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The purpose of this chapter is to review intervention strategies that have been researched for teaching adaptive and social skills to children with autism spectrum disorders (ASDs). We hope that the chapter will be useful for practitioners and that it will also stimulate further research. Before beginning our review, we briefly describe ASDs (a more thorough discussion of the characteristics of ASDs can be found in [Chapter 1](#) of this volume).

The Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition, Text Revision (DSM-IV-TR, American Psychiatric Association, 2000) classifies autistic disorder, Asperger disorder, and pervasive developmental disorders-not otherwise specified (PDD-NOS) under the umbrella of pervasive developmental disorders (PDDs). Autistic disorder is characterized by abnormal language development, qualitative impairments in communication skills and social interactions, and rigid, repetitive behaviors and interests. Asperger syndrome has similar features as autism, although it has less severe symptoms and it is typically not accompanied by language delay. If a child has symptoms of autistic disorder or Asperger syndrome, but does not meet the specific criteria for either, a diagnosis of PDD-NOS is given. The term autism spectrum disorders typically refers to these three disorders, although two other very rare, but severe disorders, Rett syndrome and childhood disintegrative disorder, are also included under PDDs.

Adaptive Skills Interventions

The American Association on Intellectual and Developmental Disabilities defines adaptive skill development as “the ability to apply basic information learned

in school to naturally accruing activities in the school, home or community” (Drew & Hardman, 2007, p. 231). A number of different life skills comprise the category of adaptive behaviors, including (a) domestic skills (e.g., chores, meal preparation); (b) self-care (e.g., tooth brushing, toilet training, and dressing); and (c) community skills (e.g., recognition of danger and street crossing). Many of these skills can be found throughout the literature, particularly for teaching individuals with developmental disabilities. For the purposes of this chapter, we will focus solely on domestic, self-care, community, and toileting skills. Among the central concerns experienced by parents of children with ASD is whether their child will lead a productive and independent life (Shibley-Benamou, Lutzker, & Taubman, 2002). Individuals who achieve independence in performing adaptive behaviors at an early age have a better chance of thriving in vocational and domestic settings (Pierce & Schreibman, 1994). Failure to teach daily living skills to individuals with ASD can negatively impact their autonomy, independence, and quality of life (Hayden, 1997). Although there has been a focus on teaching individuals with intellectual disabilities to perform domestic and daily living tasks and although approximately 70% of individuals with autism spectrum disorders also have intellectual disabilities, the application of these interventions with individuals with autism remains limited (Shibley-Benamou et al., 2002). Recently, researchers have begun addressing this dearth in the literature by examining the efficacy of a number of teaching strategies to target adaptive behaviors among individuals with ASD.

Inclusion Criteria

The literature review method used to identify published empirical articles on teaching self-help skills to individuals with ASD involved an electronic search on PsychINFO. Descriptors used in the electronic search included “show-ering,” “hair brushing,” “face washing,” “shaving,” “tooth

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brushing,” “flossing,” “oral hygiene,” “meal preparation,” “cooking,” “baking,” “food preparation,” “table setting,” “sweeping,” “cleaning,” “chores,” “dishwashing,” “dusting,” “housekeeping,” “laundry,” “bed making,” “table clearing,” “dressing,” “street crossing,” “community skills,” “bus riding,” “safety skills,” “purchasing skills,” “fork use,” “utensil use,” “knife use,” “spoon use,” “straw use,” “eating skills,” and “toilet training.” These key terms were used in conjunction with terms such as “PDD,” “ASD,” “autism,” and “autistic.” Relevant references were also identified within articles generated via the electronic literature search. The review was refined to studies that met the following criteria: (a) an intervention was carried out in a controlled experimental design; (b) participants included at least one individual with a diagnosis of ASD; (c) target behavior comprised one of the subcategories identified for adaptive skills in this chapter; and (d) the research was published in a peer-reviewed journal. The intervention strategies and recommendations for future research described in previous review papers were summarized in this chapter. Articles published between the date of the last article included in previous review papers and October 2009 were reviewed in this chapter. In all, 23 papers were included and organized into three broad skill areas (domestic, self-care, and community) and with subareas, where appropriate.

Domestic Skills

Independent performance of domestic skills can lead to opportunities to contribute meaningfully during day-to-day activities for individuals with ASD. A growing body of research has provided evidence of effective strategies that not only facilitate learning but also produce generalized, independent skill performance across various domestic tasks over time. Of the 10 articles reviewed that evaluated interventions for teaching domestic skills, all produced improved performance on the targeted domestic skill, 3 provided evidence of generalization following training, and 5 demonstrated maintenance during follow-up sessions. A variety of teaching procedures were employed across the studies including (listed according to the frequency of their application in the literature) (a) task analysis (eight articles); (b) video prompting (six articles); (c) positive reinforcement and/or praise (six articles); (d) verbal, gestural, or physical prompting (five articles); (e) picture prompting (four articles); (f) error correction (four articles); (g) chaining (three articles); (h) instructor modeling (three articles); (i) video modeling (two articles); (j) prompt fading (two articles); and (k) generalization programming (two articles).

Successful applications of verbal, gestural, and physical prompting procedures, along with instructor modeling, were demonstrated by Datlow Smith and Belcher (1985), who

taught cooking and cleaning skills to individuals with autism using an AB non-experimental design replicated across five participants. Instructors in this study provided as much assistance as needed to perform each behavior involved in the target training tasks. That is, they began by giving the individuals an opportunity to independently perform the task and provided an increased level of assistance when necessary. A second demonstration of the efficacy of these prompting techniques is evidenced in Bock’s (1999) training of laundry sorting to five children with autism using a multiple baseline across participants research design. Using modeling, verbal, and physical prompts; backward chaining; and positive reinforcement, Bock successfully taught laundry sorting and produced generalization to a public laundry facility. All participants maintained their performance for at least 4 months following training, as demonstrated in a follow-up probe, and four children displayed their laundry sorting skills under naturalistic conditions.

Another prompting strategy, picture prompting, involves presenting pictures to cue learners to respond correctly. A number of variations on picture prompting procedures were used across a series of studies investigating teaching domestic tasks to individuals with ASD. These ranged from simple photograph sequences (Pierce & Schreibman, 1994) to elaborate personal digital assistant (PDA) devices, consisting of digital still and video images to prompt individuals through a complex domestic task sequence (Mechling, Gast, & Seid, 2009). Pierce and Schreibman taught three children with autism self-management picture prompting sequences for table setting, meal preparation, laundry, and bed making. With little additional training, generalization emerged across untrained tasks in novel settings. These findings are consistent with prior research, which suggests that picture prompts are successful in producing generalization across settings and tasks (Wacker & Berg, 1983). Advantages to using these systems are that they are small, readily transported to novel settings as a means for producing generalization, and can be easily faded if necessary (Pierce & Schreibman, 1994).

