Autism spectrum disorder (ASD) is one of the fastest growing developmental disabilities in the United States, occurring in 1 in 150 births. In 2006, approximately 194,000 students ranging from 6 through 21 years of age were identified as having ASD and were receiving special education services for it (U.S. Department of Education, 2006). This number has increased approximately 500% over the past decade (U.S. Government Accountability Office, 2005). Speech-language pathologists (SLPs) play an important role in the education, assessment, and treatment these students receive.

ASD is a lifelong developmental disorder characterized by core deficits in verbal and nonverbal communication, social skills, play skills, and behavior (American Psychiatric Association [APA], 2000). Many children with ASD exhibit distinctive behavior patterns such as hyperactivity, inattention, impulsivity, aggression, irritability, self-injury, obsessive compulsiveness, anxiety, and mood disorders. These behaviors often inhibit the children’s ability to participate in educational, social, and family activities.

The exact cause of ASD is unknown; however, the pathophysiology likely involves dysregulation of several key central nervous system (CNS) neurotransmitters including serotonin, dopamine, norepinephrine, glutamate, and gamma-aminobutyric acid, as well as several neuropeptides (McDougle, Erickson, & Posey, 2005). A variety of psychoactive medications’ mechanisms of action (how they work in the body) depend on regulation of one or more of these neurotransmitters. As a result, psychoactive medications have been prescribed to children with ASD to ameliorate disruptive behaviors associated with ASD such as hyperactivity, inattention, impulsivity, aggression, irritability, self-injury, obsessive-compulsiveness, anxiety, and mood disorders. The entire health care team, including SLPs, should be involved in monitoring children with ASD for efficacy, tolerability, and potential side effects when medications are prescribed.

**ABSTRACT:** Purpose: The purpose of this tutorial is to provide speech-language pathologists (SLPs) with general information regarding the most commonly prescribed medications for children with autism spectrum disorder (ASD; e.g., central nervous system stimulants, noradrenergic reuptake inhibitors, alpha-2 adrenergic agonists, antipsychotics, anticonvulsants, selective serotonin reuptake inhibitors, benzodiazepines) in regard to their mechanism of action, behaviors treated, and potential side effects.

**Method:** This clinical resource was compiled to support SLPs who need to understand the functions and effects of medications that have been prescribed to a child with ASD to whom they have or will be providing assessment and intervention services.

**Conclusions:** SLPs play an important role in the education, assessment, and treatment of children with ASD. Although there is no definitive cure for ASD, up to 70% of children with ASD are prescribed psychoactive medications to ameliorate disruptive behaviors associated with ASD such as hyperactivity, inattention, impulsivity, aggression, irritability, self-injury, obsessive-compulsiveness, anxiety, and mood disorders. The entire health care team, including SLPs, should be involved in monitoring children with ASD for efficacy, tolerability, and potential side effects when medications are prescribed.

**KEY WORDS:** autism spectrum disorder, medication, pharmacotherapy, behaviors, side effects
studied for their ability to ameliorate disruptive behaviors in children with ASD, thereby allowing nonpharmacological interventions to be more successful. Unfortunately, the research in this area is limited to a small number of trials, often with small sample sizes and methodological weaknesses that restrict meaningful conclusions regarding the medication’s efficacy (Matson & Dempsey, 2007). Consequently, well-delineated, nationally recognized practice guidelines do not exist to direct the pharmacological management of children with ASD.

Although conclusions regarding their efficacy are limited, there has been a substantial increase in the use of medications in this population, particularly in the United States (Matson & Dempsey, 2007). National Medicaid data from 2001 revealed that 56% of children with ASD were prescribed at least one psychoactive medication per year, and 20% of those children used three or more concurrent psychoactive medications (Mandell et al., 2008). In a 2002 analysis of a large national insurance database, approximately 70% of the children who had been diagnosed with ASD, ages 8 to 21 years, received at least one psychoactive medication annually (Oswald & Sonenklar, 2007). Although a significant number of children with ASD are prescribed psychoactive medications, medication alone will not alleviate all of the disruptive behaviors associated with ASD. Furthermore, some challenging behaviors may be learned or maladaptive (e.g., self-injury to get attention or to avoid tasks) and therefore do not usually respond to psychoactive medications (Tsai, 2000).

Only one medication, the antipsychotic risperidone (Risperdal®), is approved by the Food and Drug Administration (FDA) to treat behaviors associated with ASD, specifically irritability, aggression, self-injurious behavior (SIB), and temper tantrums (Myers, Johnson, & the Council on Children With Disabilities, 2007). Other medications used to treat ASD behaviors are prescribed off label; that is, they are prescribed for a purpose other than their FDA-approved purposes. Ideally, off-label prescribing is only done when necessary or when evidence exists to support that off-label use.

