic labels overlap with ASD to some extent, with the overlap and diagnostic uncertainty being the greatest for spectrum disorders other than autistic disorder itself (Volkmar et al., 2004). These diagnostic labels include semantic-pragmatic disorder (Bishop & Rosenberg, 1987; Rapin & Allen, 1983) or pragmatic language impairment (Bishop, 1998), nonverbal learning disorder (NLD; Volden, 2004), hyperlexia (Grigorenko, Klin, & Volkmar, 2003), sensory integration disorder/dysfunction or sensory processing disorder (L. J. Miller, Cermak, Lane, Anzalone, & Koomar, 2004), and multiple complex developmental disorders (Buitelaar & van der Gaag, 1998; D. J. Cohen, Paul, & Volkmar, 1986). Widespread consensus does not exist on the existence of, or criteria for, these disorders as representing distinct diagnoses, which makes interpreting the available literature more challenging. Fitzgerald (1999) argues that several of these categories represent unnecessary "diagnostic splitting" resulting to some extent from a lack of communication among different professional groups, such as SLPs and psychiatrists. Further, Fitzgerald suggests that families often will be better served by receiving a diagnosis of ASD, at least in those situations in which the individual meets criteria for one of the disorders within the autism spectrum, in order to point to the need for and access to recognized services.

Botting and Conti-Ramsden (1999) maintain that at least in Great Britain, the diagnosis of semantic-pragmatic disorder (or more recently, pragmatic language impairment) is used for children who do *not* meet the criteria for a diagnosis of autism; however, they acknowledge an ongoing debate about whether these children are viewed more appropriately as representing a subgroup of children with language impairments or a subgroup of children with PDD. At least 6 of the 10 children with pragmatic language impairment included in their study did not meet diagnostic criteria for Asperger's disorder or autistic disorder. Thus, the only possibly appropriate ASD diagnosis for these children would be PDD-NOS, and the investigators questioned the benefit of that diagnosis with respect to planning intervention or providing families with access to services.

Nonverbal learning disorder or disability (Volden, 2004) is characterized by deficits in such areas as arithmetic, tactile and visuospatial perception, and motor coordination. Individuals with this disorder also have been described as having good rote verbal memory and problems with social pragmatic skills (Myklebust, 1975; Rourke, 1989). As Volden points out, the neuropsychological profile of individuals with NLD bears striking similarities to that reported for many individuals with Asperger's disorder. There has been insufficient research to resolve questions about overlap between these diagnoses, but it is likely at least some individuals with diagnoses of NLD would be included appropriately on the autism spectrum.

Hyperlexia is another diagnostic term that has been applied with varying criteria (Grigorenko et al., 2003) to refer to children with precocious printed language decoding abilities. In some definitions, hyperlexia is identified based on a discrepancy between print recognition and print comprehension abilities. Other proposals have identified hyperlexia based on precocious print recognition in the context of significant language and/or cognitive impairments, and still others have combined the criteria and specified that hyperlexia involves a discrepancy between superior print recognition and both language or cognitive level and print comprehension abilities. Hyperlexia has been reported among children with DD other than ASD, but particularly when the criteria used for hyperlexia include the development of precocious decoding skills relative to cognitive level, research demonstrates a high likelihood that children with hyperlexia will meet criteria for an ASD diagnosis (Grigorenko et al., 2002).

Sensory integration disorder or dysfunction and sensory processing disorder are diagnostic labels stemming from Ayres's (1975) work related to children with learning disabilities. Symptoms of sensory integration disorder include both oversensitivity and underreactivity to various stimuli, distractibility, social emotional problems, physical clumsiness, hyper- or hypoactivity, impulsiveness, and other difficulties in self-regulation of arousal level, and concomitant delays in speech, language, and motor skills and aca-

demic achievement (Anzalone & Williamson, 2000). Limited peer-reviewed research is available regarding differential diagnosis or characterization of the population of individuals with sensory integration dysfunction, but clinically it is common to encounter children with diagnosed or suspected ASD who also have been given a diagnosis of sensory integration disorder. Although few of the symptoms of sensory integration disorder appear among the diagnostic criteria for ASD, these symptoms nevertheless are reported widely among children with ASD (Baranek, David, Poe, Stone, & Watson, in press; Piek & Dyck, 2004). More detail about sensory and feeding issues for individuals with ASD with supporting references is provided in the companion technical report (ASHA, 2006b).

Multiple complex developmental disorders (Buitelaar & van der Gaag, 1998; D. J. Cohen et al., 1986) grew out of studies of children diagnosed with PDD-NOS and other severe developmental disorders who did not meet the criteria for autistic disorder. Cluster analyses "identified a group of children characterized by social problems, bizarre and disorganized thinking, recurrent anxieties, inappropriate affect, and mood lability" (Buitelaar & van der Gaag, 1998, p. 912). Researchers have proposed that this is a distinct diagnostic subgroup that represents not a milder variant of autism, but rather a different group with different distinguishing diagnostic features. Compared with children with autism, these children show more symptoms of aggression, more anxiety, and more psychotic thoughts and suspiciousness, whereas children with autism show more disturbances in social interaction, communication, and stereotyped and rigid behaviors (van der Gaag et al., 1995). Unlike children with autism, children meeting the criteria for multiple complex developmental disorders are at risk for developing schizophrenia in adulthood; they also show different biologically based responses to psychosocial stress, suggesting that this subgroup may have a different biological etiology than children with autism (Jansen, Gispende Wied, van der Gaag, & van Engeland, 2003).

Determining Eligibility and the Challenges of Identifying Higher Functioning Individuals

High-functioning individuals with ASD pose particular challenges both for identification and for determining eligibility for services. By definition, individuals with high-functioning autism or Asperger's disorder have either verbal or nonverbal measured intelligence within normal limits. Many are not diagnosed until later school age, adolescence, or even adulthood (Howlin & Asgharian, 1999). One reason for such late diagnosis is that they often appear to succeed in some or most academic subjects, particularly in the early school years. This often masks the significant challenges faced by these students and thus may delay a referral for special education services. Long-term outcome research for individuals with high-functioning autism or Asperger's disorder, however, has shown that social communication deficits significantly affect their ability to adjust to new social demands in later academic and community settings and, therefore, achieve vocational goals (Gilchrist et al., 2001; Mueller, Schuler, Burton, & Yates, 2003; Tsatsanis, Foley, & Donehower, 2004). These findings suggest that it is important to provide early intervention to address the gap between cognitive potential and social adaptive functioning.

Although current research outcomes support the provision of individualized educational programming, SLPs often find it challenging to demonstrate that a child or older individual with high-functioning autism or Asperger's disorder is eligible for services. The NRC has recognized this challenge and has recommended that all children with ASD, including autistic disorder, Asperger's disorder, and PDD-NOS, be deemed eligible for special education services under the category *autistic spectrum disorders*, as opposed to other educational categories often used by school systems (e.g., other health-impaired, social emotional disorder; NRC, 2001, p. 213). Nevertheless, it may be necessary to conduct a comprehensive evaluation to demonstrate the expected gap between an individual's cognitive potential and his or her social adaptive functioning. Furthermore, school systems need to make eligibility decisions through the team process of the individualized educational program. The team should decide the optimal eligibility decision for the child. Formal testing may be useful for assessing the structure and form of language, whereas these evaluation tools may not provide an accurate assessment of an individual's use of language (i.e., pragmatics). Determining an individual's social and communication competence, therefore, necessitates evaluation across a range of social settings and not just one-on-one structured formal testing sessions. A variety of strategies should be used for gathering information. These may include direct standardized assessments, naturalistic observation across contexts, and caregiver/teacher interviews or questionnaires. Standardized assessment tools such as the Clinical Evaluation of Language Fundamentals, Fourth Edition (Wiig, Secord, & Semel, 2004) and the Test of Language Competence—Expanded Edition, Levels 1 and 2 (Wiig & Secord, 1989) should be complemented with standardized measures of social adaptive functioning such as the Vineland Adaptive

Behavior Scales—Expanded Edition (Sparrow, Balla, & Cicchetti, 1984) and the Vineland Adaptive Behavior Scales—Classroom Edition (Sparrow et al., 1984). Finally, measures that provide a means to assess an individual's spontaneous communicative bids within natural conversational exchanges such as the Damico Clinical Discourse Analysis (Damico, 1985), the Children's Communication Checklist (Bishop, 1998, 2001), and the Pragmatic Rating Scale (Landa et al., 1992) also may be useful for documenting social communication deficits in higher functioning individuals with ASD.

Summary of Recommendations

The SLP plays a critical role in screening and early detection of individuals at risk for ASD and makes referrals to experienced professionals for diagnosis and intervention services. SLPs who acquire and maintain the necessary knowledge and skills can diagnose ASD, typically as part of a diagnostic team or in other multidisciplinary collaborations, and should make appropriate referrals to rule out other conditions and facilitate access to comprehensive services. The SLP who has been trained in the reliable and valid use of diagnostic and assessment tools as well as in the clinical criteria for ASD may be qualified to diagnose these disorders as an independent professional. Individuals with ASD may be eligible for or demonstrate a need for speech-language pathology services due to the pervasive nature of the social communication impairment, regardless of age, cognitive abilities, or performance on standardized testing of formal language skills.

As mandated by the IDEA (2004), SLPs should avoid applying a priori criteria (e.g., discrepancies among cognitive abilities and communication functioning, chronological age, or diagnosis) and make individualized decisions on eligibility for services. Further, in public school settings, a student's diagnosis and eligibility for services must be determined by a team rather than a single individual. Because formal assessment tools may not accurately detect problems in the social use of language and communication, eligibility for special education services may need to be based on clinical judgment and more informal, observational measures.

Characteristics of Effective Interventions

Framework for Considering the Evidence Base of Treatment

The NRC formed the Committee on Educational Interventions for Children with Autism at the request of the U.S. Department of Education, Office of Special Education Programs. The charge for the NRC committee was to integrate the scientific, theoretical, and policy literature and create a framework for evaluating the scientific evidence concerning the effectiveness of educational interventions for young children with ASD. A report was published in October of 2001 summarizing the findings and recommendations of this committee (NRC, 2001). The NRC report delineated specific conclusions and recommendations about diagnosis and assessment, role of families, goals for educational services, characteristics of effective interventions based on empirical studies, public policies, personnel preparation, and needed research.

To achieve a systematic and rigorous assessment of research studies, the NRC committee established guidelines for evaluating the quality of the scientific evidence based on the following three criteria (NRC, 2001):

- **internal validity** or control for nonspecific factors, such as maturation, expectancy, experimenter bias
- **external validity** or control for selection biases addressed in random assignment, adequate sample size, and well-defined populations
- **generalization** of treatment outcomes documented in a natural setting outside of experimental intervention or with functional outcomes

The NRC committee rated each research study using a 4-point scale for the level of rigor with respect to internal validity, external validity, and generalization with 1 being the highest evidence and 4 being insufficient design or no evidence (NRC, 2001, p. 15). The NRC committee integrated this information with an eye toward convergence of evidence, particularly from independent sources using different methodologies in an effort to characterize features of appropriate, effective educational interventions for children with ASD.

