CHAPTER 6

Teaching Functional Communication to Adults with Autism Spectrum Disorders

- Russell Lang, Jeff Sigafoos, Larah van der Meer, Amarie Carnett, Vanessa A. Green, Giulio E. Lancioni, and Mark F. O'Reilly

Communication intervention is a major therapeutic priority for individuals with autism spectrum disorders (ASD). Indeed, communication intervention was among the top 10 treatment priorities in a survey of 90 parents of individuals with ASD (Pituch et al., 2011). Specific communication skills prioritized by these 90 parents included (1) asking for information when needed, (2) describing feelings and events, (3) responding appropriately to questions, (4) initiating conversations, (5) naming objects, and (6) expressing wants and needs. The high priority assigned to these skills is not surprising given that communication impairment is a defining feature of ASD (American Psychiatric Association, 2013). However, the extent to which these priority ratings apply to adults with ASD could be questioned because only 14 (16%) of the 90 respondents were parents of older individuals (over 17 years of age) with ASD. Still, Iacono and Caithness (2009) noted that although there have been relatively fewer studies into the communication difficulties of adults with ASD, the few studies that do exist suggest that significant communication impairment—and hence the need for communication intervention—remains prevalent among adults with ASD.
Sturmey and Fitzer (2009) reviewed a number of empirical studies that assessed the nature and severity of communication impairment in individuals with ASD. The collective results of these studies point to three main findings. First, individuals with ASD have delayed language development compared with typically developing peers. Second, individuals with ASD tend to produce less frequent and fewer self-initiated communicative acts than both typically developing peers and individuals with some other types of developmental disabilities (e.g., Down syndrome). Third, ASD is associated with a range of differing types and degrees of communication impairment. At one end of this range are the 30% or so of individuals who fail to develop any appreciable speech (National Research Council, 2001). In addition to ASD, such individuals also have severe communication impairment or complex communication needs (Beukelman & Mirenda, 2013). The remaining 70% of individuals with ASD develop some spoken language, but their speech is often characterized by a number of unusual features. For example, the individual with ASD may simply repeat the speech of others (a condition known as echolalia) or speak only when prompted to do so (i.e., lack of spontaneity). In addition, persons with ASD may engage in obsessive, repetitive speech. Their speech might also consist of (1) unusual voice tone and inflection, (2) dysfluency (e.g., stuttering), (3) pronoun reversal, (4) inflexible sentence structuring, and/or (5) immature grammar (Brundage, Whelan, & Burgess, 2013; Scheuermann & Webber, 2002). Although each of these types of deficits—from lack of speech to lack of spontaneous speech to unusual voice tone—represents a potential priority for communication intervention, this chapter focuses on reviewing interventions aimed at developing the functional communication skills of individuals with ASD and severe communication impairment. This population could be viewed as priority candidates for communication intervention (Pituch et al., 2011). Our focus on functional communication includes procedures for establishing speech, as well as the use of one or more and augmentative and alternative communication modes.

In the next sections of this chapter, we define functional communication and describe the major augmentative and alternative communication (AAC) systems that have been incorporated into communication intervention programs for adults with ASD. After this, we provide an overview of research studies that have evaluated general approaches and specific procedures for teaching functional communication to adults with ASD. This overview of research evidence is followed by a summary of the generic instructional steps that appear to be consistently effective for teaching functional communication skills to persons with ASD. A case study is then presented to illustrate the application of these instructional steps for teaching an initial requesting skill to an adult with ASD. We conclude
by summarizing the overall evidence base related to teaching functional communication skills to adults with ASD.

Functional Communication

Communication is functional when it enables the individual to express wants and needs and participate in meaningful social interactions (Plavnick & Normand, 2013; Reichle, York, & Sigafos, 1991). Because opportunities to express wants and needs and to participate socially are pervasive, the communication skills taught to adults with ASD should occur in and be effective across multiple environments (e.g., home, school, work, and community) and with a range of communicative partners (e.g., peers, teachers, family, and general members of the community). Communication skills will be more functional not only when they generalize outside of the training environment but also when they are fluent and readily interpreted by others (Reichle et al., 1991). Some communication modes (e.g., using a speech-generating device to request a meal vs. leading a listener's hand to the desired object) are likely to be more socially acceptable, and hence more functional, across a wider range of settings and listeners (Carr & Kemp, 1989).

Contemporary intervention programs for individuals with ASD and severe communication impairment have tended to concentrate on teaching four basic communicative functions (Fitzer & Sturmey, 2009; Frost & Bondy, 2002; Sundberg & Partington, 1998). These are the mand, the tact, the intraverbal, and the echoic relations first described by Skinner (1957) and later refined by a number of subsequent researchers (Bondy, Tincani, & Frost, 2004; Michael, Palmer, & Sundberg, 2011). Table 6.1 describes the distinguishing features of each of these communicative functions.