Medications currently prescribed off label to help alleviate challenging behaviors in children with ASD include CNS stimulants, nonadrenergic reuptake inhibitors, alpha-2 adrenergic agonists, antipsychotics, anticonvulsant mood stabilizers, selective serotonin reuptake inhibitors (SSRIs), benzodiazepines, and others. The side effect profiles of these medications are broad and include neurological, cognitive, behavioral, cardiovascular, and dermatological reactions. The severity of these effects can range from mild to life threatening, with overdoses being potentially fatal. Several of the neurological, cognitive, and behavioral side effects may mimic symptoms of ASD itself, making it difficult to determine if the symptoms observed are due to the medication or are the result of new or worsening symptoms caused by the disorder.

It is important then, before medications are initiated, that the SLP and other members of the child’s team consider the following questions:

- What does the team hope will be addressed if the child receives pharmacotherapy?
- What challenging behaviors have been identified, and have they been specifically defined?
- What functions do the challenging behaviors serve for the child?
- What evidence-based nonpharmacological interventions have been attempted?
- What were the outcomes of the interventions?
- Does the child have a positive behavior support (PBS) plan in place?
- Does the team feel that the PBS plan has been effectively applied or should the team revisit this process?
- Has the medication been studied in ASD and specifically in children?
- What impact does the medication have on learning?
- What are the expected side effects of this medication?

To provide well-informed responses to these questions, team members may find it helpful to conduct a functional behavioral assessment. During this assessment process, it will be necessary for the team to identify and specifically define the challenging behaviors being demonstrated by the child; establish baselines for those behaviors; determine the functions the behaviors appear to be serving for the child; and identify any environmental factors and events that may be triggering, reinforcing, and/or maintaining the behaviors. The information gleaned from the functional behavioral assessment should then be used to develop a PBS plan that details educational supports and evidence-based interventions that will best meet the needs of the child. Once the PBS plan has been established, it will be important for the team to monitor and document any changes in the child’s behavior. When changes do occur, the PBS plan should be revisited and modified accordingly to ensure that the proper supports are in place. Additionally, it will be necessary for the team to regularly evaluate the outcomes stated within the PBS plan to verify if the problematic behaviors have decreased and the child’s use of the more appropriate behavioral responses has increased.

During ongoing facilitation of this process, team members often identify additional treatments or supports that the child will need to ensure his or her continued success, which may include pharmacotherapy. Should it be determined that pharmacotherapy is an appropriate option, the child’s team should be attentive to the fact that other behavioral intervention strategies should not be discontinued. In this situation, it will be important for the team to review the child’s PBS plan and consider what supports should be continued, added, or modified to support the inclusion of pharmacotherapy in the child’s plan.

Before pharmacotherapy is initiated, it will be necessary for the team to collect well-defined baselines and continue to gather data throughout the use of the medication, particularly during the first few months of treatment. In general, psychoactive medications may take several weeks before full benefits are seen, although side effects can occur at any time. If no benefits are noted after the trial period, or side effects become problematic, it is reasonable that a physician may decide to discontinue that medication and try another. Additionally, team members should be alert to children who have been receiving pharmacotherapy without incident, but who begin to present with worsening or different problematic behaviors. In these situations, the team should be aware of the medication’s side effects, document and track patterns of behaviors demonstrated, modify the PBS plan as needed, and notify appropriate team members (Janney & Snell, 2008). When a child with ASD is receiving pharmacotherapy, it is essential that the child’s entire team (i.e., family members, appropriate school personnel, and health care professionals) be involved in monitoring the child for efficacy, tolerability, and side effects (Schall, 2002).
This clinical tutorial was compiled to support SLPs who need to understand the functions and effects of medications that have been prescribed to a child with ASD to whom they have or will be providing assessment and intervention services. This information will be presented by discussing patterns of behavior that are often demonstrated by children on the autism spectrum, the class of medications commonly used to treat that behavior, and potential side effects of those medications. A synopsis of this information is provided in Table 1.

Hyperactivity, Inattention, Impulsivity

One of the defining features of ASD is the demonstration of restricted, repetitive, and stereotyped patterns of behavior, interests, and activities (APA, 2000). Problems of hyperactivity and inattention are common in children with ASD, affecting approximately 40% and 60% of individuals with ASD, respectively (Tsai, 2000), with an equal occurrence in males and females (Brereton, Tonge, & Einfeld, 2006). Because children with ASD often have limited but intense areas of interest, their attention to events and/or activities may be inconsistent. For example, if a child with ASD is presented with a stimulus that is of interest, he or she may initially demonstrate appropriate attention to the activity but then shift into a hyper-focused state to the exclusion of other information. If, however, the activity does not pertain to a child’s particular area of interest, he or she may appear aloof and completely inattentive to his or her surroundings (Janzen, 2003).

Children with ASD may also exhibit characteristics of hyperactivity or inattentive behaviors when they are unable to focus on structured activities, stay engaged with preferred activities for any period of time, or rapidly shift among activities within their visual field. Reactions to sensory stimuli (e.g., olfactory, visual, auditory, tactile) may also cause children with ASD to be distracted and inattentive to tasks, or these same reactions may cause them to overact with increased physical activity. When a child is hyperactive or is unable to attend to therapy or schoolwork, the ability to benefit from educational and related treatments is compromised, possibly affecting his or her overall quality of life (Janzen, 2003).