Video modeling and video prompting have been used to teach a variety of skills to individuals with developmental disabilities and ASD. Video modeling involves making a videotape of a person performing a behavior or completing a task (Sigafos et al., 2007). The individual views the entire video without interruption, after which they are given the opportunity to perform the target behavior depicted in the video (Charlop & Milstein, 1989; Charlop-Christy & Daneshvar, 2003). Video prompting is a variation on video modeling, in which a participant is shown one step of a task, after which they are given the chance to perform the modeled step before proceeding to the next step in the sequence. Video prompting has been demonstrated as effective in teaching table setting in a multiple baseline across participants with an ABAC within participants research

design (Goodson, Sigafoos, O'Reilly, Cannella, & Lancioni, 2007), meal and snack preparation routines using a multiple probe across behaviors research design (Mechling et al., 2009), putting away groceries using a multiple probe across subjects with alternative treatment within subject research design (Cannella-Malone, Sigafoos, O'Reilly, de la Cruz, Edrisinha, & Lancioni, 2006), and dishwashing using a multiple baseline across participants research design (Sigafoos et al., 2007) among individuals with ASD. One of two perspectives is typically presented in video models or prompts: (a) a first person perspective (i.e., from the view of the person performing the skill) and (b) a third person perspective (from the view of someone watching another person perform a skill). A comparison of perspectives of video models was carried out by Ayres and Langone (2007) while teaching four elementary school-aged students with autism to put away groceries using an adapted alternating treatments design. Although their results demonstrated improved performance in the context of computerized training and produced generalization to some natural conditions for some of the participants, it remains unclear as to which perspective, first or third person, was more efficient in teaching this skill to the children who participated in the study. Further research is needed to identify, and refine, effective and efficient procedures for teaching skills to children with ASD using video modeling and video prompting.

Picture prompting, video modeling, and video prompting have all been demonstrated as effective in teaching a number of adaptive self-help skills to individuals with ASD. Little research, however, has systematically examined the relative effectiveness and efficiency of these three teaching systems. When compared with static picture prompts using an adapted alternating treatments design, video prompts were superior in producing independent cooking skills among five adolescents and one adult diagnosed with autism (Mechling & Gustafson, 2008). The authors recommended extending the findings of their study to teaching daily living skills or vocational tasks consisting of an extended sequence of behaviors, as opposed to the discrete skills taught in the context of their cooking tasks. A more systematic comparison between these visual prompting systems, in conjunction with measures of generalization and maintenance, would serve as a useful contribution to this scarce body of research.

Lovaas (2003) indicated that it is important to work toward eliminating the need for continued prompting so as to promote greater independence and prevent prompt dependence. To address this, Sigafoos et al. (2007) investigated an innovative strategy for fading out the use of video prompts. The fading procedure they developed – video chunking – involved gradually compressing the video prompts into one video segment, by systematically merging the independent steps into the full sequence (i.e., video modeling). Although the researchers successfully removed all of the video prompts

for two of the three participants by the end of the fading procedure, performance for all three participants was variable at a 3-month follow-up. After having the participants review the video model, their performances returned to levels comparable to the final training stage, suggesting that a brief booster session was sufficient in re-establishing the skill.

Although absolute independence is the ultimate goal when teaching individuals with ASD, the use of self-managed prompting strategies, such as those described in this section, may result in reliance on books, pictures, videos, or PDAs in executing complex domestic tasks. If the individual independently retrieves the prompting device and subsequently manipulates the device in a way that facilitates self-management of the behavior, the objective is still being achieved, in that the presence of a caregiver to aid in performing the task has been removed. Considering that we often rely on cookbooks, assembly instruction manuals, and global positioning systems as aids in performing complicated sequences, it is conceivable that similar prompting devices can remain present as strategies to maintain and facilitate otherwise independent behavior among individuals with ASD.

Self-Care Skills

Teaching self-care skills, such as grooming, dressing, tooth brushing, and appropriate mealtime behaviors, can result in improved independence for individuals with ASD. A significant amount of caregiver time is devoted to assisting individuals with ASD to complete their daily living routines. By establishing effective interventions that promote independence, staff and caregiver assistance can be reduced. Not only is it important to identify effective teaching strategies, but consideration must be given to maintenance and generalization. Although limited evidence exists of empirically validated procedures for teaching self-care behaviors to individuals with ASD, researchers have attempted to address these key issues in their investigations. Across the eight articles reviewed on teaching self-care skills, the following procedures were identified (listed according to the frequency of their application in the literature): (a) verbal, gestural, or physical prompting (six articles); (b) task analysis (five articles); (c) positive reinforcement and/or praise (four articles); (d) instructor modeling (four articles); (e) chaining (three articles); (f) generalization programming (three articles); (g) error correction (one article); (h) picture prompting (one article); (i) prompt fading (one article); and (j) negative reinforcement (one article).

Grooming

Matson, Taras, Sevin, Love, and Fridley (1990) taught tooth brushing and hair combing to three children with autism

using a multiple baseline across behaviors research design. Each teaching session consisted of the instructor first modeling and verbally describing the steps, physically and verbally assisting the children in completing each step, and finally providing the children an opportunity to independently perform this skill. This strategy was successful in increasing two grooming behaviors across all three children. Datlow Smith and Belcher (1985) applied a least to most prompting system to teach tooth brushing, hair combing, and face washing to three adults with autism using an AB non-experimental design. Because the number of sessions per week varied across participants and weeks, the average number of steps performed independently for all training sessions per week was reported. One individual learned to perform all of the steps identified in the tooth brushing sequence after 34 weeks of training, a second learned to perform all five hair combing steps within 39 weeks of training, while the third child learned to independently perform 11 of 17 steps of a face washing sequence within 19 weeks. Further research on the maintenance and generalization of these skills is needed to determine the long-term impact of training on improved independent grooming skills.

Dressing

Like grooming skills, dressing behaviors often involve lengthy, complex sequences which require the chaining of multiple discrete behaviors. Pierce and Schreibman (1994) applied a picture prompting self-management training procedure to teach dressing skills to one 6-year-old boy with autism using a multiple baseline with probes across behaviors research design. Although he learned to use a picture prompting book to correctly complete the dressing sequence, he did not maintain the skill at the level of independence produced during training. Further, in the absence of the book, he did not perform any of the dressing skills. Matson et al. (1990) taught four dressing skills to children with autism using a multiple baseline across behaviors research design. Two participants improved their shoe-tying skills, although only one maintained the skill at a 7-month follow-up. A third participant learned three dressing skills (i.e., putting on a shirt, pants, and socks) to 100% accuracy during training. Unfortunately, he did not complete the follow-up sessions because he had moved to another city; however, his mother reported that he continued to perform these skills independently. Finally, using a multiple probe across behaviors research design, Sewell, Collins, Hemmeter, and Schuster (1998) successfully taught a 2-year-old girl with a diagnosis of PDD to put on her shirt and shoes using a simultaneous prompting procedure and activity-based instruction. Simultaneous prompting involves delivering a prompt at the same time as the target stimulus is presented (e.g., at the same time as the instruction "Put on your shirt" is issued, the instructor would begin physically guiding the student

to complete the entire task). Activity-based instruction is a strategy used to teach functional skills within the context of child-initiated, planned, or routine scenarios and is designed to incorporate naturally occurring antecedent and consequence events (Bricker & Cripe, 1992). Learners in Sewell et al.'s (1998) study were taught dressing sequences within the context of activities that incorporated the target dressing behaviors. For example, when teaching the child to put on a shirt, instructors arranged a scenario such as painting or water play which began with the child putting on a shirt and then engaging in the selected activity.