Sigafos and Reichle (1993) outlined a number of more specific communication skills exemplifying each of the four basic functions described in Table 6.1. Skinner (1957) described a mand as “the unique relationship between the form of the response and the reinforcement characteristically received in a verbal community” (p. 36). Specific communication skills that exemplify the mand function include (1) requesting preferred objects, (2) requesting help with difficult tasks, and (3) rejecting nonpreferred objects or activities. These communicative behaviors are classified as mands because the contingent consequence is likely to be what was requested. For example, an adult with disabilities might mand for a friend or relative to play cards (i.e., “Will you play cards with me?”), and the resulting reinforcement is likely to be engaging in the card game with that communication partner (i.e., the form of the response predicts
TABLE 6.1. Basic Communication Functions

<table>
<thead>
<tr>
<th>Function</th>
<th>Definition and example</th>
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<tbody>
<tr>
<td>Mand</td>
<td>The mand is controlled by deprivation or aversive stimulation and reinforced by a characteristic consequence that matches the form of the response. The mand <em>food</em>, for example, would be controlled by hunger and reinforced by giving the person a preferred food item. Requesting and rejecting are examples of mands.</td>
</tr>
<tr>
<td>Tact</td>
<td>The tact is controlled by a prior nonverbal stimulus, such as some object or event in the environment. The function of the tact is to direct the listener’s attention to the object or event. The tact <em>rain</em>, for example, would be controlled by water droplets falling from the sky. Reinforcement occurs when the listener thanks the speaker. Naming, labeling, and commenting are examples of tacts.</td>
</tr>
<tr>
<td>Intraverbal</td>
<td>An intraverbal is also controlled by the partner’s prior communicative behavior, but in this case the form of the response does not match the form produced by the speaker. Instead, the response is contextually related to the prior verbal stimulus. If the parent asks a child what she wants for a birthday present, appropriate intraverbal responses might include <em>doll</em>, <em>bicycle</em>, and <em>pony</em>, for example.</td>
</tr>
<tr>
<td>Echoic</td>
<td>An echoic response is controlled by the partner’s prior communication behavior, with the form of the echoic response matching the form produced by the speaker. The teacher says <em>truck</em>, for example, and the child responds by producing the exact same word. Imitation of speech and manual signs are examples of echoic responding.</td>
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*Note. Based on Skinner (1957) and reprinted with permission from Sigafoos, O’Reilly, Schlosser, and Lancioni (2007). Copyright 2007 by Pro-Ed, Inc.*

the contingent consequence). Although Skinner avoided references to unobservable properties of communication related to internal states (e.g., desires), from a practical perspective, manding is important because these types of communication skills enable the individual to gain access to reinforcing consequences (e.g., mands for preferred stimuli), including escaping from or avoiding aversive stimuli (e.g., requesting food to escape the aversive hunger pains). In lay terms, the types of mands are often referred to as ways of expressing wants and needs.

Second, specific communication skills that exemplify the tact function include (1) naming or labeling objects, (2) describing aspects of the environment, and (3) counting objects in the environment. Tacting is important because a number of such skills enable the individual to impart useful information to listeners. A listener benefits when told by a speaker that it is raining or cold outside or that the telephone is ringing.
The speaker benefits in that listeners provide social reinforcement (e.g., “Thank you for telling me that. I really appreciate it”). Tacting is also one way in which the individual might initiate conversational exchanges with others (e.g., “Looks like rain”). Instruction to teach naming or labeling is one way to build vocabulary related to new objects and actions. Tact instruction might also focus on teaching the person to accurately describe what he or she sees, hears, or feels. These skills can be very useful in academic instructional activities and when listeners would benefit from having this type of information.

Third, specific communication skills that exemplify the intraverbal function include (1) answering questions, (2) building on the conversation of others, and (3) thematically classifying objects (e.g., “Yogurt, milk, and cheese are all dairy products”). intraversals are critical for effective participation in the community, including daily communicative exchanges. For example, persons with ASD must respond accurately to questions such as “Where do you live?” and “Are you okay?”. Maintaining a conversation will also typically require intraverbal behavior. For example, if the conversation drifts toward classic movies, intraverbal responses such as Citizen Kane, Star Wars, and The Graduate are likely to be appropriate ways of contributing to that conversation. As with the tact relation, the reinforcement for intraverbal responses is the resulting social reinforcement from listeners.