SLPs should be cautious, however, when classifying behaviors as hyperactive or inattentive as children with ASD can exhibit

Table 1. Medications prescribed to treat behaviors associated with autism spectrum disorder (ASD).

| Behaviors often demonstrated by children with ASD | Medication class and generic name (brand name®) used to treat behaviors | Possible side effects
<table>
<thead>
<tr>
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<tr>
<td>Hyperactivity, inattention, and impulsivity</td>
<td>Central nervous system stimulants Methylenidate (Ritalin®) Dextroamphetamine (Dexedrine®) Mixed amphetamine salts (Adderall®) Pemoline (Cylert®) Atroventine (Strattera®)</td>
<td>Irritability, anxiety, agitation/aggression, worsening of underlying behaviors, sleep disturbance, loss of appetite/weight, tics, a state of dissatisfaction, social withdrawal, and paradoxical reactions (e.g., sedation, lethargy) Fatigue, sleep disturbance, nausea, irritability, anxiety, weight loss, and risk of suicidal ideation</td>
</tr>
<tr>
<td>Hyperactivity, inattention, and impulsivity</td>
<td>Noradrenergic reuptake inhibitors (nonstimulants) alpha-2 adrenergic agonists (nonstimulants) tricyclic antidepressants</td>
<td>Sedation, fatigue, dry mouth, constipation, and weight loss/gain</td>
</tr>
<tr>
<td>Aggression, irritability, tantrums, self-injury, repetitive and stereotypical behaviors, obsessive behaviors, social withdrawal, hyperactivity, and inattention</td>
<td>1st-generation antipsychotics Haloperidol (Haldol®) 2nd-generation antipsychotics Risperidone (Risperdal®) Clozapine (Clozaril®) Olanzapine (Zyprexa®) Quetiapine (Seroquel®) Ziprasidone (Geodon®)</td>
<td>Extrapyramidal side effects, sedation, weight gain, and anticholinergic side effects (e.g., dry mouth, blurred vision, constipation, urinary retention, agitation, memory impairment)</td>
</tr>
<tr>
<td>Aggression, self-injury, and impulsivity</td>
<td>Anticonvulsant mood stabilizers Clonidine (Catapres®) Lamotrigine (Lamictal®) Levetiracetam (Keppra®)</td>
<td>Dizziness, sedation, dizziness, incoordination, difficulty with memory and concentration, weight loss/gain, and mild to severe skin rashes</td>
</tr>
<tr>
<td>Repetitive thoughts, obsessive behaviors, perseverative behaviors, repetitive and stereotypical behaviors, anxiety, and depression</td>
<td>Selective serotonin reuptake inhibitors (SSRIs) Citalopram (Celexa®) Escitalopram (Lexapro®) Fluoxetine (Prozac®) Fluvoxamine (Luvox®) Paroxetine (Paxil®) Sertraline (Zoloft®)</td>
<td>Increased irritability, insomnia, anxiety, lethargy, agitation, activation, extrapyramidal side effects, and suicidal ideation</td>
</tr>
<tr>
<td>Anxiety, agitation, nervousness, and sleep problems</td>
<td>Benzo diazepines Alprazolam (Xanax®) Diazepam (Valium®) Lorazepam (Ativan®)</td>
<td>Sedation, lethargy, confusion, difficulty concentrating, slurred speech, difficulty with memory, paradoxical reactions (e.g., aggression, anxiety, nervousness), and slowed respirations</td>
</tr>
<tr>
<td>Anxiety, agitation, irritability, tantrums, aggression, and self-injury</td>
<td>Nonsedating anxiolytic Buspirone (BuSpar®)</td>
<td>Sedation, dizziness, nausea, nervousness, lightheadedness, and overexcitement</td>
</tr>
</tbody>
</table>

*This list of side effects is not all inclusive. Specific symptoms and descriptions of this side effect appear in the text of the manuscript.
characteristics similar to those of hyperactivity or inattention when activities are not of interest to the child, the tasks being presented are too difficult, or the tasks have not been structured appropriately to meet the individual child’s learning needs (Janzen, 2003). A functional behavioral assessment can assist team members in determining whether modifying the child’s environment will help control his or her hyperactive, inattentive, or impulsive behaviors. Should it be determined that environmental or treatment modifications have not improved the child’s ability to attend, medications including CNS stimulants, noradrenergic reuptake inhibitors (nonstimulants), and alpha-2 adrenergic agonists may be considered.