The studies described thus far on teaching dressing skills have focused on producing independent performance of the sequences discussed. Using an ABAB withdrawal with baseline probes research design, one study by Fantuzzo and Smith (1983) was designed to remedy a situation where a 12-year-old boy with autism was taking up to an hour to complete his morning dressing routine. With the introduction of a token reinforcement system combined with a back-up reinforcer (chocolate milk with his breakfast) to reinforce appropriate dressing behavior which involved putting on his clothing within the allotted time period, he learned to perform the sequence independently in under 9 min both in a community residential setting and at his mother's home. This case study demonstrates that in addition to the discrete-trial interventions and chaining procedures typically applied to self-care skills, issues such as length of time required to perform a task can impact independent functioning and, therefore, still require careful consideration.

Eating

Two main approaches have been adopted to teach self-feeding skills to individuals with developmental disabilities and ASD: (a) promoting skill acquisition (e.g., basic utensil use) and (b) eliminating inappropriate mealtime behaviors (e.g., reducing sloppiness and spills). Using a multiple baseline across behaviors research design, Sisson and Dixon (1986) applied a group training procedure combined with modeling, verbal, gestural, or physical prompts and tokens following the occurrence of appropriate behaviors to teach a group of children, one of which had a diagnosis of autism, appropriate utensil use, napkin use, to chew with a closed mouth, and to display good posture during mealtimes. When tested under naturalistic conditions, however, performance of these skills was variable. The authors noted that special consideration must be given to generalization programming for mealtime behaviors because food reinforcement is accessible regardless of appropriate mealtime behaviors (i.e., whether your mouth is open or you are slouching, once the food is in your mouth reinforcement will occur despite the presence of undesirable behaviors).

Toilet Training

Independent toileting can improve a number of quality of life factors for individuals with developmental disabilities and ASD including, but not limited to, improved hygiene, self-confidence, and daily activities as well as reduced stigmatism and physical discomfort (Cicero & Pfadt, 2002; Hyams, McCoull, Smith, & Tyrer, 1992; McCartney, 1990). Competent toileting can influence socialization opportunities as well as educational and vocational placements (Kroeger & Sorensen-Burnworth, 2009).

In 1971, Azrin and Foxx introduced their rapid toilet training (RTT) procedure which consisted of (a) positive reinforcement for successful in-toilet urinations; (b) positive punishment, involving an overcorrection and positive practice component following out-of-toilet urinations; (c) increased fluid intake to promote urination; and (d) scheduled sittings to ensure frequent toilet sittings and to promote independence. For almost 40 years this method of toilet training, and variations of it, has produced increased in-toilet urinations and reduced out-of-toilet urinations among individuals with developmental disabilities (Azrin, Bugle, & O'Brien, 1971; Sadler & Merkert, 1977; Smith, 1979). Since its inception, researchers continue to refine the procedures originally outlined by Azrin and Foxx. In doing so, a number of variations have been explored with varying levels of success.

In 2009, a comprehensive review of the toilet training literature for individuals with developmental disabilities and autism was conducted by Kroeger and Sorensen-Burnworth. The authors identified the following common behavioral components in toilet training procedures: (a) graduated guidance (i.e., providing the necessary amount of assistance required to perform the toileting skill); (b) reinforcement-based training (i.e., providing a preferred activity, item, or event following performance of the skill); (c) scheduled sittings to increase opportunities for successful in-toilet eliminations; (d) identification of elimination schedules prior to beginning toilet training, in order to identify the naturally occurring elimination times for each individual; (e) punishment procedures to consequate out-of-toilet eliminations; (f) increased fluid intake to promote eliminations; and (g) stimulus control manipulations (i.e., identifying the conditions under which out-of-toilet eliminations occurred and manipulating the environment in a way that results in transferring those eliminations to the toilet). The intervention strategies and recommendations for future research described in Kroeger and Sorensen-Burnworth were summarized in this chapter and articles published between the date of the last article included in their review and October 2009 were included in this chapter.

Keen, Brannigan, and Cuskelly (2007) provided evidence that video modeling may be an effective tool in toilet training when combined with operant procedures described by Azrin

and Foxx (1971). Further investigation of video modeling is needed to determine its efficacy in treating incontinence, as well as other toileting behaviors (e.g., self-initiation) among children with ASD. A second avenue of investigation focuses on the elimination of positive punishment practices (Cicero & Pfadt, 2002), such as overcorrection and positive practice (e.g., having the individual walk from the spot of the accident to the toilet a specific number of times following an accident). Although the application of these procedures has demonstrated effective components of toilet training packages for individuals with autism (e.g., Ando, 1977), others have reported them counterproductive, particularly among some individuals exhibiting challenging behaviors (Cicero & Pfadt, 2002).

One area in need of detailed investigation is the components included in a toileting sequence. Although many behaviors are involved in the sequence (e.g., undressing, eliminating in the toilet, wiping, dressing, and hand washing), little evidence exists detailing empirically based interventions for teaching these component skills. Stokes, Cameron, Dorsey, and Fleming (2004) taught two adult males, one of whom had a diagnosis of autism, to wipe themselves independently following bowel movements using an AB non-experimental design. A task analysis was conducted to identify 10 steps for carrying out self-hygiene practices following bowel movements. The participant was taught to follow a complex chain by providing prompts when needed to ensure proper completion of the sequence. Correspondence training, in which the individual examined a wet wipe at the seventh step of the sequence, after which he was required to report to the instructor whether the wipe was clean, and if so, he could finish up and leave the wash-room. If the wipe was discolored, he was instructed to repeat the wiping procedure until the wipe was clean. This step served as a strategy for self-feedback on their cleanliness, a prompt that could be carried out in the absence of a caregiver. Following training, the participant performed the entire task with 100% independence, and his cleanliness improved substantially following 22 training sessions. The authors further extended the toileting sequence by varying four environmental stimuli in order to promote generalization to non-training settings and conditions. Accuracy and independence were maintained at 100% during generalization probes and maintenance sessions at 1- and 9-month follow-up sessions.