The ASHA Ad Hoc Committee on Autism Spectrum Disorders used the NRC report and adopted the NRC guidelines to evaluate scientific evidence for these guidelines and family of related documents on ASD. The NRC report included a thorough literature review on children from birth to age 8, published in peer-reviewed journals through 2000. The ASHA committee reviewed literature with an effort to identify research published since the NRC report or that which was not included in the NRC report. To assist this committee, the ASHA National Center for Evidence-Based Practice in Communication Disorders conducted a literature search to identify empirical treatment studies on speech, language, and/or com-

munication in children with ASD that have been published since 2000, in adolescents or adults with ASD that have been published over the past decade, and any studies pertaining to multicultural issues and ASD. Studies were included in this review only if they were published in English in peer-reviewed journals and reached a Level 1, 2, or 3 rating on internal and external validity based on the NRC 4-point scale. Chapters in books were used only as resources for summaries of findings based on peer-reviewed publications.

Within the field of ASD, there is a wide variety of approaches to intervention that vary with regard to availability of empirical evidence, longevity, popularity, and influence of marketing efforts. Because of the sheer number and variety of the approaches available, criteria were established for the inclusion and exclusion of intervention information within these guidelines. These criteria focused on available empirical information and were based on criteria established by the NRC (2001). Intervention approaches were discussed in these guidelines if

- empirical research published in a peer-reviewed journal was available that included individuals with ASD;

- intervention outcomes were measured in relationship to the core challenges of ASD; and

- empirical research published in a peer-reviewed journal was available for all or some of its methodological components.

Approaches that had no evidence were excluded. Approaches that had strong refuting evidence, such as facilitated communication and auditory integration training, were also excluded. Members are referred to ASHA position statements for further information on these two methods (ASHA, 1994, 2004a).

Treatment approaches were evaluated for internal validity, external validity, and generalization according to guidelines described by the NRC (2001). Results are summarized in these guidelines in an effort to characterize the strength of empirical evidence for different intervention approaches considering the findings of individual research publications, methodological challenges in clinical studies, selection biases, and the difficulties in measuring meaningful, generalizable outcomes. Like the NRC committee, the ASHA Ad Hoc Committee on ASD recognized that within empirical research, there is a range of emphases and designs depending on the questions being answered, so no attempt was made to prioritize specific interventions or programs. The goal was to integrate intervention information in an effort to identify points of convergence of findings and thus

to provide a framework to guide the clinician in making individual intervention decisions.

Active Ingredients of Effective Programs

Three major research conclusions emerge from current empirically supported intervention strategies for individuals with ASD and should form the basis for clinical decision making. First, there is empirical support demonstrating the effectiveness of a range of approaches for enhancing communication skills of individuals with ASD along a continuum from behavioral to developmental (Dawson & Osterling, 1997; NRC, 2001; Prizant & Wetherby, 1998; Rogers, 1998). Furthermore, there are no group design studies directly comparing the effectiveness of different approaches using randomly assigned, matched control samples with sufficient sample sizes and adequate statistical power. Therefore, evidence that any one approach is more effective than another approach is not available to date.

Second, intervention research is not yet available to predict which specific intervention approaches or strategies work best with which individuals with ASD. No one approach is equally effective for all individuals with ASD, and not all individuals in outcome studies have benefited to the same degree (NRC, 2001). Group design treatment studies are needed to identify characteristics of individuals with ASD that predict response to treatment (Yoder & Compton, 2004). For clinicians to determine whether an individual with ASD is benefiting from a particular treatment program or strategy, measurement of that individual's progress using systematic methods, such as in single-subject research design, is recommended.

Third, knowledge about the effectiveness of treatment is limited by the outcome measures used in research. The most common reported outcome measures in comprehensive interventions for children with ASD are changes in IQ scores and post-intervention placement (NRC, 2001). The NRC concluded that these measures may not be ecologically valid, because they do not measure meaningful changes within natural learning environments, do not address the core deficits in ASD, and are particularly problematic for young children. The NRC (2001) recognized the need for more meaningful outcome measures and recommended measures that include (a) gains in *initiation* of spontaneous communication in functional activities and (b) *generalization* of gains across activities, interactants, and environments. The broad impact of the social communication challenges and problems with generalization for individuals with ASD underscores the critical importance of ecologically meaningful outcome measures. The NRC

concluded that learning in natural learning environments appears to be the most effective intervention approach. Not only do such environments invite higher rates of initiation and generalization, they also enhance the ecological validity of the intervention because the behaviors involved are more likely to translate into a better quality of life and increase social acceptance.

Based on a systematic review of research on educational interventions for children with ASD from birth through age 8, the NRC concluded that there is a convergence of evidence that the following characteristics are essential active ingredients or components of effective interventions for children with ASD:

Entry into intervention programs as soon as ASD is suspected. Children who participate in intensive intervention beginning by age 3 have a significantly better outcome than those beginning after 5. Intervention beginning before age 3 appears to have an even greater impact. These intervention findings indicate the pressing need to identify and provide intervention for children with ASD as early as possible (NRC, 2001).

Active engagement in intensive instructional programming for a minimum of 5 hours per day, 5 days a week. Instruction is used broadly to refer to the structure that supports learning and can occur in any environment—the home, school, or community settings. Children with ASD need instructional strategies that ensure that they are actively engaged during activities, and the intensity of programming needs to be sufficient to provide 5 hours per day of active engagement (NRC, 2001). SLP direct services should contribute to the 25 hours per week of active engagement but would likely compose only a small portion of these hours. SLP consultative services should be aimed at helping the communicative partner (i.e., teacher, parent, peer, or sibling) provide the supports and teaching strategies to enhance active engagement in natural learning environments.

Repeated, planned teaching opportunities. Instructional opportunities should be organized in a series of brief time intervals and include sufficient amount of adult attention to meet individualized goals. Goals and objectives should be targeted in systematically planned, developmentally appropriate learning activities (NRC, 2001).

Inclusion of a family component, including parent training. Concerns, priorities and perspectives of the family need to actively shape educational planning. All of the comprehensive intervention programs with the best treatment outcomes included a strong family component. Family members should be supported to be effective members of the educational team and provided with the opportunity to learn strategies for teaching their child new skills and reducing problem behaviors (NRC, 2001).

Low student:teacher ratios. A child must receive sufficient individualized attention on a daily basis so that instructional strategies can be implemented effectively. In order to accomplish this, a low student:teacher ratio is needed, with no more than two young children with ASD per adult in the classroom as a guideline; however, this may vary depending on the functioning level of the individuals with ASD (NRC, 2001).

Mechanisms for ongoing assessment and program evaluation with corresponding adjustments in programming. An individual's progress in meeting objectives should be measured on an ongoing basis to refine the instructional program. Lack of documented progress over a 3-month period should be an indicator that changes in one or more aspects of programming need to be adjusted in some way, such as increasing intensity by adding instructional time or lowering student:teacher ratio, modifying the curricula or instructional strategies, or targeting different objectives (NRC, 2001).

Six kinds of instruction should take priority for individuals with ASD: (a) functional, spontaneous communication; (b) social instruction in various settings throughout the day; (c) play skills with a focus on play with peers and peer interaction; (d) new skill acquisition and generalization and maintenance in natural contexts; (e) functional assessment and positive behavior support to address problem behaviors; and (f) functional academic skills when appropriate (NRC, 2001).

There are many different intervention approaches and strategies that have been developed and implemented for individuals with ASD. Programs differ in how goals are prioritized and the techniques used to target goals. Some programs rely heavily on singular strategies, while others are more comprehensive or eclectic. There are many "name brand" programs; however, there can be much variation in the way these programs are implemented. More important than the name of the program is how the environment and instructional strategies support individualized goals and objectives for the individual with ASD and his or her family and other communication partners (NRC, 2001).

Application of Active Ingredients to Decision Making for the SLP

It is challenging for SLPs to make informed decisions about intervention approaches and strategies for individuals with ASD, especially in light of the

wide variety of approaches to intervention within the field of ASD and the variance in regard to availability of empirical evidence, longevity, popularity, and influence of marketing efforts. The following questions should be considered by clinicians to aid this decision-making process based on efficacy research and core characteristics of ASD:

1. Can the intervention approach harm the child with ASD?

2. Is there empirical evidence to support or refute the intervention approach?

3. What is the impact of the intervention on the caregiver?

4. How will you know the treatment is working?

5. Does the intervention program match the family vision and the developmental level and learning style of the individual with ASD?

6. Does the intervention program include the family?

7. Does the intervention program support the development of spontaneous communication?

8. Does the intervention program consistently support social development, play, and interaction with peers as appropriate?

9. Does the intervention program promote generalization and maintenance in natural contexts?

10. Does the intervention program incorporate functional assessment and positive behavior support to address problem behaviors?

11. Does the intervention program provide sufficient intensity for meaningful progress?

12. Does the intervention program address functional academic skills, if appropriate?

13. Does the intervention program address self-advocacy skills and independence for activities of daily living for adults with ASD?

The IDEA (2004) added a new provision that the individualized education program should include a statement of the special education and related services, based on peer-reviewed research to the extent possible (§1414(d)(1)(A)(i)(IV)). In public school settings, the SLP should play an active role as a team member to stay abreast of peer-reviewed research and incorporate strategies based on evidence-based practice into educational programs for students with ASD.

Summary of Recommendations

Based on a review of empirical research on specific intervention strategies and comprehensive intervention programs using a package of strategies, the NRC (2001) committee concluded that there are a number of critical features that are the active ingredients in effective intervention programs for children with ASD, delineated above. SLPs should be an active member of educational teams that work collaboratively to incorporate these critical features into educational programs of individuals with ASD as well as build the capacity within school districts to incorporate these features systemwide.

Assessment for Program Planning

Assessment Goals and Strategies

Following screening, diagnosis, and eligibility consideration, ongoing assessment is critical to guide program planning. Assessment of an individual with ASD should be an ongoing process for achieving a number of essential goals. These include: (a) to determine an individual's current profile of social communication skills, (b) to identify learning objectives that are priorities within natural communication contexts, and (c) to examine the influence of the communication partner and the learning environment on the individual's competence as a communicator (Meisels, 1996). Dynamic assessment is a term used for assessment protocols in which support is systematically provided to determine what factors influence and enhance an individual's current skills and ability to complete tasks that would otherwise be too difficult for her or him to accomplish independently. Dynamic assessment procedures should be implemented, as these procedures identify not only those skills that an individual has achieved but also those skills that may be emerging and what contextual supports enhance communication skills, such as augmentative and alternative communication (AAC) and modeling provided by communication partners (Mirenda, 2003; Olswang, Bain, & Johnson, 1992; Schuler, 1989; Vygotsky, 1978).