**Drug class: CNS stimulants**

**Medications:** Methylphenidate (Ritalin®, Daytrana® patch), dextroamphetamine (Dexedrine®), mixed amphetamine salts (Adderall®), and pemoline (Cylert®). Although it may seem contradictory to prescribe a CNS stimulant to treat hyperactivity/inattention, keep in mind that just as a CNS stimulant such as caffeine may help a fatigued individual stay alert and focused, these medications often do the same for a child who is having difficulty maintaining attentiveness.

The efficacy of methylphenidate (Ritalin®) has been confirmed in children with ASD, although the magnitude of the effect was lower, and the side effects higher, for children with ASD than for children without ASD (Research Units on Pediatric Psychopharmacology [RUPP] Autism Network, 2005a). Efficacy trials of the other CNS stimulants such as dextroamphetamine (Dexedrine®), mixed amphetamine salts (Adderall®), and pemoline (Cylert®) have been inconsistent (Nickels et al., 2008; Stigler, Desmond, Posey, Wiegand, & McDougle, 2004). The most common side effects of CNS stimulants include irritability, anxiety, agitation/aggression, worsening of behavior, sleep disturbance, loss of appetite/weight, tics, a state of dissatisfaction, social withdrawal, and in some cases, sedation/lethargy and sleepiness (Leskovec, Rowles, & Findling, 2008; Nickels et al., 2008; Wan-Chih, 2006).

**Drug class: Noradrenergic reuptake inhibitors (nonstimulants)**

**Medication:** Atomoxetine (Stratera®). Atomoxetine (Stratera®) is a nonstimulant medication that is used to treat hyperactivity/inattention. It appears to be less effective than CNS stimulants in treating hyperactivity/inattention in children with and without ASD; however, data are limited. One small placebo-controlled pilot study (Arnold et al., 2006), one small open-label trial (a trial where both researchers and participants know which treatment is being administered; Troost et al., 2006), and one retrospective chart review (Jou, Handen, & Hardan, 2005) showed reduction in some aspects of hyperactivity/inattention. The chance of a beneficial response is higher with methylphenidate than with atomoxetine; however, some children may respond to atomoxetine after failing to respond to the CNS stimulants (Newcorn et al., 2008).

Children with ASD tend to have higher rates of side effects to atomoxetine than children without ASD. Side effects include fatigue, sleep disturbance, nausea, irritability, anxiety, and weight loss (Erickson, Posey, Stigler, & McDougle, 2007). One advantage of atomoxetine over CNS stimulants is a lower incidence of irritability, anxiety, and weight loss (Newcorn et al., 2008). Although atomoxetine is not effective in treating depression, it has some similarities to antidepressants; thus, FDA warnings regarding an increased risk of suicidal thoughts with antidepressant use also apply to atomoxetine (Stratera®) (greater detail is provided in the mood disorders discussion).

**Drug class: Alpha-2 adrenergic agonists**

**Medications:** Clonidine (Catapres®) and guanafacine (Tenex®). Clonidine (Catapres®) tablets, transdermal patches, and, to a lesser extent, guanafacine (Tenex®), have been studied in children with ASD to ameliorate hyperactivity, inattention, and impulsivity (Fankhauser, Karumanchi, German, Yates, & Karumanchi, 1992; Jaselskis, Cook, Fletcher, & Leventhal, 1992; Ming, Gordon, Kang, & Wagner, 2008; Scahill et al., 2006). The alpha-2 adrenergic agonists have been studied less than the CNS stimulants and, as a result, are more commonly prescribed to children who do not respond to CNS stimulants or who have other neurological disorders (Tsai, 2000). Reported side effects include sedation, fatigue, dry mouth, constipation, and weight loss/gain (DiPiro et al., 2008; Wan-Chih, 2006).

**Aggression, Irritability, SIB**

SIB typically refers to any behavior that may cause tissue damage such as bruises, redness, and open wounds. Common forms of SIB include head banging, hand biting, and excessive scratching or rubbing (Edelson, n.d.). Two sets of theories, physiological and social, have been proposed to account for an individual’s engagement in self-injury (Edelson, n.d.).

There are five physiological hypotheses suggested. The first is that SIB releases beta-endorphins (endogenous opiate-like substances) in the brain, which provide a form of internal pleasure (Edelson, n.d.). The second hypothesis is based on the idea that incidents of SIB may be the result of subclinical seizures (Gedye, 1989). Subclinical seizures are not generally associated with the characteristic behaviors of conventional seizures but are characterized by abnormal electroencephalogram (EEG) patterns (Edelson, n.d.). Individuals demonstrating acts of SIB may benefit from an EEG to determine if the self-injury is associated with subclinical seizures. The results of this examination may indicate the need for medication. The third hypothesis is that a child may have a middle ear infection that may lead to head banging or ear hitting. This type of ear infection is treatable with antibiotics, and children demonstrating these behaviors should be evaluated accordingly (Edelson, n.d.). The fourth hypothesis is that some forms of self-injury may result from a sense of overarousal (e.g., frustration), whereby the SIB provides a release that lowers the child’s state of arousal. A final physiological hypothesis is that SIB may be a form of self-stimulatory behavior where repetitive, ritualistic behaviors seemingly provide the child with sensory stimulation or arousal (Edelson, n.d.). In these situations, a functional behavioral assessment and careful monitoring of the child’s PBS plan will assist the team to determine the most appropriate actions to take (Jainney & Snell, 2008). If a child’s irritability, aggression, or SIB cannot be properly managed through environmental modifications, as documented through the child’s PBS plan, or the child’s safety is thought to be at risk, medications such as antipsychotics and anticonvulsant mood stabilizers may be considered.