Finally, the echoic relation can also be thought of as a form of imitation. Specific communication skills that exemplify the echoic relation include repeating the speech of others (e.g., responding with “Hello to you, too” after being greeted with “Hello”) or imitating the manual sign greeting of a newly arrived friend. Much conversation is echoic, as the speech of one communicative partner often overlaps with and builds on the prior utterances of the first speaker. For example, the first speaker might say “Citizen Kane is a classic movie,” and the second person might follow this statement with “Yes, I agree that Citizen Kane is a classic movie, and so is Star Wars.” The echoic relation is often specifically taught in communication interventions for persons with ASD as a way of teaching new response forms (e.g., teaching the person to imitate manual signs), which can then be generalized to serve other communicative functions, such as manding and tacting. The issue for some individuals is too much echoic behavior (i.e., echolalia). Intervention for these individuals has focused on replacing echolalia with tacts and intraverbals (McMorrow & Foxx, 1986).

Although the mand, tact, intraverbal, and echoic relations are often conceptualized as separate and distinct communication functions, Bondy and colleagues (2004) explained that communication responses often
represent a blend of different functions. For example, an individual might be taught to name objects when the teacher holds up the object and asks, "What is this?" The naming response in this scenario might in fact be controlled not only by the object but also by the verbal instruction, making the response part tact and part intraverbal. Manding is also often taught in the presence of the preferred objects, which could make the response part mand and part tact. The implication here is that interventionists need to consider the precise antecedent conditions and reinforcing consequences that should evoke and maintain the targeted communication responses so as to ensure that these responses will be functional for the individual.

**Augmentative and Alternative Communication**

AAC can be used as an alternative to speech when the person develops little or no speech or to augment an existing but limited or unintelligible speech repertoire. AAC includes several alternative modes, such as manual signs, picture-based communication, and electronic speech-generating devices (SGDs). Skinner (1957) recognized that the four classes of basic communicative functions outlined in Table 6.1 could be expressed in a variety of modes. That is, functional communication does not necessarily require speech but can also be expressed through various AAC modes. AAC modes are indicated for adults with ASD who have limited or no speech. This, however, does not mean that efforts to teach speech should necessarily be abandoned when AAC is implemented, as AAC intervention can be used in combination with speech therapy. In fact, this combination might sometimes enhance speech development in persons with ASD and severe communication impairment (Millar, 2009). Millar also noted that AAC intervention does not appear to have any negative effects on speech development. Currently, there is a paucity of research in this area focused on adults with ASD, but, based on the research involving children, it seems likely that AAC use would not hinder and, in some cases, might enhance speech in adults with ASD.

The most common AAC modes taught to individuals with ASD are (1) manual signs or gesture-mode communication, (2) picture-exchange systems and picture-based communication boards, and (3) SGDs (Mirenda, 2003). Thus there are four general intervention approaches that might be implemented in the attempt to teach functional communication skills to an adult with ASD and severe communication impairment (i.e., speech, manual signs or gestures, picture exchange, and SGDs). The evidence base for each of these general approaches is considered next.
Evidence-Based and Promising Practices

This section provides an overview of the four main intervention approaches and associated procedures that have been used to establish functional communication skills in individuals with ASD. An important issue is whether there is in fact sufficient research evidence to support the use of any of these intervention approaches. In line with the guidelines offered by Horner and colleagues (2005), an approach or procedure can be considered evidence based or empirically validated when it has been shown to be effective in at least five high-quality studies involving proper experimental designs, including single-case experimental designs, and with at least 20 individuals with ASD. Of course, as there are fewer studies dealing with adults with ASD than with children with ASD, there might not be five high-quality studies involving 20 adults with ASD for some of these approaches or procedures. Therefore, approaches or procedures with demonstrated effectiveness in fewer than five studies or fewer than 20 individuals or that have been well validated only in studies involving children and adolescents can only be considered as promising, not empirically validated.