Most recently, Ozcan and Cavkaytar (2009) examined the effectiveness of a parent training program designed to teach toileting skills to two children diagnosed with autism using a multiple-probe design with probe sessions across participants. The parent training procedures demonstrated that following intervention, both children carried out 100% of the skills independently and maintained performance during follow-up sessions. The results of this study extended

previous toilet training research by demonstrating the effectiveness of parent instruction in producing independent toileting skills among two children with autism.

There are many protocols available in the literature for toilet training individuals with an ASD or with a developmental disability. The majority appear to be modifications of Azrin and Foxx's (1971) original toilet training protocol. The direction of the research and application has been to abbreviate and refine the steps involved in training and to minimize the cost of involving professional training and supervision (e.g., parent training models). In conclusion, Kroeger and Sorensen-Burnworth (2009) recommended the following considerations for future research directions: (a) teaching communication, self-initiation, and bowel movement training; (b) evaluation and investigation of the age and functioning limits based on the positive results of prior research on toilet training; and (c) identification of the prerequisite skills for toilet training individuals within these populations. Finally, refining the toileting procedures and generating cost-effective intervention approaches for addressing toileting among individuals with ASD are needed if parents and caregivers, already busy with other responsibilities in caring for an individual with ASD, are expected to carry out toilet training procedures that can be maintained and generalized across natural settings.

Community Skills

Any curriculum for individuals with developmental disabilities, including autism, should emphasize the inclusion of skills that are both functional and relevant over time (Morse & Schuster, 2000). Deciding which skills to target can be difficult given the adeptness required to independently perform complex behaviors in community settings. With a lack of empirical data to guide these decisions, caregivers and practitioners are left to decide where to start and how to train adaptive community skills. This section describes research on teaching community living skills – including shopping and safety – to individuals with ASD. Across the six articles reviewed the following intervention approaches were identified (listed according to the frequency of their application in the literature): (a) verbal, gestural, or physical prompting (five articles); (b) positive reinforcement and/or praise (five articles); (c) task analysis (three articles); (d) error correction (three articles); (e) prompt fading (three articles); (f) instructor modeling (two articles); (g) picture prompting (two articles); (h) video modeling (two articles); (i) generalization programming (two articles); and (j) virtual reality (VR) (one article). Additional research on applying these intervention procedures in the context of controlled experimental designs is needed to establish evidence-based strategies for teaching community skills to individuals with ASD.

Shopping

Morse and Schuster (2000) examined the efficacy of an intervention to teach shopping skills using in vivo training, prompting according to a predetermined time delay, and a pictorial storyboard using a multiple baseline across participants research design. Eight children, one with a diagnosis of autism, participated. After 20 training sessions, the individual with autism learned to perform the two shopping tasks, generalized those skills to a grocery store not before seen during training, and maintained her performance at 100% accuracy at 2- and 6-week follow-up sessions. A limitation of this intervention was the cost associated with training (e.g., transportation and actual purchases made at the store). Although some research examining generalization to naturalistic versus simulated settings has found training to be superior in simulated settings (van den Pol et al., 1981), others have suggested just the opposite (Marchetti, McCartney, Drain, Hooper, & Dix, 1983).

Haring, Kennedy, Adams, and Pitts-Conway (1987) taught children with autism to make simple purchases in a school cafeteria and at a convenience store. Alcantara (1994) extended these findings by teaching purchasing skills to three children with autism using a multiple baseline across settings research design. First, video modeling training was carried out in isolation, after which all participants showed improvement in their purchasing performance in naturalistic settings. Because none of the students achieved 100% accuracy during training, a second phase was introduced. During this phase, in addition to viewing video models, prompting and reinforcement were provided while participants were shopping at a local convenience store. The introduction of this second training phase produced further improvement for all participants. All three children maintained their purchasing skills with between 94 and 97% independence at a 2-week follow-up. Further, shopping session time decreased from an average of 8 min and 27 s during baseline to 2 min and 48 s during follow-up, indicating that not only did training improve independent purchasing, it also improved the speed with which the skills were performed.

Shopping skills are valuable skills for independent living. Not only can they facilitate opportunities to make meaningful purchases, but other important life skills can be embedded within the shopping sequence (e.g., transportation to and from the store, money management, money use, and preparation of a grocery list to replenish their food supplies). Further investigation of cost-effective shopping skills and strategies for incorporating other useful independent living skills into shopping routines for individuals within this population are needed.

Helping Others

Although helping others is an important social skill, it is also a functional community skill. Harris, Handleman, and

Alessandri (1990) successfully taught three adolescents diagnosed with autism to provide assistance to adults struggling with adaptive and community activities (i.e., putting a key into a lock and putting a letter in an envelope) using a multiple baseline across participants and multiple baseline across tasks within participants research design. Some participants showed evidence of generalization across people and environments; however, generalization to untrained tasks was limited. To extend these findings, Reeve, Reeve, Buffington Townsend, and Poulson (2007) taught four individuals with autism to offer assistance in the context of various community and domestic activities (e.g., cleaning, replacing broken materials, picking up objects, locating objects, carrying objects, and putting items away) using a multiple baseline across participants research design. Training procedures consisted of video modeling, verbal, and physical or gestural prompting, in conjunction with tokens and verbal praise following helping behaviors. Not only was there an increase in the execution of these skills, performance was maintained for up to 2 months following training. Further, all participants offered assistance in the presence of novel stimuli, in an untrained setting, and when presented by a new instructor. These two studies offer evidence of effective interventions for producing increased helping behaviors, which can be maintained over time, and generalized across a variety of contexts. Further research designed to reduce the complexity of this multi-component intervention and to identify the essential training components for teaching helping skills will assist in the development of user-friendly training procedures to increase these behaviors in individuals within this population (Reeve et al., 2007).

Safety Skills

When in community settings, individuals with developmental disabilities and ASD encounter various scenarios that can pose threats to their safety. Some situations can be remedied through teaching visual discrimination (e.g., sign reading), auditory comprehension (e.g., following instructions issued over intercom systems), and personal safety skills (e.g., appropriate street crossing). Until recently, despite ongoing research addressing this topic among individuals with developmental disabilities, little evidence exists to guide clinicians and practitioners supporting children, adolescents, and adults with ASD. In recent years, researchers have only started to extend these findings to this population. Given the restrictions that a lack of safety skills can impose on individuals with ASD, and the dangerous situations that can result from failure to teach safety skills, effective interventions are of the essence.