**Drug Class: Antipsychotics**

**Medications:** First generation – haloperidol (Haldol®) and second generation – risperidone (Risperdal®), clozapine (Clozaril®), olanzepine (Zyprexa®), quetiapine (Seroquel®), and ziprasidone (Geodon®). There are two main categories of antipsychotics: the older medications (typical or first-generation antipsychotics) and the newer medications (atypical or second-generation antipsychotics).
Antipsychotics have been studied in children with ASD to ameliorate a wide range of behaviors including aggression, irritability, tantrums, and SIB, as well as repetitive/obsessive behaviors, social withdrawal, hyperactivity, and inattention (Erickson et al., 2007; Wan-Chih, 2006).

First-generation antipsychotics such as haloperidol (Haldol®) block multiple dopamine receptor subtypes in the CNS, accounting for the relatively high rate of extrapyramidal side effects. Extrapyramidal side effects refer to a cluster of CNS reactions including acute dystonia, akathisia, pseudoparkinsonism, tardive dyskinesia, and neuroleptic malignant syndrome (DiPiro et al., 2008).

If acute dystonia is going to develop, it will typically occur within the first few days of therapy, presenting as painful, sustained muscle spasms of the neck, tongue, eyes, face, or back. It can progress quickly and requires immediate medical treatment. Children experiencing akathisia may have difficulties sitting still and feel a desire to be in constant motion (e.g., pacing, squirming). This is easily mistaken for anxiety or attention deficit.

Pseudoparkinsonism resembles Parkinson’s disease and may include slowness in movement initiation, resting tremor, rigidity, drooling, mask-like facial expression, and difficulty with speech. Each of these types of extrapyramidal side effects is generally reversible with prompt medical treatment followed by discontinuation or dosage reduction of the antipsychotic.

Tardive dyskinesia is associated with long-term therapy (several years) and may be irreversible. Symptoms include involuntary lip smacking and tongue thrusting/twisting that can dramatically interfere with eating and speech, and in some cases may progress to the limbs. Tardive dyskinesia is more likely to be reversible if it is caught early. Therefore, early recognition is crucial in preventing significant and permanent disability. SLPs should be aware of changes in the child’s speech, swallowing, laryngeal or oromandibular dystonia (i.e., involuntary movement and prolonged muscle contraction, resulting in tremor and abnormal posture), and/or other behaviors associated with early or subtle signs of extrapyramidal side effects and immediately alert the child’s prescriber.

A rare but potentially life threatening side effect, neuroleptic malignant syndrome, occurs from deregulation of the body temperature. Symptoms can mimic heat stroke and include fever, altered level of consciousness, rapid pulse, urinary or fecal incontinence, and muscle rigidity. Symptoms can progress rapidly over 24 to 72 hours; immediate medical attention is warranted at the first signs of symptoms (DiPiro et al., 2008).

Second-generation antipsychotics are more selective in the types of dopamine receptors blocked, and they also have activity on serotonin receptors (DiPiro et al., 2008). Their dopamine selectively results in fewer extrapyramidal side effects, making them preferred over first-generation antipsychotics (Erickson et al., 2007; Oswald & Sonenklar, 2007; Wan-Chih, 2006). The efficacy of risperidone (Risperdal®) has been confirmed by studies conducted by the RUPP Autism Network Group (McCracken et al., 2002; RUPP Autism Network, 2005b). The other second-generation antipsychotics listed have also been studied, but in smaller scale trials (Leskovec et al., 2008).

Side effects seen with first- and second-generation antipsychotics include sedation and weight gain. Anticholinergic side effects such as dry mouth, blurred vision, constipation, urinary retention, agitation, and memory impairment may also occur (DiPiro et al., 2008).

**Drug Class: Anticonvulsant mood stabilizers**

**Medications:**
- Divalproex sodium (Depakote®), lamotrigine (Lamictal®), and levetiracetam (Keppra®). Based on the subclinical seizure hypothesis accounting for some children’s SIB and the high prevalence of clinical seizures in children with ASD (8% overall and 40% in children with ASD and mental retardation), anticonvulsant mood stabilizers have been studied in the treatment of aggression, SIB, and impulsivity in children with ASD (Myers et al., 2007; Wan-Chih, 2006). These anticonvulsants are also called “mood stabilizers” because of their efficacy in the treatment of bipolar disorder in adults.