Teaching Functional Use of Speech

As mentioned in the introduction, approximately 30% of individuals with ASD present with very limited or no functional speech (National Research Council, 2001). However, previous research has demonstrated that many of these individuals can acquire at least some functional speech via behavioral intervention. In a pioneering study by Lovaas, Berberich, Perloff, and Schaeffer (1966), a shaping procedure was used to teach first words to participants with autism. Shaping involves gradual changes in reinforcement contingencies based on a series of subtle changes in the individual’s vocalizations. Specifically, in the first stage of Lovaas and colleagues’ intervention, all the participants’ vocalizations were reinforced with a small preferred edible. This reinforcement contingency increased the frequency of vocalizations directed at the therapist. In the second stage, the therapist modeled a specific vocalization (e.g., “cookie”) and reinforcement was provided only when the participants vocalized within 6 seconds after the therapist spoke; it did not matter what the participants’ vocalizations sounded like. In the third stage, after the participants consistently vocalized within this 6-second window, reinforcement was provided only when the vocalizations began to sound similar to the therapist’s original vocalization. The similarities between the therapists’ vocalizations and those of the participants were then increased by gradually requiring
more and more similarity in order to meet the increasingly more precise criteria for reinforcement. For example, the therapist might say “cookie.” Initially, reinforcement would be provided for making the hard $c$ sound, then $co$ or $co-ey$, and, eventually, only for the full word $cookie$. Over time, the participants’ speech was brought under the stimulus control of the therapist’s spoken (imitative) model, and new words were taught by repeating the final step in the procedure. Although effective in some cases, this procedure is difficult because the subtle distinctions between one vocalization and the next can be hard to determine, and not all individuals with ASD will experience improvement. The validity of this approach also does not seem to have been tested with adults with ASD. The approach is therefore promising, but not empirically validated for adults with ASD.

Another promising approach for teaching speech is known as stimulus–stimulus pairing. Sundberg, Michael, Partington, and Sundberg (1996) demonstrated the potential benefits of this approach for increasing the frequency of vocalizations. In general, pairing is a procedure used to create reinforcing stimuli from neutral stimuli by presenting a neutral stimulus at the same time as (or in close temporal proximity to) a stimulus that already functions as a reinforcer. When used to increase speech, the intent is to condition the sounds produced by speech to be automatically reinforcing. To use this procedure, the therapist first recruits the individual’s attention and then produces a target sound (e.g., $wa$ or $mmm$). At the very moment the therapist makes the sound, the individual is positively reinforced. When effective, the sound will become a conditioned reinforcer, and the individual with ASD may begin to imitate the sound in an effort to produce this reinforcement independently. It may take as many as 400 such pairings of the sound and reinforcer before the individual with ASD begins to produce the target sound (Miguel, Carr, & Michael, 2002; Yoon & Bennett, 2000). Additional research investigating this procedure is warranted, but this stimulus–stimulus pairing procedure can be considered a promising approach for inducing imitative speech in adults with ASD.

As mentioned earlier, echolalia (i.e., repeating verbatim the verbal behavior of another person) is common among individuals with ASD and has been shown to impede social interactions, cause communication breakdown, and complicate the instruction of new communication skills (Prizant & Duchan, 1981). One approach to intervention aims to replace echolalia with functional speech, such as answering a question. Specifically, the person with echolalia is asked a question, but before he or she has time to echo the question, the therapist provides a model of the correct answer for the person to imitate. For example, the therapist might ask, “What type of animal barks?” and then immediately provide the
verbal prompt *dog*. Ideally, the individual receiving treatment would then imitate the word *dog*. This enables the therapist to reinforce the response to the question and, eventually, to fade the verbal prompt for the answer. Although several studies demonstrated that this approach led to a reduction of echolalia and an increase in appropriate responding (e.g., Carr, Schreibman, & Lovaas, 1975), the benefits of this approach may not generalize to untrained verbal stimuli (Carr et al., 1975; McMorrow & Foxx, 1986; Schreibman & Carr, 1978).

A variation of this procedure, called cues–pause–point, involves first prompting the individual to remain silent; for example, the therapist might hold up a finger near his or her lips. If the individual with ASD produces a sound during this pause prompt, the therapist responds by saying “no,” “shh,” or some other indication to remain quiet. After the participant is able to remain silent in the presence of the pause prompt, the therapist points to a target object and asks, “What is this?” or some equivalent question. The pause prompt is then removed (e.g., finger put down), which signals to the person with ASD to respond. The person is taught to say the name of the object pointed to with the aim of replacing echolalia with tact responses (Foxx, McMorrow, Faw, Kyle, & Bittle, 1987; McMorrow & Foxx, 1986; McMorrow, Foxx, Faw, & Bittle, 1987). This procedure has been shown to generalize to untrained stimuli in studies involving children with ASD, but additional research investigating this approach with adults remains needed (Foxx, Schreck, Garito, Smith, & Wisenberger, 2004).