With these assessment goals in mind, assessment strategies should not rely solely on standardized, norm-referenced tools, as information should be gathered across natural social contexts (Schuler, Prizant, & Wetherby, 1997). Additionally, primary caregivers and communication partners (e.g., family members, teachers, clinicians, and peers) should be incorporated as active participants and informants in this assessment process (Prizant & Bailey, 1992; Schuler, 1989). Observing an individual in his or her natural social contexts, gathering information from that

individual's communication partners through questionnaires and/or interviews, and staging communication contexts that assess an individual's spontaneous use of communication and language provide critical measures of an individual's strengths and functional needs across meaningful contexts (Schuler, 1989; Wetherby & Prizant, 1993).

Likewise, these assessment strategies provide a means to examine the need to support communication partners in their efforts to respond to the individual's subtle bids for communication, interpret the functions of problem behavior, and modify the environment to foster social engagement. The idiosyncratic language used by individuals with ASD makes it difficult for communication partners to be responsive and adjust the quantity and quality of their language models. Consequently, language modeled for individuals with ASD is often too complex or too simple, limiting opportunities for communication growth. Likewise, a communication partner may misinterpret an individual's subtle bids for communication or the functions of problem behavior, a pattern that may limit the individual's exposure to modeling for coping and expressing intentions in more socially appropriate ways.

Prioritizing Intervention Goals

Based on the ongoing assessment of an individual's strengths and needs as well as the strengths and needs of his or her communication partners, intervention goals and strategies can be prioritized. Developmental sequences and processes of language development should provide a framework for determining baselines and implications for intervention goals (Schuler et al., 1997). Family priorities also should be considered paramount when selecting intervention goals, as meaningful outcomes are strongly correlated with communication competence across functional social contexts (e.g., home, school, vocational, and community settings). An individual with ASD will demonstrate greater social communication competence when goals are prioritized to ensure effective communication in meaningful contexts and across natural communication partners (Wetherby, Schuler, & Prizant, 1997).

The most critical domains for prioritizing intervention goals should be derived from the core features of ASD and the core challenges that affect social adaptive functioning within the ever-changing social contexts of an individual's natural routines. As outlined previously in this document, core challenges are noted in aspects of joint attention (e.g., social orienting, establishing shared attention, monitoring emotional states, and considering another's intentions), social reciprocity (e.g., initiating bids for interaction,

maintaining interactions by taking turns, and providing contingent responses to bids for interaction initiated by others), language and related cognitive skills (e.g., understanding and using nonverbal and verbal communication, symbolic play, literacy skills, and executive functioning), and behavior and emotional regulation (e.g., effectively regulating one's emotional state and behavior, maintaining social engagement, and attending to salient aspects of the social environment). Thus, intervention goals should be prioritized under these domains following a developmental framework.

These core challenges take different forms as an individual matures and responds to intervention. Application of a developmental framework ensures that appropriate goals are being addressed prior to the emergence of symbolic language, at emerging language stages, and at more advanced stages of conversational discourse (NRC, 2001; Prizant, Wetherby, Rubin, & Laurent, 2003). Table 1 provides sample intervention goals for prelinguistic, emerging language, and more advanced language stages. Actual goals for an individual should vary based on those aspects of development that are consistent with family priorities and an individual's functional needs within his or her current social contexts. Goals should incorporate the functional use of the individual's full communication abilities using a multimodal communication system. Decisions about the integration of modes of communication (e.g., spoken language, gestures, sign language, picture communication, speech generating devices [SGDs], and/or written language) should be individualized according to specific capabilities and contexts of communication, as well as cultural issues.

Summary of Recommendations

Integral to the diagnostic criteria, all individuals with ASD have core challenges in the area of social communication. Therefore, problems in the use of language and communication are overarching because ASD is a primary social communication disability. These challenges result in far-reaching problems including joint attention, shared enjoyment, social reciprocity in nonverbal as well as verbal interactions, mutually satisfying play and peer interaction, comprehension of others' intentions, and emotional regulation. SLPs should conduct assessments and prioritize intervention goals and objectives in those aspects of development that are critical to the achievement of social communication competence and that honor and adapt to differences in families, cultures, languages, and resources. Embracing a broad view of communication, SLPs should assess and enhance (a) the initiation of spontaneous communication in func-

Table 1. Sample intervention goals based on core challenges in ASD.

Joint attention

Prelinguistic stages

- Orienting toward people in the social environment
- Responding to a caregiver's voice
- Shifting gaze between people and objects
- Pairing communication gestures with gaze and/or physical contact when requesting and protesting as culturally appropriate
- Directing another's attention for the purposes of sharing an interesting item or event
- Attending to emotional displays of distress or discomfort
- Sharing positive affect
- Initiating social routines

Emerging language stages

- Expanding communication functions to seek specific emotional responses from others (e.g., seeking comfort, greeting others, showing off)
- Commenting to share enjoyment and interests
- Recognizing and describing emotional states of self and others

Advanced language stages

- Understanding what others are indicating with gaze and gestures
- Determining causal factors for emotional states of self and others
- Using emotions of others to guide behavior in social interactions (e.g., selecting topics based on another's preferences, praising others, sharing empathy)
- Considering another's intentions and knowledge (e.g., requesting information from others, sharing information about past and future events)

Social reciprocity

Prelinguistic stages

- Responding to the bids of others
- Initiating bids for interaction
- Increasing frequency of spontaneous bids for communication
- Developing persistence in communication attempts

Emerging language stages

- Increasing frequency of communication across social contexts and interactive partners
- Maintaining interactions by taking turns
- Providing contingent responses to bids for interaction initiated by others
- Recognizing and attempting to repair breakdowns in communication

Advanced language stages

- Engaging in topic maintenance (e.g., providing expansion comments)
- Maintaining conversational exchanges with a balance between comments and requests for information
- Providing essential background information
- Initiating and maintaining conversations that are sensitive to the social context and the interests of others

Language and related cognitive skills

Prelinguistic stages

- Using a range of gestures to share intentions (e.g., giving, showing, waving, pointing)

- Using effective strategies for protesting, exerting social control, and emotional regulation in order to replace potential problem behaviors used for these functions
- Pairing vocalizations with gestures to share intentions
- Observing and imitating the functional use of objects
- Turning pages and pointing to pictures in books

Emerging language stages

- Expanding word knowledge and use to include not only object labels, but also action words, modifiers, and relational words
- Understanding and using more creative combinations of words
- Understanding and using more sophisticated grammar
- Engaging in representational play
- Understanding sequences of events in stories, attending to beginning and rhyming sounds, and naming alphabet letters
- Producing a variety of speech sounds

Advanced language stages

- Enacting social sequences in a representational manner by incorporating themes or modifications introduced by others (e.g., role-playing and visualizing an event before it takes place)
- Understanding and using nonverbal gestures, facial expressions, and gaze to express and follow subtle intentions (e.g., sarcasm and other nonliteral meanings)
- Understanding and using intonation cues to express and follow emotional states
- Understanding and using more sophisticated syntax to provide background information for one's listener
- Understanding and using more sophisticated syntax to show relationships between sentences in conversational discourse
- Demonstrating story grammar knowledge, decoding, and letter–sound correspondence and expanding literacy skills (e.g., reading comprehension and written expression)
- Problem solving and self-monitoring future, goal-directed, behavior (i.e., executive functioning)

Behavior and emotional regulation

Prelinguistic stages

- Attending to salient aspects of the social environment
- Expanding the use of conventional behaviors to regulate one's emotional state (e.g., covering one's ears to block out noise, carrying a preferred toy into an unfamiliar setting to assist in the transition, removing oneself from a situation when overwhelmed)
- Protesting undesired activities

Emerging language stages

- Requesting a soothing activity when distressed
- Requesting a break from a given activity
- Requesting assistance from others
- Using language to maintain engagement within an activity (e.g., "first … then")
- Using language to talk through transitions across activities
- Expressing one's emotional state and the emotional state of others

Advanced language stages

- Preparing and planning for upcoming activities
- Perceiving one's actions within social events and predicting social behavior in others in order to self-monitor
- Negotiating and collaborating within interactions with peers

tional activities across social partners and settings; (b) the comprehension of verbal and nonverbal discourse in social, academic, and community settings; (c) communication for a range of social functions that are reciprocal and promote the development of friendships and social networks; (d) verbal and nonverbal means of communication, including natural gestures, speech, signs, pictures, written words, as well as other AAC systems; and (e) access to literacy and academic instruction, as well as curricular, extracurricular, and vocational activities.

Intervention Approaches and Strategies

The following sections contain a review of empirical evidence of a variety of intervention approaches and strategies for individuals with ASD. The framework for evaluating evidence and the search strategy were summarized above. The quality of evidence with supporting references is provided in each of the following sections. The challenge for SLPs is matching intervention approaches and strategies with philosophical beliefs underlying best practices as well as the core deficits of individuals with ASD. Interventionists typically are guided by varying beliefs about development, learning, the role of social interactions, and attributions about the etiology of core deficits. The latter is most commonly attributed to factors intrinsic to the individual involved, and interventions typically target the remediation of assessed deficits within the individual. By focusing on modification of the learning environment, *ecological* interventions take a different stance, as they examine the context in which deficits are observed, targeting the contributing circumstances rather than any intrinsic deficiencies. This approach is of particular relevance to *communicative interactions,* which are defined by situational context as well as by the interaction style of the communication partner. If positive changes are targeted solely within the behavior repertoire of the least competent contributor to a successful communicative exchange, variables in the contexts where those behaviors would be expected may not be addressed and social communication challenges may continue secondary to factors extrinsic to the individual. Therefore, ecological interventions attempt to complement the latter by, for example, explicitly training parents, siblings, and peers; coaching partners to be less directive and to pause longer before presenting next bids for interaction; or providing more contextual supports, such as real-life objects, visual supports, and concrete physical activity.

Beliefs about learning and development underlie the extent to which interventions are described as behavioral, developmental, naturalistic, and affective

or "relationship based." Behavioral interventions derived from applied behavior analysis were the earliest to document their effectiveness in increasing rates of desirable and decreasing rates of undesirable behaviors, but questions remain regarding the social validity and generalization of some of the behaviors that were changed. In selecting appropriate interventions, it is important to discriminate between more traditional applications of behavior modification, such as those relying primarily on massed discrete trial training approaches, and those that incorporate more socially and cognitively mediated models of learning, such as modeling, vicarious learning, and self-regulation (cognitive behavior modification). In contrast, developmental interventions generally attempt to carefully describe levels and/or stages of development and to provide the corresponding strategies needed to proceed to the next developmental level.