Side effects of these anticonvulsants include dizziness, sedation, nystagmus, incoordination, difficulty with memory and concentration, weight loss/gain, and skin rashes (DiPiro et al., 2008). A rash in a child taking an anticonvulant must be immediately evaluated by a prescriber due to the potential for Steven’s-Johnson syndrome and toxic epidermal necrolysis (i.e., widespread peeling of the top layer of skin similar to a second-degree burn), especially if it is accompanied by blistering or fever.

**Repetitive Thoughts and Obsessive and Perseverative Behaviors**

Children with ASD may perform perseverative behaviors to establish a sense of order and predictability. A variety of perseverative and compulsive behaviors may be exhibited, including the need for an unchanging daily routine (i.e., a complete inability to function when the routine has been changed), the desire to eat only one color of food (putting their nutritional needs at risk), and the constant need to line up toys or objects and not allow others to touch them (affecting the daily living needs of their family members). Perseverative patterns of speech (i.e., echoed or self-regulated utterances that are produced repeatedly with no communicative intent) are also frequently demonstrated by children with ASD (Prelock, 2006). Perseverative speech may occur when these children become anxious or overstimulated and/or when they experience difficulties processing information (Lewis & Bodfish, 1998).

It is important for SLPs to recognize perseverative behaviors and implement evidence-based treatment strategies to determine if the behaviors can be modified with behavioral intervention (Prelock, 2006). When children with ASD exhibit excessive rigidities in behavior to the degree that their daily functioning is immobilized, medications such as antipsychotics (discussed previously) and SSRIs may need to be considered (Myers et al., 2007).

**Drug class: SSRIs**

**Medications:**
- Citalopram (Celexa®), escitalopram ( Lexapro®), fluoxetine (Prozac®), fluvoxamine (Luvox®), paroxetine (Paxil®), sertraline (Zoloft®). Because SSRIs are FDA approved to treat depression, anxiety, and obsessive compulsive behavior, they have also been studied in children with ASD to ameliorate interfering, repetitive, stereotypical, perseverative, and obsessive compulsive behaviors. The SSRIs are the most commonly prescribed antidepressants for individuals under 21 years of age (Oswald & Sonenklar, 2007).

Efficacy of the SSRIs has been studied in only a few small-scale studies, open-label trials, or single-case reports in children with ASD with inconsistent results (Fatemi, Realmuto, Khan, & Thuras, 1998; Hollander, Phillips, & Chaplin, 2005; Leskovec et al., 2008; Namerow, Thomas, Bostick, Prince, & Monuteaux, 2003; Owley et al., 2005). Reported side effects include increased irritability, insomnia, anxiety, and lethargy (Fatemi et al., 1998). Although the use of SSRIs is growing, it should be noted that their efficacy has not been confirmed, and there is evidence that children and adolescents with ASD are more
sensitive to the potential side effects of SSRIs when compared to adults or children without ASD; specifically, agitation, activation, and even extrapyramidal side effects, which are typically not seen with SSRIs when they are used in the general population (Kolevzon, Mathewson, & Hollander, 2006; Sokolski, Chicz-Demet, & Demet, 2005). Antidepressants increase the risk of suicidal ideation in some adolescents and children, especially early in treatment (Wan-Chih, 2006). This topic is discussed in more detail with the discussion of mood disorders. As discussed later, SSRIs are also effective in the treatment of anxiety and depression in children with or without ASD.

**Interfering, Repetitive, and Stereotypical Behaviors**

The *Diagnostic and Statistical Manual of Mental Disorders—Fourth Edition–Text Revision* (APA, 2000, p. 75) refers to “stereotyped and repetitive motor mannerisms (e.g., hand or finger flapping or twisting, or complex whole-body movements)” as behaviors that might be observed in children with ASD. The World Health Organization (2001) also described restrictive and repetitive behaviors or interests as atypical sensory processing and/or motor responses.

Repetitive and stereotypic behaviors may occur more frequently and intensely in children with ASD during periods of either very high or very low levels of stimulation. These behaviors may also occur in the presence of problems, stress, or moments of excitement. When individuals with ASD were asked why they rock or flip their hands and fingers, they reported that it makes them feel better or more relaxed. Others have stated that it occurs automatically “when (I am) not paying attention to my body” (Cesaroni & Gaber, 1991, p. 309).

Typically, when other functional skills increase and more time is spent in interesting and productive activity, repetitive and stereotypic behaviors decrease (Janzen, 2003; Division TEACCH, n.d.). Should the behaviors become so pronounced and problematic that they interfere with the individual’s ability to function and cannot be modified by behavioral management strategies, medications such as antipsychotics and SSRIs (discussed previously) may be considered.

**Mood Disorders**

Adolescents with ASD frequently suffer from depressive symptoms, depressive mood, and/or an affect disorder. The term *affect disorder* is often used in conjunction with or interchangeably with mood disorder. Typically, a mood disorder is considered to be constant, internalized, and depressive, whereas the symptoms of a disordered affect are usually demonstrative and disruptive (Lainhart & Folstein, 1994).