While offering assistance (Harris et al., 1990; Reeve et al., 2007) is a useful self-help skill that may also facilitate appropriate social interactions, the ability to seek out assistance when separated from a caregiver presents a serious safety

concern for individuals with ASD. Using a multiple-baseline probe design across participants, Taylor, Hughes, Richard, Hoch, and Rodriguez Coello (2004) examined whether three adolescents with autism could be taught to request assistance from an adult in community settings when their teacher or parent were not in sight. A vibrating paging device was given to each participant and was activated by a teacher when the individual was no longer in their view. A card with the child's name, a statement that he/she was lost, and an instruction to call or page their parent or teacher was placed in each participant's pocket. Upon sensing vibration of the paging device, students were taught to solicit assistance by handing the communication card to an adult in the community. All three individuals showed success by seeking out an adult to request their help. As evidence of generalization, they all performed the behavior when in the community with a parent. The authors noted that future research is needed to improve the social validity of the procedures used in this study by teaching participants to approach specific community helpers, such as cashiers or sales clerks, so as to minimize the danger of communicating information of being alone and lost to a potentially dangerous person. Overall, however, the results of this study demonstrate the usefulness of advances in technology in teaching community safety skills to individuals with ASD.

A second demonstration of the impact of rapidly evolving technology can be seen in Strickland, McAllister, Coles, and Osborne's (2007) successful teaching of fire safety skills to individuals with ASD using headset and PC-based VR systems using a changing-criterion research design. VR technology is a method used to create the illusion of actually performing an event in a computer-generated environment (Strickland et al., 2007). Self, Scudder, Weheba, and Crumrine (2007) later compared VR with an *integrated visual learning model* consisting of a variety of commonly used teaching strategies for individuals with ASD (e.g., social stories, picture cards, role-play/rehearsal, video modeling) using a group research design. Both instructional methods were reported as successful in teaching fire safety and tornado safety skills to children with ASD in the context of the VR training conditions; however, controlled studies are still required to determine the efficacy of these interventions for individuals with ASD. An important finding with respect to establishing cost-effective and efficient interventions is that the amount of training time required using the VR approach was half that of the integrated visual learning model.

With rapid advances in technology, it is not surprising that case studies applying innovative techniques, such as those described in this chapter, are emerging in the literature. Empirical investigation of their efficacy in rapid teaching, generalization production, and maintenance of adaptive life skills is still needed to demonstrate their applicability among

this population. Further investigation is needed to determine how technology can be used to reduce training time and produce rapid skill acquisition that can be generalized across environments and maintained over time. The use of PDAs and VR computer configurations should be considered a launching point for research investigating the role of advanced technology in teaching individuals with ASD.

Social Skills Interventions

Social impairment is one of the main areas of deficits for individuals with ASDs. With the most recent autism prevalence report of 1 in 110 live births (Centers for Disease Control and Prevention, 2009) and with social skill deficits being one of the most debilitating areas of dysfunction for children diagnosed with ASD (Kanner, 1943; Rogers, 2000), there is an urgent need for empirical validation of effective social interventions for children with ASD (Kransny, Williams, Provencal, & Ozonoff, 2003; Paul, 2003).

There are a large number of social skills training intervention strategies for children with ASDs reported in the literature. These studies can be categorized in many ways including (a) delivery (e.g., teacher-directed, peer-mediated instruction; direct instruction; incidental teaching); (b) theoretical orientation (e.g., behavioral, cognitive-behavioral); (c) setting (e.g., school, clinic); (d) teaching methods (e.g., social stories, video self-modeling, social scripts); and (f) age of participants (preschool, middle school) (Ruble, Willis, & McLaughlin Crabtree 2008; Scattone, 2007).

The majority of the social skills intervention studies to date have employed direct observation in small *N* research designs and have implemented modeling of target behaviors and reinforcement procedures (Matson, Matson, & Rivet, 2007); however, increasing varieties of intervention approaches continue to develop at a very fast pace. Although this development is very encouraging, the rapid growth in this area has led to lack of consensus in the literature on definitions of social skills and assessment techniques (Matson & Wilkins, 2007). Although further investigations involving behavioral intervention strategies and single-case research are very important, statistical analyses of larger scale intervention studies are lacking, an approach that could help to identify which specific interventions are most effective (Kroeger, Schultz, & Newsom, 2007; Matson et al., 2007).

Given the growth of intervention studies in the literature, a number of comprehensive reviews involving social skills intervention strategies exist, which have garnered important recommendations for future research. Some key issues addressed in these reviews include the (a) need for clarification of variations in diagnostic procedures for ASD and understanding subtypes of ASD to more efficiently individualize and implement treatments (Rao, Beidel, & Murray,

2008; Reynhout & Carter, 2006; Stichter, Randolph, Gage, & Schmidt, 2007); (b) need for assessment of the effectiveness of various intervention strategies through comparative analyses (DiSalvo & Oswald, 2002; Matson et al., 2007); (c) need for increased use of generalization and long-term assessments (Bellini, Peters, Benner, & Hopf, 2007; Goldstein, Schneider, & Thiemann, 2007; Hwang & Hughes, 2000); and (d) need for manualized curricula for public dissemination (Rogers, 2000; Williams White, Keonig, & Scahill, 2007). More recent studies will be reviewed in the context of the recommendations highlighted within those reviews.

Inclusion Criteria

The articles included in this review met the following criteria: (a) an intervention was carried out in a controlled experimental design, (b) participants included at least one individual with a diagnosis of a PDD or ASD, (c) the target behavior comprised one of the subcategories identified for the social skills in this chapter, and (d) the study was published in a peer-reviewed journal.

The literature review procedure used to identify the published empirical articles on social skills interventions included an electronic search of PsychINFO. The search terms, "social skills," were used in conjunction with the terms "PDD," "ASD," "autism," and "autistic." The results of this search resulted in over 1,500 peer-reviewed articles. To refine the search, "social skills training" and "social skills intervention" were used in conjunction with the terms "PDD," "ASD," "autism," and "autistic." Next, even more specific search terms such as "sharing," "turn-taking," "social initiations," "reciprocal interaction," "appropriate display of affection," and "compliment giving" were used in conjunction with the terms "pervasive development disorder (PDD)," "autism spectrum disorder (ASD)," "autism," and "autistic." Any additional references were identified within the articles found in the electronic literature search. For the purposes of this review, the following subcategories of social skills will be discussed: (a) compliment giving/greetings; (b) social initiations/reciprocal interactions; and (c) sharing/turn-taking.

If the search terms generated results for studies involving topics such as play skills (e.g., Bass & Mulick, 2007; Stahmer, Ingersoll, & Carter, 2003), emotion recognition (e.g., Solomon, Goodlin-Jones, & Anders, 2004), theory of mind (e.g., Prelock & Hutchins, 2008), or language skills, they were excluded on the basis that they were encompassed by topics to be covered in other chapters. A number of review papers concerning social skills will be cited in this chapter; however, studies that were included in previous reviews will not be described in detail, with two exceptions (Apple, Billingsley, & Schwartz, 2005; Thiemann &

Goldstein, 2004). A total of 17 articles that met the inclusion criteria are reviewed here and organized into the three broad categories mentioned previously; 5 articles on greetings/compliment giving, 7 on social initiations/reciprocal interactions, and 5 articles on sharing/turn-taking.