Further differentiations need to be made between behavioral interventions to the extent that they take place in natural learning environments and use natural, nonstigmatizing prompts or other supports and natural consequences. These types of strategies embedded in natural settings are often described in the behavioral intervention literature as incidental learning and are aimed at promoting generalization and inclusion. This is consistent with the legal mandate to educate children with special needs in the least restrictive environment that can meet their educational needs. The focus in some intervention programs is primarily on positive behavior changes in the individual with ASD without explicit regard to the quality of interactions and relationships between interaction partners. Other programs focus more explicitly on the establishment of reciprocity and positive affect in the context of developmentally progressive interactions.

Although such different approaches to intervention may seem incongruent at first, they may be reconciled in intervention practices. For instance, the growing acceptance of functional assessment of behavior may speak to the congruence of developmental and behavioral perspectives, as the search for the functions of seemingly aberrant behaviors is congruent with a developmental perspective. Effective practitioners should combine a variety of intervention methods and strategies, drawing from evidence-based practices rooted in varying conceptual models. In fact, overly strict applications of "developmental logic" may backfire as individuals with ASD are noted for their unique ways of learning and thinking. While much variation exists, individuals with ASD often excel in tasks that require visuospatial skills to the extent they may learn to "read," or rather "de-

code," before they learn to talk. Thus, learning styles and developmental differences constitute an important consideration in designing effective interventions because they help determine best treatment modalities. Clinicians and educators need to determine which different strategies are effective with students/clients presenting varying developmental levels; social, linguistic, and cultural backgrounds; learning styles; behavior repertoires; and communication needs; taking into consideration family resources and cultural values.

Many issues should be considered in order to make informed decisions about specific instructional strategies. Clinicians need to ask themselves whether the interventions under consideration—

- focus on core characteristics and challenges as essential outcomes;
- incorporate empirically supported strategies to support initiation and generalization;
- assess the link between behavior and communication and use of positive behavior support;
- use strategies that support learning style, developmental framework, and self-determination;
- incorporate AAC;
- consider peer and peer-mediated learning as a context.

Each of these considerations is discussed below in relation to available evidence-based practice.

Focus on Core Characteristics and Challenges as Essential Outcomes

Since positive long-term outcomes for individuals with ASD are strongly correlated with the achievement of social communication competence (L. K. Koegel, Koegel, Yoshen, & McNerney, 1999; NRC, 2001; Venter, Lord, & Schopler, 1992), intervention goals should be evaluated as to their relative impact on effective communication in meaningful contexts and across natural communication partners. An individual with ASD will demonstrate greater social communication competence when goals are prioritized to address the core characteristics and challenges of the disorder (NRC, 2001; Wetherby et al., 1997). Thus, efficacy of an intervention program should not be judged by whether an individual has been placed in a regular education environment or by whether improvements have been made on IQ scores. Rather, essential outcomes in intervention should be related to improvements in social communication that affect the ability to form relationships, function effectively, and actively participate in everyday life.

Longitudinal research has, in fact, shown that positive outcomes in the hallmark features of the disorder, including joint attention, social reciprocity, language and related cognitive skills, and behavior and emotional regulation, are predictive of gains in language acquisition, social adaptive functioning, and academic achievement (NRC, 2001). Refer to Table 1 for sample intervention goals that can guide the development of essential and meaningful outcome measures.

Empirically Supported Strategies to Promote Initiation and Generalization

The earliest research efforts at teaching speech and language to children with autism used massed discrete trial methods to teach verbal behavior. A major limitation of a discrete trial approach for language acquisition is the lack of spontaneity and generalization. Lovaas (1977) stated that "the training regime . . . its use of 'unnatural' reinforcers, and the like may have been responsible for producing the very situation-specific, restricted verbal output which we observed in many of our children" (p. 170). In a review of research on discrete trial approaches, it was noted by L. K. Koegel (1995) that "not only did language fail to be exhibited or generalize to other environments, but most behaviors taught in this highly controlled environment also failed to generalize" (p. 23).

There is now a large body of empirical support for more contemporary behavioral approaches using naturalistic teaching methods that demonstrate efficacy for teaching not only speech and language but also communication. The following specific intervention strategies have been found to promote initiation and generalization: arrange the environment to provide opportunities for communicating with preferred materials, encourage child initiations and follow the child's attentional focus and interest, intersperse preferred and nonpreferred activities, use embedded instruction in the natural environment, offer choices and encourage choice making, use natural reinforcers that follow what the child is trying to communicate, use time delay or waiting, use contingent imitation, and structure predictability and turn taking into the activity. Some examples of comprehensive programs that incorporate some or many of these naturalistic behavioral techniques include natural language paradigm (R. L. Koegel, O'Dell, & Koegel, 1987), incidental teaching (Hart, 1985; McGee, Krantz, & McClannahan, 1985; McGee, Morrier, & Daly, 1999), time delay and milieu intervention (Charlop, Schreibman, & Thibodeau, 1985; Charlop & Trasowech, 1991; Hwang & Hughes, 2000b; Kaiser, 1993; Kaiser, Yoder, & Keetz, 1992), pivotal response

training (L. K. Koegel, 1995; R. L. Koegel, Camarata, Koegel, Ben-Tall, & Smith, 1998; Whalon & Schreibman, 2003), the Hanen Centre program for parents of children with ASD (Sussman, 1999), and the Social Communication Emotional Regulation Transactional Supports comprehensive educational model for children with ASD (Prizant, Wetherby, Rubin, Laurent, & Rydell, 2003, 2006).

There are only a few studies, all using single-subject design, that have compared traditional discrete trial with naturalistic behavioral approaches. These studies have reported that naturalistic approaches are more effective at leading to generalization of language gains to natural contexts (R. L. Koegel et al., 1998; R. L. Koegel, Koegel, & Surratt, 1992; McGee et al., 1985). Although the empirical support for developmental approaches is more limited than for behavioral approaches, there are a growing number of research studies that provide support for using developmental strategies (Aldred, Green, & Adams, 2004; Hwang & Hughes, 2000b; Lewy & Dawson, 1992; Mahoney & Perales, 2005; Rogers & DiLalla, 1991; Rogers & Lewis, 1989), and there are many case studies, with Greenspan and Wieder (1997) being the largest case review. Furthermore, developmental approaches share many common active ingredients with contemporary naturalistic behavioral approaches and are compatible along most dimensions (Prizant & Wetherby, 1998).

Link Between Behavior and Communication and Use of Positive Behavior Support

Positive, nonaversive approaches to address challenging behaviors are the most effective, evidence-based practice for individuals with severe disabilities (see Horner, Albin, Sprague, & Todd, 2000). The expanded use of applied behavior analysis, improved technology of *functional assessment* of problem behaviors, and increased awareness of developmental constructs such as emotional regulation have led to a variety of alternatives to the use of aversive procedures. These alternatives entail positive ways to support individuals who demonstrate problem behavior (Carr et al., 1994; Fox, Dunlap, & Buschbacher, 2000; Horner et al., 2000; Prizant, Wetherby, Rubin, Laurent, & Rydell, 2003).

One of the most effective interventions derived from a functional assessment has been to teach *functional equivalents* of the problem behaviors (Carr et al., 1994; Horner et al., 2000). For example, for behaviors that are determined to serve a *communicative function* (e.g., to request an object, to request assistance, to express frustration or boredom, to seek attention), teaching appropriate communicative forms to express the function(s) served by the problem behav-

iors has been associated with a reduction in the problem behavior (Carr et al., 1994; Durand, Berotti, & Weiner, 1993; Durand & Carr, 1991, 1992).

A process that uses the functional assessment of problem behaviors to directly target the relationship between challenging behavior and communication is called *positive behavior support*. It integrates established scientific practices founded in applied behavior analysis with person-centered values, lifestyle changes, and comprehensive approaches to intervention (Buschbacher & Fox, 2003). Instead of conceptualizing intervention in narrowly defined settings and expectations, positive behavior support focuses on intervention in the natural context. By broadening the focus of behavioral intervention to include school, home, and community settings, positive behavior support increases the quality and quantity of meaningful and positive interchanges. It is this comprehensive focus and the valuing of social and ecological validity that promote comprehensive lifestyle changes and sets positive behavior support apart from other methods (Carr et al., 2002).

Early research evidence of the effectiveness of positive behavior support for children with ASD can be found in the literature on functional communication training. Functional communication training provided the underpinnings of positive behavior support by generating the idea that challenging behavior can serve one or more communication and/or regulatory functions and that teaching equivalent communication skills reduces the problem behavior (Durand et al., 1993; Durand & Carr, 1991, 1992; Horner, Day, Sprague, O'Brien, & Heathfield, 1991; Lalli, Casey, & Kates, 1995). A very robust research base for positive behavior support grew from these beginnings and continues to emerge. Carr et al. (1999) reviewed more than 100 single-subject studies from 1985 to 1996. They concluded that 68% of the outcomes showed 80% or more reduction in the challenging behaviors targeted. A review of single-subject studies for children with ASD published from 1996 to 2000 supports these positive outcomes specifically for this population. A 94.6% average reduction of inappropriate behavior for the participants was reported (Horner et al., 2000). The literature is unambiguous in showing positive behavior support as effective in reducing challenging behavior in children with disabilities and more specifically in children with ASD.

Positive behavior support includes the following components:

- **Formulate Behavior Hypotheses**—Determine the purpose of the behavior or your best guess about why the behavior occurs.

- **Use Prevention Strategies—**Implement ways to make events and interactions that trigger challenging behavior easier for the individual to manage.

- **Foster Replacement Skills—**Enhance new skills throughout the day to replace the challenging behavior and serve the same function.

- **Respond in a Positive Manner—**Assist partners to identify and encourage the replacement skill and ensure that the challenging behavior is not maintained.

With the appropriate experience with individuals with ASD and functional assessment, the SLP should play a critical role in each of these components of positive behavior support. The SLP offers unique expertise in social communication that should be used in the design of prevention strategies and replacement skills. *Positive Beginnings: Supporting Young Children with Challenging Behavior* was a project of national significance funded by the U.S. Department of Education to develop training materials that include video clips embedded within a PowerPoint presentation and extensive handouts to be used by professionals to train child care providers and paraprofessionals on positive behavior support. This resource may be useful for clinicians and is available at http://pbs.fsu.edu for a nominal fee.

Communication programming needs to be well integrated with the management of challenging behavior in order to have an impact on the individual's lifestyle by enhancing meaningful progress in communication abilities. This will result in increased access to a variety of people, places, and events. Furthermore, the use of AAC methods has positive effects on children with ASD, such as decreased rates of severe problem behaviors (Bopp, Brown, & Mirenda, 2004; Frea, Arnold, & Vittimberga, 2001) and increased rates of social interaction (Garrison-Harrell, Kamps, & Kravits, 1997). This makes the SLP's unique expertise in social communication and AAC vital to the goals of positive behavior support. Ultimately, it is the individual's competence in social interaction and capacity to cope with stress using flexible communication strategies that will determine the level of independence that can be achieved in adulthood.