Mood disorders are often difficult to diagnose due to the communication limitations that individuals with ASD experience, including the inability to verbally and nonverbally express their feeling states (Lainhart & Folstein, 1994). Unfortunately, when these children do not present with problematic behaviors, depression and social withdrawal may be overlooked (Tsi, 2005). For those children who have an affective disorder and are demonstrating challenging behaviors, the focus is often placed on the behaviors rather than on the possible cause underlying the affective disturbance (Tsi, 2005). Indicators that a child may be suffering from a depressive disorder may include depressed mood, irritability, sad facial expressions, altered tone of voice, apparent fearfulness, diminished interest or pleasure in preferred activities, and/or thoughts of suicide. Changes in appetite, fatigue, or a loss of energy may also be indicators of a mood disorder (Tsi, 2005).

Treatment for depression in children with ASD is similar to that in the general adolescent population and relies on antidepressants including SSRIs (previously discussed) and other classes of antidepressants not discussed here. Because antidepressants have been shown to increase suicidal ideation in some adolescents, individuals with ASD should be closely monitored for this during the first few months of therapy or at times of dosage increases or decreases. Thoughts of suicide/dying or worsening anxiety, agitation, irritability, insomnia, or panic attacks should be reported immediately. For more information regarding this topic, see the FDA’s *Medication Guide* (U.S. Department of Food and Drug Administration, 2009) regarding antidepressant medications (http://www.fda.gov/cder/drug/antidepressants/antidepressants_MG_2007.pdf).

**Anxiety-Induced Behaviors**

Children with ASD often display characteristics associated with anxiety, agitation, or nervousness when they appear to be out of control or destructive, engage in stereotypical movements (e.g., hand flapping, rocking), or exhibit the need to be left alone. Anxiety, agitation, or nervousness often manifest when children with ASD are placed in stressful social situations, are engaged in new learning activities, or are exposed to new or different daily routines (Prelock, 2006). Children with ASD may also exhibit behaviors associated with anxiety when they are unable to problem solve various situations, manage their emotions, understand the emotions of others, understand or use language functionally, or demonstrate flexibility when needed (Prelock, 2006). When educational programming does not provide the child with the support he or she needs to functionally control his or her anxiety throughout the day, antidepressants including SSRIs (discussed previously), benzodiazepine anxiolytics, or nonsedating anxiolytics may need to be considered.

**Drug class: Benzodiazepines**

*Medications:* Alprazolam (Xanax®), diazepam (Valium®), lorazepam (Ativan®), and others. In children with ASD, benzodiazepines may be prescribed to treat acute anxiety and sleep problems. Benzodiazepines such as alprazolam (Xanax®), diazepam (Valium®), and lorazepam (Ativan®) have been shown to be potentially beneficial for individuals with mental retardation, but information regarding their safety and efficacy, specifically in children with ASD, is extremely limited (Lindsay & Aman, 2003; Rush & Frances, 2000).

King and Bostic (2006) suggested that benzodiazepines may aggravate some behavioral characteristics in children with ASD. Side effects associated with benzodiazepines include sedation, confusion, difficulty concentrating, slurred speech, difficulty with memory, and paradoxical reactions. Paradoxical reactions (i.e., effects that are the opposite of what is normally expected) to benzodiazepines include increased aggression, anxiety, and nervousness (Marrosu, Marrosu, Rachel, & Biggio, 1987). Because benzodiazepines have the ability to slow the respiratory drive, signs of oversedation, lethargy, or slowed respirations should be reported immediately.

**Drug class: Non-sedating anxiolytics**

*Medication:* buspirone (Buspar®). There is one non-sedating anxiolytic on the U.S. market—buspirone (Buspar®). In adults, buspirone is prescribed to treat chronic generalized anxiety disorders. The
mechanism of action of buspirone is unclear but likely involves serotonin. Unlike the benzodiazepine anxiolytics, buspirone is non-sedating and cannot be used for acute anxiety because its onset of action takes several weeks (DiPiro et al., 2008). Buspirone has been studied in one open-label trial for the treatment of anxiety, irritability, and tantrums in children with ASD (Buitelaar, van der Gaag, & van der Hoeven, 1998) and two case reports for aggression and SIB (Leskovec et al., 2008). The most common side effects are sedation, dizziness, nausea, nervousness, lightheadedness, and overexcitement.

**Sleep Disorders**

Many children with ASD, particularly those under the age of 8, experience sleep disturbances. Problems may include difficulty falling asleep, lengthy periods of night waking and shortened night sleep, early waking, and excessive daytime sleepiness (Elia et al., 2000). Sleep disorders can be separated into three major categories: (a) dyssomnias, characterized by having difficulties initiating or maintaining sleep or not feeling rested after an adequate amount of sleep for a period of at least 1 month; (b) hypsomnias, involving excessive daytime sleepiness (e.g., falling asleep easily and unintentionally during the day, which is not due to an inadequate amount of nighttime sleep) for a period of at least 1 month; and (c) parasomnias or nightmare disorder, a condition where vivid dreams with reoccurring themes occur with threats to survival, security, or self-esteem (Tsai, 2005).