Giving Compliments and Greetings

Deficits in social skills obstruct children with ASDs' ability to establish meaningful relationships, which often leads to withdrawal and social isolation (Weiss & Harris, 2001). Therefore such skills are critical to successful social, emotional, and cognitive development. A conceivable way to strengthen relationships maybe by offering compliments and greetings during interactions with others. Three of the five articles reviewed included compliment-giving target behaviors and two included greetings. In all but two of the studies, the target behaviors were assessed in combination with other social skill behaviors. The most common intervention strategies included some form of direct instruction (e.g., written text training, video modeling with reinforcement, direct adult instruction) (three articles). Other interventions included the use of *Social Stories*TM (one article) and a form of music therapy combined with prompting procedures (one article). Although all of the studies resulted in improved performance of the target skills, only two studies included maintenance assessments and only one reported evidence of generalization.

Giving Compliments

Giving compliments to others provides children with ASDs a way to express their approval for, or curiosity about, issues of interest to others (Apple et al., 2005). Apple et al. addressed compliment giving in isolation from other social skills. Although this study was included in Matson et al. (2007), it warrants brief mention here as the literature on compliment giving is very sparse. In a multiple-baseline design across participants, direct instruction in the form of video modeling with explicit rules and tangible reinforcement produced and maintained "response"-type compliments (i.e., when participants used compliment statements such as "neat" in response to another individual's initiation such as "Look at my_____.") When a self-management component was added to the video modeling procedure, compliment-giving behaviors were initiated (i.e., compliment statements made more than 15 s after another persons' initiation statement) and maintained, offering evidence of a successful approach to teaching both reciprocal and self-initiated exchanges. Generalization to other social settings and to naturally occurring social rather than tangible contingencies was not assessed. Evidence of the generality of these findings would strengthen the efficacy of this intervention, in

that the applicability of these techniques to real-life scenarios and settings would increase opportunities for socialization among individuals in this population.

Further support for direct instructional intervention strategies is evidenced in Thiemann and Goldstein (2004). In a multiple-baseline design across behaviors and five participants with PDD, the effectiveness of two intervention strategies for increasing the frequency of five social skills (including compliment giving) was assessed. The two intervention strategies, peer training and direct adult instruction using written text cues (i.e., phrases appropriate to the activity), were assessed consecutively in order to attempt to differentiate the effects of both interventions on children's social initiations (i.e., compliments). Peer training alone was insufficient to increase children's rate of compliment use; however, when written text instruction was introduced, compliment giving increased. Therefore, the combined effects of the intervention strategies lead to favorable results. Maintenance of the skills was also observed; however, generalization of the behaviors outside of the structured classroom environment (e.g., recess) requires further investigation.

Another intervention technique that has been shown to be effective in increasing compliment-giving behavior is the use of *Social Stories*TM, which are designed to instruct children with ASD to identify and respond appropriately to social cues across situations and environments (Gray, 2000). In a multiple-baseline design across behaviors with two children diagnosed with PDD-NOS, Dodd, Hupp, Jewell, and Krohn (2008) examined the effectiveness of *Social Stories*TM for decreasing a problem social skill (i.e., excessive directions) and increasing a prosocial skill (i.e., compliment giving). Trained observers recorded frequencies of directions and compliments. Results indicated a 19.5% increase in compliments from baseline demonstrating that *Social Stories*TM were effective at increasing rates of compliment giving for children with PDD. Social validity evaluations of the intervention were positive; however, there were no long-term follow-up assessments or evaluation of generalization to other contexts.

Although *Social Stories*TM have gained increased clinical popularity in teaching social skills to children with ASD for reasons such as ease of implementation, they are not without limitation. A recent review of 16 social stories experiments by Reynhout and Carter (2006) revealed that (a) social story interventions are often combined with empirically validated methods such as prompting and reinforcement which confounded the results; (b) variability in the construction and implementation of social story research exists; and (c) maintenance and generalization are generally not addressed. The authors caution that this type of intervention may be more effective for individuals with mild to moderate functioning levels and for individuals with some basic language abilities.

Greetings

Greetings are a part of daily interactions for children with ASD in inclusive classroom environments; however, these children often do not have the necessary social skills to execute this type of interaction. Given that greetings typically involve peers, it seems plausible that a peer training intervention involving modeling and reinforcement would be a preferred method, as it is for training other social skills (Kamps et al., 2002); however, peer tutoring procedures may be difficult to implement because typically developing preschool children may have difficulty grasping the concepts involved in peer training. Instead, research has focused on other training strategies. For example, Gena (2006) assessed the effectiveness of social reinforcement in combination with prompting procedures in a multiple-baseline design across four participants with autism to increase five categories of social initiations (including greetings). Prompting (verbal, manual guidance) was provided by a skilled teacher and social reinforcement (verbal praise, physical contact) was delivered contingent on target behaviors. The procedures were effective in increasing the social initiations (including compliment giving) as well as appropriate responding to peers' initiations during social interactions. Two of the participants' initiations also generalized to a novel teacher. However, further research on long-term follow-up is needed.

A unique strategy for training greetings involved a "music therapy" procedure in conjunction with standard prompting methods. In a single-subject withdrawal design, Kern, Wolery, and Aldridge (2007) assessed the effects of individualized songs on the behaviors of two children with autism during morning greeting/classroom entry routines in an inclusive classroom setting. The songs included five steps of the greeting routine which were taught to the participants' teachers. The teachers sang the song during the morning routine, in conjunction with a least prompting (verbal and physical) method. Independently executed steps of the greeting routine increased from baseline for Participant 1 and a modified song procedure produced an increase in independently performed steps for Participant 2; however, no follow-up or generalization data were presented. Also, the same limitations that were raised by Reynhout and Carter (2006) in the *Social Stories*TM literature should be considered in this case. That is, because the songs were used in conjunction with previously validated prompt-fading procedure, the contribution of "music therapy" is unclear.

Social Initiations and Reciprocal Interactions

Reciprocal social interactions are necessary for social functioning and involve both an initiation and a response. It is well documented in the literature that children with ASD lack social initiation skills (Kern Koegel, 2000). Therefore,

it is not surprising that studies involving social initiation and interaction training are more represented in the literature than other target social skills reviewed in this chapter (e.g., compliment giving). Of the seven recent studies reviewed, the most common intervention strategies focused mainly on direct training methods based in behavior-analytic principles. Among the studies reviewed, six contained some measure of generalization or follow-up. For the purpose of this section, the articles reviewed are organized by intervention method: (a) visual procedures (four articles); (b) standard reinforcement (one article); and (c) peer mediated (two articles).