Strategies That Support Learning Style, Developmental Framework, and Self-Determination

Not all intervention strategies are equally effective with all individuals with whom they are implemented. Careful assessment of the needs, strengths, and preferences of an individual with ASD, along with his or her family and other caregivers, may assist in determining strategies to promote better outcomes for the individual (Freeman, 1997; Quill, 1997; Rogers, 1998). Taking an individualized approach implies that broader intervention programs should be considered in terms of their different components, both content and strategies, to evaluate the "goodness of fit" between each component and the individual's specific developmental profile, interests, and learning style, as well as family characteristics and preferences (Rogers, 1998). This section will summarize evidence-based strategies that capitalize on some of the relative strengths of many individuals with ASD, that compensate for relative weaknesses, and that have demonstrated efficacy for promoting social communication; language, literacy, and related cognitive behaviors; and behavioral and emotional regulation. The evidence for each of these strategies comes primarily from single-subject design studies; for each of the strategies included here, the efficacy has been supported by the results of at least two empirical studies published in peer-reviewed journals using the NRC evaluation criteria.

Many individuals with ASD show relative strengths in skills involving visuospatial processing (e.g., Harris, Handleman, & Burton, 1990; Lincoln, Courchesne, Kilman, Elmasian, & Allen, 1988; Minshew, Goldstein, & Siegel, 1997; Mitchell & Ropar, 2004). Other relative strengths include sustained attention; gestalt, simultaneous, and rule-based information processing; associative and recognition memory, and cued recall; and graphic symbol comprehension. Corresponding relative weaknesses include shifting attention; sequential, analytical, and abstract information processing; complex encoding in memory and free recall from memory; and oral language comprehension (Quill, 1997). Other characteristics that have been considered in the development and selection of intervention strategies are the intense, sometimes idiosyncratic, interests that individuals with ASD may have in particular objects or activities, coupled with a narrower range of interests than individuals without ASD typically have. Individuals with ASD also face challenges in generalizing social communication and other newly learned behaviors to other stimuli, settings, and partners who were not involved in the initial teaching.

The following strategies have been developed to take advantage of the relative strengths seen in many individuals with ASD and/or to compensate for relative weaknesses:

- environmental arrangements and structure
- picture schedules and other visual supports

- written scripts and social stories
- video modeling
- computerized instruction
- previewing of learning context and activity
- strategies to promote generalization
- strategies to promote self-determination

Environmental arrangements and structure. Environmental arrangements to promote social communication initiation and development have been included as one component of a number of interventions, although these strategies have not been evaluated as separate intervention ingredients (Hwang & Hughes, 2000b). Several studies including environmental arrangements and structure have reported positive effects on social communication behaviors during both training phases as well as in generalization to other stimuli, partners, or situations (Charlop et al., 1985; Hwang & Hughes, 2000a; Matson, Sevin, Box, Frances, & Sevin, 1993; Matson, Sevin, Fridley, & Love, 1990). Environmental arrangements include strategies such as using materials that are preferred by the individuals with ASD, placing preferred materials out of reach, and creating unexpected "problems" such as removing some essential, familiar part of the material. In addition, environmental arrangements can include designing spaces within classrooms or other settings to provide visual clarity regarding the activity that occurs in that space (Panerai, Ferrante, & Zingale, 2002). Environmental arrangements address the characteristics that individuals with ASD often exhibit with respect to interests and motivation, and thereby provide contexts for communication behaviors that will be meaningful to the person with ASD (Hwang & Hughes, 2000a; R. L. Koegel, Koegel, & McNerney, 2001). In addition, the use of visually structured spaces associated with specific activities takes advantage of strengths in associative memory and cued recall (Rogers, 1998).

Picture schedules and other visual supports. Picture schedules have been used successfully to promote engagement and completion of activities for both lower functioning (MacDuff, Krantz, & McClanahan, 1993) and higher functioning (Bryan & Gast, 2000) individuals with ASD, with demonstrated generalization of picture schedule used for activities other than the ones originally trained. Picture sequences can be used both to support an individual through a daily schedule of activities that may change somewhat from day to day and to illustrate a sequence of steps that need to be completed within a single activity. Visual cues also have been used to support individuals with ASD in making choices, which is associated with more engagement in activities; for instance, Watanabe and Sturmey (2003) provided a written list of possible activities to adults with autism and had them complete their own schedules for the daily activities, whereas Reinhartsen, Garfinkle, and Wolery (2002) provided toddlers with autism play choices by visually presenting two toys. In addition, visual cues have been incorporated into intervention plans aimed at increasing social communication initiations of individuals with ASD, with demonstrated efficacy. Visual cues also have been used to support specific social communication requests by children with ASD to join in play with peers (Johnston, Nelson, Evans, & Palazolo, 2003). These types of visual cues are consistent with a pattern of relative strengths in visuospatial, gestalt, and rule-based processing, cued memory recall, and comprehension of graphic symbols (e.g., Bryan & Gast, 2000; Charlop-Christy, Carpenter, Le, LeBlanc, & Kellet, 2002; Ganz & Simpson, 2004; Johnston et al., 2003).

Written scripts and social stories. Written scripts have been used to help readers with ASD initiate social verbal communication and engage in conversational exchanges with partners (Charlop-Christy & Kelso, 2003; Krantz & McClannahan, 1993, 1998; Sarokoff, Taylor, & Poulson, 2001). The participants in these interventions were provided with cue cards or more extensive written scripts and were prompted as needed to read the appropriate line of text. Across the intervention studies, participants typically learned the scripts quickly and were then able to engage in the scripted behaviors without the written cues. More importantly, the implementation of script interventions was associated, in various studies, with an increase in unscripted comments, generalization to new partners, settings, and topics, and maintenance of skills across time. As a "low-tech" strategy, the use of printed scripts for children with ASD who can read can be adapted easily to the individual student's interests and implemented in a variety of social situations (Charlop-Christy & Kelso, 2003).

Social stories also have been used with individuals with ASD to provide scripts for appropriate behaviors and social skills. Beyond providing a script or directive statements about appropriate behaviors, however, social stories have other components as well. These include descriptions of the setting and typical characteristics of the setting to help the individual identify the relevance of the story to his or her experiences, relevant cues that the individual can learn to attend to in challenging situations, and statements describing the thoughts, feelings, and behaviors of other people (C. A. Gray, 1995). As Barry and Burlew (2004) point out, the methods of using social stories also are important as they involve empirically supported instructional components for individuals with ASD and other disabilities, including repetition,

priming, opportunities to practice, and corrective feedback. Although the originator of social stories did not specify the inclusion of pictures in the stories (C. A. Gray, 1995), in most of the available research, printed text was supplemented with picture icons or photographs (e.g., Barry & Burlew, 2004; Ivey, Heflin, & Alberto, 2004). Social stories have demonstrated effectiveness in decreasing inappropriate behaviors such as tantrums, aggression, and inappropriate sounds (e.g., Kuoch & Mirenda, 2003; Kuttler, Miles, & Carson, 1999) and in increasing prosocial behaviors such as participation in novel events, independent choice making, and greater duration of appropriate play (Barry & Burlew, 2004; Ivey et al., 2004).

A small body of research exists on the use of thought bubbles with individuals with ASD. This offshoot from social stories uses cartoon-type bubbles to represent the content of people's minds as a strategy to help individuals with ASD compensate for their difficulties in understanding the thoughts and feelings of others (C. A. Gray, 1998). Thought bubbles have improved the performance of individuals with ASD on false-belief and other related tasks involving theory of mind capabilities, including transfer of improved understanding to untrained tasks (S. Kerr & Durkin, 2004; Parsons & Mitchell, 1999; Wellman et al., 2002). Thus far, however, evidence is not available to document improvements in everyday social interaction skills following interventions with thought bubble cartoons.

Video modeling. Providing models via videotape has been used successfully to promote conversational skills; comments about play, play behaviors and social initiations; and other individually targeted behaviors (Charlop & Milstein, 1989; Charlop-Christy, Le, & Freeman, 2000; Nikopoulous & Keenan, 2004; Taylor, Levin, & Jasper, 1999). One study directly compared video modeling to live modeling and found that the video modeling resulted in faster improvements in the targeted behaviors across 5 different children with ASD (Charlop-Christy et al., 2000). In addition, video modeling was associated with generalization of skills, whereas the live modeling in their study was not. The researchers of this study suggested that video modeling may be effective in helping to compensate for the tendency of individuals with ASD to overselect and attend to stimuli that are not necessarily relevant for learning targeted instructional behavior, because in video modeling the camera can zoom in on the critical aspects of the situation; in addition, the researchers suggest that watching video models is intrinsically motivating for many individuals with ASD in a way that live models are

not, perhaps due to their ability to relate better to objects than to people.

Computerized instruction. Computerized instruction also has generated some research investigations of its utility for improving language and social communication abilities of individuals with autism. It has been beneficial in teaching sentence structure (with generalization of vocal and written responses to untrained stimuli; Yamamoto & Miya, 1999), vocal imitation (Bernard-Opitz, Sriram, & Sapuan, 1999), social problem solving (Bernard-Opitz, Sriram, & Nakhoda-Sapuan, 2001), vocabulary (Bosseler & Massaro, 2003; Moore & Calvert, 2000), and increasing the use of communication initiations and relevant speech (Hetzroni & Tannous, 2004). In investigations of vocabulary and increasing communication initiation and relevant speech, the computerized instruction was found to carry over to naturalistic interactions (Bosseler & Massaro, 2003; Hetzroni & Tannous, 2004). Moore and Calvert (2000) found that computerized instruction of vocabulary resulted in more rapid acquisition than teacher instruction, possibly due to the nonsocial nature of the computer or to the ability of computerized instruction to focus the student's attention on the salient cues. A comparison of personal instruction versus computerized instruction to facilitate vocal imitation yielded similar results (Bernard-Opitz et al., 1999).

Previewing of learning context and activity. Another strategy that is consistent with the learning styles of many individuals with ASD is the use of priming or previewing upcoming events or tasks. L. K. Koegel, Koegel, Frea, and Green-Hopkins (2003) investigated the efficacy of having a "primer" (the student's parent or another individual outside of the classroom) spend approximately 1 hour previewing the subsequent day's academic lessons with 2 students with ASD. Priming was associated with more appropriate behavior and more correct behavior than when a comparable amount of time was spent outside of class on an assignment that was not a preview of the coming lesson. Other intervention strategies described above also have been used for priming, including picture or written schedules and social stories.