Sleep disorder treatment usually begins by instituting sleep hygiene techniques such as enforcing a sleep restriction (e.g., no afternoon or evening naps) and establishing a consistent bedtime routine, controlling stimulation levels before bedtime (e.g., not watching TV, limiting lights or sounds in the bedroom, reducing fluid intake in the evening), and engaging in relaxing activities before bedtime (e.g., appropriate reading, muscle-relaxation exercises). If the child does not respond to these techniques, medications may be considered (Tsai, 2005).

The usual sleep aids can be tried, including the benzodiazepines (discussed previously). Diphenhydramine, commonly found in over-the-counter sleep aids, may be helpful for some children; however, paradoxical, excitatory responses have been reported (Tsai, 2000). The alpha-2 adrenergic agonist, clonidine (Catapres®, discussed previously), was found to be effective in a small open-label trial in reducing time to sleep and nighttime awakenings (Ming et al., 2008). Melatonin, an herbal product, has also been suggested as a reasonable treatment option for insomnia in children with ASD (Tsai, 2000).

**Drug class: Pineal gland hormone**

Melatonin (various manufacturers). Melatonin, an herbal product, is a pineal hormone that is involved in regulating the circadian rhythm (natural sleep cycle). Only a small number of randomized clinical trials, open-label, and case reports exist describing its efficacy in children with neurodevelopmental disabilities, including ASD. Based on published evidence, melatonin appears to be effective in reducing time to sleep, but its efficacy in reducing nighttime awakenings and other aspects of sleep disturbances is mixed (Phillips & Appleton, 2004). A relatively new prescription medication, the melatonin-agonist, ramelteon (Rozerem®), was found to be effective in two case reports (Stigler, Posey, & McDougle, 2006).

**Herbal Therapies**

Because the benefits of traditional medicine are limited and there is no cure for ASD, parents may seek out alternative treatment options for their children. A variety of herbal and homeopathic products claim to improve symptoms associated with ASD. It is important to be aware, however, that herbal and homeopathic products are not evaluated by the FDA and are allowed to be marketed without evidence of their effectiveness or safety. Some individuals falsely assume that if the product has a natural plant source, it is benign, safe, and free of side effects and drug interactions. In reality, many herbal/homeopathic products have been found to have side effects and interactions with some prescription medications; many others are likely safe (e.g., melatonin). Therefore, just as with any prescription medication, parents and caregivers should be encouraged to consult the child’s prescriber before starting any herbal or homeopathic therapy and discuss the risks and benefits (American Academy of Pediatrics, 2001).

**DISCUSSION**

Psychoactive medications may have a role in the treatment of certain children with ASD, particularly if their problematic behaviors are chronic, severe, and unresponsive to nonpharmacological treatments (Matson & Dempsey, 2007). It is equally appropriate, however, to not prescribe psychoactive medications because, although efficacy data for most classes of drugs are increasing, they are still limited. As noted in Table 1, individual classes of medications may be used to treat a variety of behaviors, and individual behaviors may have a variety of medication classes that have been studied for treatment and therefore may be prescribed. Nationally recognized, evidence-based medication guidelines do not exist; consequently, SLPs may see significant variation in prescribing patterns for children with ASD.

Typically, SLPs spend more individualized time with the child than the prescriber; thus, they can play a significant role in the identification of even subtle side effects and changes in behaviors associated with ASD (Schall, 2002; Tsai, 2000). It is important that team members, including the SLP, use evidence-based behavioral practices in an ongoing and dynamic manner to monitor changes in a child’s behavior before initiating pharmacotherapy or when attempting to understand problematic behaviors presented by a child already receiving pharmacotherapy. Additionally, a well-developed PBS plan can assist team members in monitoring the efficacy, tolerability, and potential side effects of medications after they have been prescribed.

SLPs providing therapy to children with ASD should have a general knowledge of the most commonly prescribed medications and an understanding of why the medication was prescribed and how it may improve the quality of life for the child and family. SLPs should also have an understanding of the medication’s most common and more serious side effects, being aware that distinguishing between medication side effects and symptoms of ASD can be challenging. By taking an active role in the judicious use of pharmacotherapy in children with ASD, SLPs can help ensure that the proper balance between the behavioral practices and medication management is maintained and that the child’s quality of life is enhanced by the process.
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Received September 23, 2008
Revision received January 27, 2009
Accepted June 10, 2009
DOI: 10.1044/0161-1461(2009/08-0106)

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Pharmacotherapy and Children With Autism Spectrum Disorder: A Tutorial for Speech-Language Pathologists

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Lang Speech Hear Serv Sch 2010;41:367-375; originally published online Jun 11, 2010;
DOI: 10.1044/0161-1461(2009/08-0106)

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