Visual Intervention

Although children with ASD have delayed language ability, they often possess strong visual ability (Bondy & Frost, 2001). Therefore, it is not surprising that social skills intervention strategies that employ some form of visual intervention have yielded favorable results. Within a multi-experiment study, Buggey (2005) employed a multiple-baseline design across two participants with ASD to assess the effectiveness of videotaped self-modeling (VSM) for increasing social initiations with peers. Social initiations were defined as "unsolicited verbalizations (not preceded by peer or staff prompts for a period of 10 s) addressed to peers (other than their counterpart in the study) or staff" (p. 55). The participants were videotaped participating in social initiations across settings (e.g., walking up to a group of classmates). The videos were modified in that classmates of the participants were given scripts to accompany the videos showing the participants engaging in the desirable behavior. The participants then viewed themselves in the situations where they were performing at a higher functioning level than usual. Results indicated significant increases in social initiations across both participants, and the increased initiations were maintained. The VSM intervention technique was also shown to be effective across other participants and behaviors (e.g., decreasing tantrums). Nikopoulos and Keenan (2007) also demonstrated the effectiveness of video modeling to teach complex social skills (including social initiations) to children with autism. Results indicated increased social initiation behaviors and decreased latency to perform social initiations after the video modeling procedure. Social initiations also generalized to novel peers and were maintained at 1- and 2-month follow-ups. Further support for intervention techniques involving visual cues for increasing social initiations is evident in Laushey, Heflin, Shippen, Alberto, and Fredrick (2009). Laushey and colleagues created visual diagrams using the "Concept Mastery Routine" (see Bulgren, Schumaker, & Deshler, 1988) in combination with direct instruction in small group settings with typical peers. A concept diagram is created interactively by an instructor and student and includes necessary

elements to promote student understanding, such as definitions and examples of an idea. A multiple-baseline design across behaviors (including social initiations) revealed that the intervention technique was successful in increasing initiations across four children with high-functioning autism (HFA). Increases in the target behaviors generalized from the small group settings to an inclusive classroom setting; however, further research on generalization effects to a wider population of children with ASD is needed. Follow-up data revealed that the effects were maintained 3 weeks following cessation of the intervention, although more long-term assessment is needed.

Another visual intervention strategy combined the use of computer-presented *Social Stories*TM and visual models. Sansosti and Powell-Smith (2008) assessed the effectiveness of this intervention package for increasing social initiations and reciprocal interactions in a multiple-baseline design across three children with Asperger syndrome (AS) and HFA. Target behaviors were observed during unstructured, naturalistic settings (e.g., recess) and increased significantly after the intervention package was implemented. Maintenance of the effects was also observed at a 2-week follow-up but only one participant demonstrated generalization of the skills. An important consideration is that the intervention package was modified to allow for social reinforcement for two of the participants. Given the combined nature of the intervention strategy and the additional modifications, it is difficult to conclude what specific strategy may have contributed most to the observed effect, especially given vast empirical validation for reinforcement as a powerful tool to increase behavior.

Motivating Antecedent Variables

Another technique that has been shown to be effective for increasing social initiations is use of a motivating antecedent variable, as evidenced in Boyd, Conroy, Mancil, Nakao, and Alter (2007). The authors used a single-subject alternating treatments design to compare the effects of circumscribed interests (CI) and less preferred (LP) tangible stimuli for increasing social behaviors (including social initiations and interactions) of three children with ASD. CIs were defined as the interests or preoccupations of individuals with ASD that are unusual in intensity and focus (Boyd et al., 2007). In this study the CIs were items and, along with the LP stimuli, were identified using a multiple stimulus preference assessment. When children's CIs and LPs were embedded in a play session (i.e., a peer held the respective items), results indicated that CI sessions led to increased and longer durations of the target behaviors compared to the LP sessions. That is, participants were more likely to initiate to peers when the peers had the participant's CI in hand. In addition, it took participant less time to initiate to peers when CIs were present. These results have important implications in that CIs are potentially

powerful reinforcers and when embedded in social situations with peers can serve as motivating antecedent variable to increase the social behavior. Future research should examine whether other appropriate stimuli that are more reinforcing than CIs could be used. Also generalization to other contexts and long-term follow-up assessments are needed.

Peer- and Adult-Mediated Approaches

Both peer-mediated and adult-mediated approaches to intervention strategies have effectively helped to establish social skills in children with autism (Bellini et al., 2007; McConnell, 2002). Owen-DeSchryver, Carr, Cale, and Blakeley-Smith (2008) evaluated the impact of a peer training intervention on social interactions in a multiple-baseline design across three children with ASD. Peers participated in training sessions that targeted increasing social interactions (e.g., initiations) and data were collected in unstructured settings (e.g., recess). Peer training intervention, delivered by trained peers and other children with ASD, was effective in increasing initiations. Another interesting finding was that untrained peers also showed increased initiations. This finding has important implications for classroom-based interventions in which teachers have many responsibilities and peers are readily available. Future research should also address long-term follow-up of the effects.

Another example of favorable collateral effects from social skills training that focused on increasing social initiations is that the training can also lead to decreased problematic behavioral excesses (e.g., repetitive motor behaviors) in children with autism. In a multiple-baseline design across participants, Loftin, Odom, and Lantz (2008) assessed the effectiveness of a multi-component (peer training, direct social initiation training, and self-monitoring) intervention strategy for decreasing repetitive motor behavior of three children with autism. Direct instruction was used to teach participants social initiations, which were defined as, "the participant starting an interaction with a peer(s) with whom there has not been an interaction during the previous 5 s" (p. 1126). Participants were also taught to self-monitor instances of initiations using a wrist counter. Social initiations increased with direct social initiation training, and social interactions continued when self-monitoring was introduced. Further, participants' repetitive motor behavior was significantly reduced and this effect was maintained more than 1 month after the intervention ended. Future research examining the generalizability of these findings across untrained conditions is needed.

As indicated by previous reviews of social skills training and the studies described thus far in this chapter, the majority of intervention strategies to date have involved traditional behavioral methods, and these methods have demonstrated that children with autism can indeed learn to perform discrete social behaviors. Assessments of the efficacy of these

strategies indicate that generalization of these skills is lacking (Bellini et al., 2007; Williams White et al., 2007). Another recommendation highlighted in previous reviews is that intervention techniques should be selected based on the individual language and cognitive abilities of children with ASD (Stichter et al., 2007).