Strategies to promote generalization. A variety of strategies promotes better generalization of learning, language, and other social communication behaviors to naturalistic settings (NRC, 2001; Schreibman, 2000). These include the involvement of parents and other caregivers in intervention planning and implementation, as well as the use of naturalistic approaches in teaching (e.g., natural settings, natural reinforcers, and capitalizing on child interests and child-initiated behaviors as the bases for intervention activities).

These strategies are important to help individuals with ASD compensate for relatively weak skills in analytical and abstract information processing, which limit their ability to understand the application of skills, particularly complex social communication skills, in new situations.

Strategies to promote self-determination. Self-determination is "living one's life consistent with one's own values, preferences, strengths, and needs" (Turnbull et al., in press). Self-determination is highly valued in our society. All persons, including individuals with ASD, deserve the ability to have control over their lives and to advocate for the quality of life they desire.

In children without disabilities, the school system tacitly fosters self-determination through teaching prerequisite skills for technical careers or further education, providing increased opportunities for decision making, and expecting students to assume more personal responsibility as they grow older (Westling & Fox, 2000). Unfortunately, self-determination has traditionally been overlooked for children with disabilities or postponed until adulthood (Bannerman, Sheldon, Sherman, & Harchik, 1990). It is now widely recognized that self-determination should be explicitly addressed from an early age.

Regrettably, many individuals with ASD seem to have been taught to depend on others (Wehmeyer & Shogren, in press). Wehmeyer and Shogren point out that even when self-determination is addressed, because of their differences in communication and social interaction, individuals with ASD may be "at risk for simply learning the component skills of self-determination, and practicing them in a rote manner, without fully understanding the application to their lives."

As self-determination emerges across the life span, SLPs can incorporate a variety of strategies to make sure that choice and self-advocacy are inherent in the lives of persons with ASD. First and foremost, being able to make one's own decisions is greatly affected by one's ability to communicate with others (Baker, Horner, Sappington, & Ard, 2000). Teaching communication skills supports the development of self-determination. In turn, strategies that lead to self-determination can be incorporated into communication interventions, as well as daily activities across the life span. Communication interventions that support self-determination include (a) providing choices that are meaningful and that honor preferences (Frea et al., 2001; Reinhartsen et al., 2002), (b) teaching and honoring the ability to end and refuse activities, and (c) teaching social problem solving so that self-determination skills taught are not applied rotely (Wehmeyer & Shogren, in press).

AAC

A wide range of AAC approaches is often used in order to improve the social and communication competence of individuals with ASD. Unaided AAC approaches include, but are not limited to, the use of gestures, sign language, and facial expressions. Aided AAC approaches include, but are not limited to, the use of tools such as pictures, graphic symbols, or written cues and the use of tools such as SGDs. A recent meta-analysis of studies examining the efficacy of AAC indicated that the majority of AAC interventions were either highly or fairly effective in terms of behavior change and generalization (Schlosser & Lee, 2000), suggesting that a strong level of evidence exists for these approaches (ASHA, 2004c, 2005; Mirenda, 2003). Nevertheless, the available literature does not predict yet which forms of AAC will be most effective for a specific individual, particularly with respect to individuals with ASD (NRC, 2001). Thus, clinical decisions about unaided AAC techniques and aided AAC techniques should be made on an individual basis by examining the quality and relevance of evidence available and using principles of evidence-based practice. Considerations might include the individual's learning strengths and weaknesses, his or her developmental level of social communication skills, and his or her motor abilities. In addition, the contexts in which AAC approaches might be embedded, potential communication partners, and family preferences should be considered, as the potential impact on quality of life should be of paramount importance.

The use of both unaided and aided AAC approaches with individuals with ASD has been associated with (a) improvements in behavior and emotional regulation (Frea et al., 2001); (b) improvements in speech, expressive language, and social communication (Garrison-Harrell et al., 1997; Light, Roberts, DiMarco, & Greiner, 1998; Mirenda, 2003; Schlosser, 2003); and (c) improvements in receptive language development and comprehension (Brady, 2000; Peterson, Bondy, Vincent, & Finnegan, 1995). Although consumers often raise concerns as to whether the implementation of AAC approaches interferes with or inhibits the development of speech, there is no evidence to support this notion (Mirenda, 2001, 2003; NRC, 2001). Thus, AAC approaches can be useful components of a comprehensive educational program designed to promote social communication, language, literacy, and related cognitive behaviors, and behavior and emotional regulation (NRC, 2001). The following three sections summarize

evidence for the broad applications of AAC for individuals with ASD.

The positive impact of AAC on behavior and emotional regulation. Decreased rates of severe problem behaviors are associated with the implementation of AAC (Frea et al., 2001; Wendt, Schlosser, & Lloyd, 2004). In addition to the use of gestures and manual signs, the use of symbol systems, particularly those with static visual representations such as picture and written communication supports, enhances the efficiency of word recall and spontaneous communication (Ganz & Simpson, 2004). Therefore, when these supports are available to serve the same function as a problem behavior (e.g., aggression, crying, screaming), individuals with ASD have access to a simple and efficient tool to communicate through more appropriate means (Mirenda, 1997; Wendt et al., 2004). Additionally, by capitalizing on the common learning style preference for static visual information, many AAC approaches alleviate processing challenges caused by information presented through the auditory modality, which is more "fleeting" in nature (e.g., oral directions, nonverbal social cues). These supports may include the use of between-task schedules, within-task schedules, first/then boards, and social stories. When available, an individual with ASD is likely to have more access to information that denotes the social expectations of a given activity and the need for transitions between activities, allowing for greater self-organization and emotional regulation (Shane & Simmons, 2001).

The positive impact of AAC on speech, expressive language, and social communication. Although there are a significant number of children with ASD with limited functional speech who are ideal candidates for AAC systems, AAC approaches also have shown utility with individuals who are developing speech, supplementing existing speech, or using verbal language as a primary mode of communication. As noted earlier, there is no evidence that either unaided or aided AAC approaches interfere with speech and language development in individuals with ASD (Mirenda, 2003; NRC, 2001). In fact, the available evidence suggests that there is a range of AAC approaches that enhance the use of speech, lead to improvements in expressive language, and foster increased bids for social interaction (Schlosser, 2003). Thus, consideration of the use of AAC, paired with systematic efforts to enhance speech development, should be made on an individualized basis to support improvements in these areas.

With respect to unaided approaches such as the use of speech paired with sign language (i.e., total communication), research has indicated that this AAC approach results in more efficient and broad

receptive and/or expressive vocabulary acquisition than targeting speech alone for many children with autism (Barrera, Lobatos-Barrera, & Sulzer-Azaroff, 1980; Barrera & Sulzer-Azaroff, 1983; Layton, 1988; Yoder & Layton, 1988). The NRC (2001) summarized the literature on the efficacy of sign language and concluded that (a) the use of manual signs enhances the use of speech for some children with ASD, (b) those children with good verbal imitation skills are more likely to acquire speech (with or without this AAC approach), and (c) those children who have difficulty with speech imitation are ideal candidates for AAC, as they are likely to make poor progress in speech acquisition without the use of AAC approaches.

Although individuals with ASD may benefit from learning manual signs when acquiring speech, it is uncommon for individuals with ASD to use this mode of communication to create more sophisticated and creative combinations of words and sentences (NRC, 2001). As a result of this limitation in treatment outcomes and the preference of individuals with ASD for static visual information, the use of aided AAC approaches has received considerable attention. There is a growing body of research on the use of the Picture Exchange Communication System (PECS) with individuals with autism (Bondy & Frost, 1994; Charlop-Christy, Carpenter, Le, LeBlanc, & Kellet, 2002; Ganz & Simpson, 2004; Kravits, Kamps, Kemmerer, & Potucek, 2002; Schwartz, Garfinkle, & Bauer, 1998; Tincani, 2004; Yoder & Stone, in press), demonstrating increased communication initiations associated with the PECS intervention. Furthermore, picture/graphic communication systems have been used successfully to increase functional and spontaneous requests in individuals with ASD (Mirenda & Santogrossi, 1985; Steibel, 1999), to increase requests for peer interaction (Johnston et al., 2003), and to engage in conversational exchanges with partners (Krantz & McClannahan, 1998). Although the use of SGDs has not been studied systematically, preliminary outcomes suggest that feedback through synthesized speech increases communication interactions (Schepis, Reid, Behrmann, & Sutton, 1998; Schlosser, 2003; Wendt et al., 2004).

The positive impact of AAC on receptive language development and comprehension. Individuals with ASD also have benefited from the use of AAC to augment language input from others, as this instructional strategy fosters receptive language development of comprehension (Brady, 2000; Light et al., 1998). Presenting more complex information such as the sequence of activities, the components of tasks, and the individual components of multiword utterances in a static visual format may alleviate the processing chal-

lenges posed by orally presented verbal language. Between-task schedules and within-task schedules, which were described above in relation to reducing problem behaviors, provide an individual with ASD with support in following symbolic representations of tasks and task components more independently (Hall, McClannahan, & Krantz, 1995; Pierce & Schreibman, 1994), while aided language stimulation (i.e., pairing spoken language with visually depicted language) and video-based instruction may foster increased utterance length and comprehension across settings (Charlop & Milstein, 1989; NRC, 2001).

Play and Peer Mediation

While the pervasive social isolation often experienced by individuals with ASD argues against the continued reliance on isolate settings in the provision of treatment, ASHA survey data (2004c) suggest that "pull-out services" remain the most common mode of intervention in the schools. Nevertheless, inclusion of communication partners is essential in order to minimize social isolation and boost communication competence. Peers are primary candidates for such inclusion, particularly when children with ASD are served in integrated or inclusive settings. Without intervention, children with ASD are even less likely to initiate communication with peers than with adults. Moreover, since interactions with peers and participation in peer culture become more critical over time (Hartup, 1979), children with ASD may become increasingly isolated without specific interventions to counteract such developmental trends (for a more detailed overview, see Wolfberg & Schuler, in press).

The inclusion of communication partners in intervention efforts not only serves to decrease isolation, it also increases treatment intensity and, most importantly, makes the intervention more responsive to the core features of ASD. The fact that the prevailing lack of reciprocal interaction may well be the most defining characteristic of individuals with ASD serves to underscore how important it is that the child's communication partners are included in intervention efforts. Finally, inclusion of peers and other communication partners provides an antidote to the commonly reported generalization problems. Often communication gains made with a particular interventionist are demonstrated only in the presence of that particular individual and only in the settings where training took place. Therefore, a model of service delivery that targets the communication responsiveness and active engagement of communication partners is critical to success (for a further discussion of these issues, see the following section).