Sharing and Turn-Taking

Cooperative skills, including sharing and turn-taking, are necessary for forming positive peer relationships, including accessing opportunities to obtain positive reinforcement through social exchanges; however, research in this area is lacking. For example, of the five articles reviewed here, only two studies (DeQuinzio, Townsend, & Poulson, 2008; Sawyer, Luiselli, Ricciardi, & Gower, 2005) targeted cooperative skills (including sharing and turn-taking); specifically, the remaining three studies assessed cooperative behaviors in conjunction with other social skills (e.g., play). Four of the five articles included some form of direct instruction, such as Pivotal Response Training (PRT), video modeling, priming with prompting and reinforcement, and one article assessed a novel social-behavioral intervention strategy called “SODA” (Stop, Observe, Deliberate, and Act) (Bock, 2001). One of the five studies also involved peer-mediated delivery of this strategy (Harper, Symon, & Frea, 2008). Effectiveness in increasing cooperative skills was demonstrated across all five studies, and all but one study reported some measure of generalization or maintenance (Kroeger, Schultz, & Newsom, 2007).

Sharing

The majority of the research devoted to increasing prosocial behaviors (e.g., sharing) has applied behavior-analytic techniques such as modeling, prompting, and reinforcement (e.g., Kamps et al., 1992). Sawyer et al. (2005) demonstrated the effectiveness of behavioral interventions for increasing sharing skills with children with ASD. In an ABCB single-case design, Sawyer et al. assessed the effectiveness of a multi-component package for increasing instances of physical sharing (e.g., handing an item to another individual) and verbal sharing (e.g., requesting an item from another individual) with one child with autism. Two interventions were employed. The first intervention procedure consisted of priming, prompting, and reinforcement. Priming of sharing behaviors occurred before a play session in which the instructor described the importance of sharing to the participant and then modeled a few examples of both verbal and physical sharing behaviors with one of the participant's peers. The instructor then guided the participant to perform sharing behaviors with the peer while provided prompts and reinforcement. The participant's sharing skills

were then measured in the inclusive classroom. The second intervention procedure was the same except that priming was not included. The combination of priming, prompting, and reinforcement was needed to increase and maintain improvements in sharing behavior. This study was conducted in an inclusive preschool classroom and implemented by the teacher who had other ongoing responsibilities, which has important social validity implications. Maintenance data were also collected 40 and 60 days after the study had ended and showed positive results. Methodological issues include lack of generalization, the use of a non-experimental case study, and some baseline data points increased in the absence of intervention. Therefore, although the results of this study should be interpreted with caution, since sharing skills are rarely targeted in isolation in the literature, it provides preliminary evidence of successful strategies requiring further investigation under controlled experimental conditions.

More recently, in a multiple-baseline design across four participants with autism, DeQuinzio et al. (2008) found that a behavioral intervention package (manual guidance, auditory prompts, and contingent reinforcement) was successful in teaching all four children a sharing response chain. Further, the sharing behaviors generalized to non-trained (non-reinforced) toys, individuals (i.e., peers), and settings. The generalization measures were based on pre- and post-test data, however; so they should be interpreted with caution. Information pertaining to the maintenance of these skills was not reported.

Turn-Taking

In a controlled group design with 25 children with autism, Kroeger et al. (2007) assessed the effectiveness of a direct-teaching strategy (video modeling with prompting and edible reinforcement) compared to an unstructured play activities group for teaching turn-taking skills to children with ASD. Pre-post assessments on videotaped behavior data revealed that children in both groups made prosocial behavioral gains, including increased turn-taking, and, most importantly, the direct-teaching group showed greater success. Long-term follow-up and generalization were not assessed.

Another effective, albeit time-consuming strategy involving direct-teaching strategies for promoting positive social interaction (e.g., social initiations) between children with ASD and peers, is peer-mediated PRT (Pierce & Schreibman, 1995, 1997a, 1997b). PRT is based on principles of applied behavior analysis and incorporates motivational procedures to improve responding. Peer-mediated PRT can assist in increasing generalization of skills to others, although it is yet to be assessed for a wide range of social skills (Pierce & Schreibman, 1997a). More recently, PRT has been demonstrated as effective in increasing cooperative behavior in children with ASD. In a concurrent multiple-baseline design across two children with autism, Harper et al. (2008)

assessed improvements in social skills, including turn-taking, during recess, using peer-mediated PRT. Results indicated increased and maintained turn-taking behaviors in both participants; however, the authors noted that advanced language and cognitive abilities of one participant might have contributed to his prominent improvement. Hence, assessment of the effectiveness of the intervention across a wider range of functioning levels is needed. The majority of research on social skills training to date focuses on children in the higher functioning range (Harper et al., 2008; Hwang & Hughes, 2000; Rogers, 2000). This limitation also speaks to the recommendation that social skills programs for children with ASD require modification to meet the specific needs of subgroups of children within the diagnostic category (Rao et al., 2008).

Bock (2001) developed a social-behavioral learning strategy for children and adolescents with Asperger syndrome: "SODA" (stop, observe, deliberate, and act) which provides a set of rules to help children with AS attend to relevant social cues and select specific social skills that they will use in novel social settings (generalization). The first three steps (S, O, and D) include self-talk questions or statements. The final step (A) assists with development of what they will say and do in novel social settings. A recent evaluation of the SODA strategy revealed its effectiveness for increasing cooperative learning skills of children with Asperger syndrome (Bock, 2007). In a multiple-baseline design across natural settings with four children with Asperger syndrome, participant's cooperation skills increased considerably from baseline in the presence of the SODA intervention. Further, participants' cooperative skill performance was maintained for 5 months after the intervention was terminated and actually increased to levels comparable to their typically developing peers. In addition, the participants demonstrated long-term memory (e.g., recalling SODA components in follow-up interviews) of SODA 1 month after the termination of maintenance assessments. As indicated previously, training methods may require tweaking based on the specific functioning level of the children involved, providing further support for the need for accurate assessment and diagnosis of ASDs (Matson & Wilkins, 2007).

Future Research

We reviewed 23 studies grouped in three adaptive skills domains (domestic, self-care, and community skills), and 17 studies grouped in three social skills domains (compliments and greetings, social initiation and interaction, and sharing and turn-taking). Of the 40 articles, only 15 specified the types of scales that were used to diagnose participants, and only 2 of the 40 studies included independent confirmation of the diagnoses. In order to allow for adequate comparison

of effectiveness of treatments across specific diagnostic categories of ASDs, future research should describe the tools used for diagnoses and include confirmation of diagnoses.

Across articles the intervention strategies were based predominantly on behavior-analytic techniques. The most common strategies included standard prompting and reinforcement procedures, task analysis, and modeling. The majority of articles employed single-subject research designs and demonstrated internal validity of the treatment strategies; however, only 30% of the studies actively programmed for generalization. The independent performance of the various adaptive and social skills under naturalistic conditions requires further research.

Of the 40 articles, only 53% reported some measure of social validity (Kazdin, 1977; Wolf, 1978). Given that caregivers of children with ASDs are often involved in the implementation of treatment programs, measures of social validity are important in developing user-friendly treatment programs for addressing adaptive and social skill needs and future research should include them routinely.

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