Despite the apparent benefits, the use of peers as intervention agents is not common practice. A number of factors have hampered peer involvement. First of all, the common belief that so-called readiness skills need to be demonstrated prior to the provision of peer access means limited opportunities for peer interactions. But, as discussed by Strain (2001) and documented by Strain and Kohler (1998) in their review of 80 case histories, accumulating evidence of successful peer interaction without the prior demonstration of such readiness skills has contradicted such claims.

Another related obstacle to supported peer interactions lies in the common belief that the perspective-taking capabilities of young children limit their ability to be successful communication partners. While the effectiveness of such partners for children with ASD remains to be investigated systematically, evidence from various different peer-mediated interventions suggests that the competencies of typically developing peers exceed common expectations (Goldstein & Cisar, 1992; Guralnick, 1990, 1994; Guralnick & Neville, 1997; Strain & Kohler, 1998) when support structures are put in place (for a more extensive overview and discussion of such evidence, see Wolfberg & Schuler, in press). Moreover, specific inquiry into the perspective-taking skills of typically developing children has documented that they are able to adapt their communication style and language use based on their perceptions of the linguistic and cognitive status of children with whom they are interacting (see, e.g., Goldstein, Kaczmarek, Pennington, & Schafer, 1992).

The first accounts of the successful use of peers appeared in the late 1970s, documenting their use primarily as trained tutors, role models, and initiators of interactions (Guralnick, 1976; Strain, 1977; Strain, Kerr, & Ragland, 1979). Odom and Strain (1984) further documented peer-mediated approaches, with typically developing peers being trained, prompted, and reinforced by adults to increase the social initiations and responses of children with autism. Although these early studies resulted in increased frequency and duration of social interaction, critics pointed out that improvements did not generalize beyond the peer tutor (Lord & Hopkins, 1986) and that interventions did not correspond to contexts in which social behavior would naturally occur (Lord, 1984).

Besides providing specific reinforcement and more general feedback, peers have proven to be effective role models to boost communication and language skills through the use of incidental teaching, peer-based script training for language acquisition, and small-group individualized instruction. For in-

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stance, Charlop and Milstein (1989) showed video-tapes of peers engaging in three turn conversations to teach scripted interactions of varying length and complexity to children with ASD. Goldstein et al. (1992) successfully taught typically developing peers to comment and respond to peers with ASD in a play context. While the children with ASD demonstrated increased social communication interactions, the interactions were reported to be mostly responses rather than initiations, and the peers needed continued prompting to act as facilitators, providing only limited evidence of generalization.

Extensions of these earlier approaches include a dual focus on training the typical peers and the children with autism to increase interactive play (Haring & Lovinger, 1989; Oke & Schreibman, 1990). Self-monitoring has been used to increase play interactions between children with ASD and their typically developing peers (e.g., Sainato, Goldstein, & Strain, 1992; Shearer, Kohler, Buchan, & McCullough, 1996). In vivo and video modeling has also been used to increase play with peers and siblings (Taylor et al., 1999). Interventions are also more commonly being carried out in inclusive settings where play with typically developing peers naturally occurs (e.g., preschool settings; see, e.g., Pierce & Schreibman, 1997; Roeyers, 1996; Strain & Kohler, 1998). Further, there is more of an emphasis on supporting the children in play activities that are common among typically developing children. For instance, Goldstein and Cisar (1992) used modeling, prompting, and reinforcement procedures to train triads, consisting of 1 child with autism and 2 typically developing peers, to act out specific turns in sociodramatic play scripts. Thiemann and Goldstein (2004) found that teaching typically developing peers to use specific social interactive strategies led to better initiation and responding for 4 of 5 elementary-age students with ASD. Interestingly, the addition of written cues prompting social communicative behaviors for the students with ASD resulted in even further improvements in the communicative functions expressed by the children with ASD who had already shown positive changes during the peer training phase of the study and also resulted in improvements in social communication behaviors for the fifth child. Social validity data collected in conjunction with this study suggested the changes in the children with ASD resulted in improved social skills in the classroom (as observed by teachers) and greater social acceptance and higher friendship ratings among their classroom peers.

Although these types of adult-directed practices involving peer-mediated play are documented to be effective, it is well established that there is a heavy reliance on explicit and precise adult control to effectively deliver the intervention (NRC, 2001). This type of adult-imposed structure defies the inherent qualities of children's play as intrinsically motivated, governing a self-imposed structure. Drawing from general developmental knowledge and insights, a number of investigators have reported the use of naturalistic approaches whereby children with ASD had repeated exposure to familiar peers and their play activities with minimal adult support (e.g., Lord & Hopkins, 1986; McHale, 1983). These more child-centered interventions have yielded both quantitative and qualitative improvements in the social interaction, language, and play of the children with ASD. Moreover, systematic comparisons of low versus high levels of adult intrusion on children's spontaneous play (Meyer et al., 1987) have propelled a trend toward less adult-imposed structure consistent with more child-centered practices. Subsequent efforts have included peers in a wider variety of roles and in a more reciprocal fashion, closer aligned with the core challenges experienced by individuals with ASD and their communication partners. Moreover, a further examination of current literature, including behavioral as well as developmental, affective, and ecological sources, reveals some common themes and trends (see Wolfberg & Schuler, in press). For instance, there is a growing recognition of the inherent value of more naturalistic approaches to support children with ASD in play.

Play interventions are increasingly taking place in natural settings with more involvement of typically developing peers. Many interventions share a focus on identifying and responding to what is intrinsically motivating for the child. Similarly, there is a greater acknowledgment of individual differences among children, as early intervention programs incorporate strategies that are tailored to each child's developmental level and style of learning. Finally, more blended approaches and practices are observed, as opposed to a strict adherence to a particular paradigm, method, or specific skill. To arrive at a broader conceptual foundation that can incorporate complementary perspectives and help guide practitioners in deciding which techniques and training contexts to use, a closer understanding is needed of the different layers and configurations of support that invite play. In doing so, it is important to realize that a sole focus on single contributions may not be productive; all these components may be better combined into a more powerful multidimensional approach. Thus, to provide children with ASD sufficient and contextually relevant support, all of the factors known to affect play (both from a developmental and sociocultural perspective) must be carefully weighed and

considered when designing a comprehensive peer play intervention.

While multilayered interventions have much intuitive appeal, as they seem to draw from all available resources, they do complicate research efforts designed to compare the relative effectiveness of different components and teaching methods (for a more in-depth discussion of such complications, see Goldstein, 2002). Moreover, advances in play are more difficult to operationalize and to quantify than specific interventions and outcomes, such as the type and frequency of reinforcements provided to peers or the physical proximity of the participating children.

By separating the social interactive components from the cognitive/representational dimensions of play, Wolfberg and Schuler (1993) managed to operationalize play, documenting the positive impact of "integrated play" experiences quantitatively through a multiple-baseline design as well as qualitatively through parent interviews. In an effort to have children with ASD take turns in dramatic play, typically developing peers were taught to scaffold play. Coached by adults, peers learned to initiate play interactions, model play behaviors, and even more importantly acknowledge even the most erratic play initiations of their peers with ASD, learning to cue into their often unusual forms of communication. The watchful layout of play space, the prudent structuring of and the ritualization of play events, and the careful selection of toys and other play materials provided additional levels of structure. While the presented data clearly speak to the effectiveness of the integrated playgroups, it is difficult to evaluate which components are most effective for whom, and what additional supports might have to be presented. Studies such as the one carried out by Kok, Kong, and Bernard-Opitz (2002) may be useful to investigate such questions. This study compared more tightly adult-structured and looser facilitated peer play in children with ASD and found communication and play increased with both techniques; however, the facilitated approach was more effective in eliciting spontaneous communication and play in children with more advanced skills.

Using combinations of quantitative and qualitative methods of inquiry, further positive impacts of integrated play on social communication, and more specifically symbolic development, have been explored and documented by Schuler and Wolfberg (2000), Wolfberg (1999), Yang, Wolfberg, Wu, and Hwu (2003), and Zercher, Hunt, Schuler, and Webster (2001). Highlighting the inherent opportunities for joint attention, affect, and action, the importance of dramatic play to boost communication and symbolic

development was reviewed by Schuler (2003) and illustrated through case examples. More specifically, the latter served to demonstrate how participation in adult-mediated and peer-facilitated play helps the participating children to engage in longer interaction cycles, extending beyond mere instrumental language functions, such as requests and protests that typically characterize the communicative interactions of individuals with ASD. While supported peer play promises to be a powerful tool to diversify communication repertoires, more research is needed to investigate such claims. The participation of SLPs in such research efforts seems most important so that growth in social reciprocity and symbolic representation can be carefully documented.

Summary of Recommendations

SLPs should recognize the guidelines and active components of effective, evidence-based practice for individuals with ASD. They should draw on empirically supported approaches to meet specific needs of children with ASD and their families, thereby incorporating family preferences, cultural differences, and learning styles. SLPs should assist communication partners in recognizing the potential communicative functions of challenging behavior and designing environments to support positive behavior. SLPs should recognize the importance of family involvement and working with a variety of partners, the facilitation of peer-mediated learning, the continuity of services across environments, and the importance of matching service delivery to meaningful outcomes.

Service Delivery Models and the Collaborative Role of the SLP

There is little research on speech-language pathology service delivery models for individuals with ASD. However, current recommended practice suggests a move from exclusive use of the traditional model of individual pull-out services for individuals with ASD to a more flexible service delivery model (ASHA, 2003b; NRC, 2001). The search for more effective treatment practices and service delivery options along with the increased incidence of ASD may stimulate the examination of new models of service delivery that better address the specific challenges of ASD. The type of service delivery selected should be flexible and dynamic, adapting to changing needs, preferences, and priorities of the individual with ASD and his or her family. All service delivery options should be sensitive to culture, language, and resources and reflect a partnership with families.

There are many variables involved in service delivery. First of all, interventions vary according to

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whether the SLP directly works with the student or adult or serves them indirectly by collaborating with their communication partners. Second, interventions vary according to their location, that is, whether they are being delivered in home, clinic, school, or community settings. Third, interventions vary as a reflection of the extent to which the SLP or client operates in social isolation. Fourth, interventions vary in the intensity or frequency of the services.

Direct service provision in a separate treatment room, the most prevalent model of service provision (ASHA, 1993, 1995, 1999, 2004c), includes individual or small-group face-to-face intervention sessions and evaluations as well as providing services to children in the classroom. The pull-out model of service delivery continues to be the most used model for preschool and school-age children (ASHA, 2004c; Paul-Brown & Caperton, 2001). This model focuses on the teaching of discrete skills with little contextual support. For individuals with ASD, exclusive provision of services through pull-out services does not address the underlying challenge of social communication inherent in the disorder, the issues of generalization, functional outcomes, or the importance of collaborating with significant communication partners.

Contextually referenced and ecologically based services are essential to support the communication and social growth and development of persons with ASD (Strain, 2001). Service delivery models that are more contextually referenced and ecologically based include home-, classroom-, or community-based services and collaborative consultation models (Paul-Brown & Caperton, 2001). These models focus on services in natural learning environments and include education and training of family members, teachers, peers, and other professionals. By augmenting or supplanting pull-out services with services in everyday contexts, the SLP can involve important communication partners to ensure understanding of the nature of communication in ASD and to provide the intensive intervention needed (NRC, 2001). Within home/classroom/community service delivery modes, the SLP may provide direct service, design and maintain augmentative systems and/or other visual supports, adapt curricular materials, and collaborate with and train significant communication partners to support communication in all environments (ASHA, 2003b). Recognizing the importance of supported social interactions, repeated, planned teaching opportunities, and a focus on functional outcomes, service delivery models that provide relevant contextual support and include collaboration with significant communication partners are imperative across the life span.

While services for children are often the focus of SLPs, supports for adolescents, young adults, and their families in planning the transition to adulthood are less available (Smith & Donnelly, 1998). Speech-language services for adolescents and young adults preparing for adulthood are important to their success in functioning during activities of daily living. Community and home-based service delivery models also are relevant for persons with ASD transitioning to independent living and working.

Research on children with ASD suggests that the greatest effects of any direct treatment are reflected in the generalization of learning achieved by working with parents and classroom personnel (NRC, 2001). There is no evidence supporting the long-term effectiveness of individual therapies implemented infrequently (e.g., once or twice a week), unless the strategies are taught to be used regularly by communication partners in the natural environment. Skill development may begin in individual treatment, but the intensity of treatment will affect outcomes, and generalization of gains must be planned and monitored. The impact of speech-language services on language outcomes for individuals with ASD has not been systematically investigated. However, Stone and Yoder (2001) found a strong positive association between the number of hours of speech therapy and the participant's language skills at age 4.

Summary of Recommendations

The broad impact of the social communication challenges and problems with generalization for individuals with ASD necessitates service delivery models that contribute to intensive services and lead to increased active engagement in the natural environment. SLPs should provide services in natural learning environments that are connected with functional and meaningful outcomes and only provide pull-out services when repeated opportunities do not occur in the natural environment or to work on functional skills in more focused environments. Because of the limited impact of pull-out services focused on discrete skills, SLPs should ensure that any pull-out services are tied to meaningful, functional outcomes and incorporate activities that relate to the natural environment. SLPs also play an important role as advocates for individuals with ASD in promoting social communication skills that lead to greater independence in home, school, work, and community environments and greater participation in social networks.

Professional Development of SLPs to Work Effectively With the Population of ASD

The recent NRC report (NRC, 2001) reviewed overall needs related to personnel preparation to work with individuals with ASD. The conclusions of the NRC report are applicable to the preparation of SLPs to work effectively with this population. The NRC report emphasized the need to develop and support infrastructures for professionals working with this population, such that qualified service providers continually flow into the system. Infrastructures are needed to support direct service providers in the following ways: (a) to work as part of a support system team; (b) to be part of a communication network that links them to other professionals who may be encountering similar challenges; (c) to have ongoing access to technical support; and (d) to participate in and benefit from applied research, program evaluation, organized data systems, and comprehensive planning for services to this population.

The U.S. Department of Education, Office of Special Education Programs, regularly provides grant support for personnel preparation for school settings (U.S. Department of Education, 2004). The funded projects have included a number that involve the preparation of SLPs to work with children with ASD. The specific personnel preparation plan varies from project to project; however, the projects generally involve a combination of academic course work related to autism and specialized practicum experiences with individuals with autism. Features of some of the projects have included interdisciplinary training to prepare SLPs to work as part of a team, ongoing interactions with families of individuals with ASD, preparation in AAC strategies, recruitment from underrepresented groups, preparation to work with multicultural populations, use of distance education, and the preparation and dissemination of evidence-based practice materials for in-service personnel development. To date, however, published descriptions and program evaluations of these projects to prepare SLPs to work more effectively with individuals with ASD are not available to help guide other programs interested in improving the preparation of SLPs in this area.

Summary of Recommendations

SLPs should collaborate with families, individuals with ASD, other professionals, support personnel, peers, and other invested parties to identify priorities and build consensus on a service plan and functional outcomes. They should participate in preservice and continuing education designed to prepare and en-hance the knowledge and skills of professionals who provide services for individuals with ASD. Furthermore, they should be informed of current research and/or participate in and advance the knowledge base of the nature of the disability, screening, diagnosis, prognostic indicators, assessment, treatment, and service delivery of individuals with ASD.

Consideration of Risks and Benefits of Intervention for Individuals With ASD

Autism is a very challenging disability for families, schools, and society because it is often associated with severe communication and behavior problems. In this and previous generations, most individuals with ASD required special education at school age. The average annual cost for educating a child with ASD, based on 2005 figures from the U.S. Government Accountability Office, is $18,800, compared with $12,500 for the average special education student and $6,556 for the typical regular education student. Thus, the cost for educating a student with ASD is far more than that of most students in special or regular education. Intensive, appropriate early intervention during preschool has the potential to greatly reduce the cost of special education since about half of the children studied have been able to be included into regular education at kindergarten (NRC, 2001). Furthermore, the number of hours of speech-language therapy in preschoolers with ASD was a significant predictor of spoken language 2 years later (Stone & Yoder, 2001). The committee recognizes that there are potential systemic, organizational, and financial barriers in implementing the recommendations made in these guidelines. However, investing in improved early detection of ASD and early intervention services will lead to cost savings later in life. Appropriate intervention services for school-age individuals with ASD that lead to meaningful changes in social communication skills can enhance independence in adulthood and impact on quality of life. Throughout the life span of the individual with ASD, effective interventions offer potential benefits to families by alleviating some of the stress family members experience related to having a family member with ASD. Because the cost of individual speech-language therapy may be prohibitive, the recommendations in these guidelines emphasize targeting the communication partner within the natural environment in order to maximize the impact of services by building capacity of the family, classroom teacher, school system, and potential job placements and minimize the amount of professional time.

Although there are no known risks associated with recommended practices for speech-language

pathology or other educational services for students with ASD that have been delineated in these guidelines, lack of appropriate services may have grave consequences on outcomes. The use of ineffective intervention practices or practices that have not been validated or lack evidence can be very costly for families and institutional systems in terms of wasted time and money. In addition, families' emotional burdens may be increased when the family member with ASD does not show improvement and has missed opportunities to benefit from effective practices. Hence, time and/or money lost to ineffective or invalidated practices cannot be recouped, and the quality of life for the individual with ASD and the family and surrounding community members may be diminished.

The SLP's role is critical as a team member in supporting the individual, the environment, and the communication partner to maximize opportunities for interaction. This must be done to overcome barriers that would lead to ever decreasing opportunities and social isolation if left unmitigated. SLPs also play an important role in promoting social communication skills that lead to greater independence in home, school, work, and community environments and greater participation in social networks. Thus, the benefits of appropriate, educational services, including speech-language pathology services, for individuals with ASD may have a combination of benefits to the quality of life of the individual and family as well as cost savings for society.

Directions of Future Research Related to Individuals With ASD

SLPs should seek to stay informed about current research and/or participate in research to advance the knowledge base, enhancing the quality of professional practice. Ongoing research should deepen our understanding of the nature of ASD, of prognostic indicators, and long-term outcomes, and it should fine-tune procedures and protocols used for screening, diagnosis, assessment, and treatment, as well as models of service delivery for the population of concern. The NRC (2001) made the following recommendations for future research to enhance our overall knowledge of ASD: (a) Funding agencies and journals should require minimum standards in design and description of participants and intervention programs; (b) to improve child outcomes, better instruments for diagnosis and early screening of ASD should be developed; and (c) to help educators make informed decisions about selecting appropriate treatment methods for particular children, treatment studies should use more precise, ecologically valid outcome measures, define appropriate targets in-

formed by typical development, and measure the effects of the interactions between family variables and child factors on intervention outcomes as they pertain to different treatment approaches.

Given that the core features of ASD revolve around social communication and language use, the field of speech-language pathology should take a more prominent role in future research of ASD. Many questions regarding speech production, auditory perception, feeding issues, AAC, and language acquisition and loss in individuals with ASD remain unanswered. Future research should devote more attention to the needs of culturally and linguistically diverse populations who have family members with ASD. The expertise of SLPs with regard to early communication development and the overall acquisition of language and literacy skills holds much promise in this regard. More precise documentation of the development of particular communication profiles over time in relation to particular interventions, educational experiences, and home environments should help SLPs become more skilled in prognosis and the evaluation and fine-tuning of treatment variables. Investigations designed to compare the effectiveness of specific interventions aimed at promoting speech production with interventions targeting broader social communication skills and to identify variables that predict response to treatment would help determine whether particular children or subgroups of children with ASD would benefit in different ways from different intervention strategies. By being more knowledgeable and better informed, SLPs should be better equipped to help parents cope with the uncertainties and challenges of ASD and to guide and support them in their decision making.

Ultimately, SLPs need to know at which point to implement what type of intervention strategy, where, for how long, and by who, and, last but not least, how to evaluate outcomes and make treatment modifications. No matter which interventions are recommended, designed, and/or implemented, a stronger research agenda is needed. Only careful observation and systematic analysis will lead to the level of professional sophistication, allowing SLPs to help find the best matches between child and family characteristics, developmental levels, learning profiles, parental believes, cultural values, treatment philosophies, and strategies, as well as suitable research methods. The heterogeneity of the population of concern as well as its low incidence makes it particularly difficult to conduct relevant and meaningful research. To develop measures that are sensitive to changes in social communication and can be collected in a variety of intervention settings that cannot be rigidly controlled, qualitative methodologies (Miles &

Huberman, 1994) may need to be combined with quantitative methods, as recommended by Greene and Caracelli (1997) and described by Schwartz, Staub, Gallucci, and Peck (1995). Ultimately, the challenges encountered in serving this population may inspire practitioners to pose new pertinent clinical questions to be answered and develop alternative methods of inquiry. Future research promises not only to enhance the efficacy of speech-language pathology services but also to elucidate the enigma of ASD.

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Appendix

Ad Hoc Committee on Autism Spectrum Disorders

The following people served on the ASHA Ad Hoc Committee on Autism Spectrum Disorders. Credentials and affiliations are indicated for each committee member. Committee members were selected to serve on the committee because of their expertise in the area of ASD.

Amy M. Wetherby, PhD, CCC-SLP
Committee Chair
L. L. Schendel Professor of Communication Disorders
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Declaration of Competing Interest

All members of the Ad Hoc Committee on Autism Spectrum Disorders agreed to declare any interest or connections with any commercial programs or products discussed in the guidelines. No member had any paid consultancy or any other conflict of interest with any of the commercial programs or products described in this document.