**Teaching Functional Use of Manual Signs and Gestures**

Manual signs and gestures have been widely used as a response mode for individuals with ASD and severe communication impairment. In the first such study, Carr, Binkoff, Kologinsky, and Eddy (1978) taught four children with autism to use manual signs to name objects. The children ranged from 10 to 15 years of age. Teaching involved presenting an object and reinforcing the child when the corresponding manual sign was produced. Response prompts were initially used to ensure that the correct sign occurred and could thus be reinforced. After a number of manual signs had been taught in this way, the authors reported that the children also came to use their newly acquired manual signs to mand for (i.e., request) objects. Subsequent research further demonstrated the efficacy of similar instructional tactics (i.e., response prompting, prompt fading, differential reinforcement) for teaching a range of functional communication skills (i.e., mand, tacts, intraverbals) to individuals with a range of developmental disorders (Duker, 1988; Duker, Didden, & Sigafoos, 2004; Sundberg, 1980).
In a systematic review of this research, Wendt (2009) identified 21 intervention studies aimed at teaching manual signs or gestures to a total of 130 individuals with ASD. Of the 21 included studies, 18 used single-case experimental designs and 3 used group designs. The communication skills targeted for intervention were mainly mands for preferred objects, imitative (echoic) responses, and tacts. The intervention procedures used in these studies generally involved the types of behavioral/systematic instructional techniques described by Duker and colleagues (2004). Specific procedures used included: (1) response prompting (i.e., verbal instruction, graduated guidance, modeling), (2) prompt fading, and (3) differential reinforcement. For most studies, the claim for a positive intervention effect was rated as either conclusive or suggestive, based on Simmonson and Bailey's (1991) guidelines. In only four studies were claims for a positive intervention inconclusive. Overall, these data support the use of behavioral/systematic instructional techniques for teaching functional use of manual signs and gestures to individuals with ASD, but Wendt could not appraise the effectiveness of this approach for adults because the oldest participant in his review was only 16 years of age.

There is one study suggesting that adults with ASD can learn to use manual signs to mand (i.e., request) preferred objects. Specifically, Kee, Casey, Cea, Bicard, and Bicard (2012) provided intervention to a 28-year-old man who was blind and autistic. The aim of the intervention was to teach two manual signs (i.e., EAT and DRINK). These two signs were taught during lunchtime, when it was likely that the man would be hungry and thus motivated to produce the targeted signs to request the available food and drink items. At the beginning of the lunch period, the therapist provided a general verbal cue (i.e., "There is food and drink on the table") and reinforced signing by providing either food or drink. These procedures were in place during an initial baseline phase. After baseline, the intervention procedures were implemented. This involved physically prompting the use of manual signs by lightly touching the man's hand and pushing it in an upward direction. After intervention, signing continued to be monitored during a maintenance and 1-month follow-up phase. The results showed an increase in the number of mands for food from approximately 10 or fewer per session in baseline to between approximately 25 and 40 requests per session in intervention. Mands for food continued at a high and stable level (approximately 40–50 per session) during maintenance and follow-up. The results for the second mand (i.e., DRINK) are more difficult to interpret because the man was already using the sign DRINK at a high rate during baseline (i.e., from 30 to 70 responses per session). In addition, the baseline, intervention, maintenance/follow-up sequence is preexperimental and therefore does not provide conclusive evidence of an intervention effect. Still, this study is unique in its aim to
teach manual signs to an adult who was blind and had autism. The results suggested the intervention was effective in increasing the man’s use of one of the targeted signs.

**Teaching Functional Use of Picture-Exchange Communication Systems**

As with manual signs and gestures, picture-based communication boards and the related Picture Exchange Communication System (PECS; Frost & Bondy, 2002) have been widely used as a mode of functional communication for individuals with ASD. With the latter systems, the individual is generally taught to point to or give the listener a line drawing or photograph representing some object, activity, or event. For example, the individual might be taught to exchange a line drawing of a cup of coffee for a real cup of coffee. In one study, Reichle and Brown (1986) provided intervention to a 23-year-old man with autism who reportedly used no “vocal or verbal language to communicate” (p. 68). Intervention focused on teaching the man to use a communication wallet to make a general request and to label objects. For general requesting, a tray of preferred edibles (e.g., cookies, chips) was presented, and the teacher asked “What do you want?” A correct request required the man to touch a line drawing representing WANT. For labeling, the teacher showed the man an object (e.g., a cookie) and asked “What’s this?” A correct response required the man to touch the matching line drawing from a choice of two line drawings. Later the man was taught to make explicit requests by touching the WANT symbol and then one of the object symbols (e.g., WANT + COOKIE). These skills were initially assessed in a nonteaching baseline. Intervention was then introduced first to teach general requesting. When progress was obtained with general requesting, intervention began to teach object labeling and, after that, explicit requesting in a delayed multiple baseline design (Kennedy, 2005). The teaching procedures involved physically prompting correct responses using graduated guidance (Duker et al., 2004) and reinforcing correct responses with access to the requested item(s) or by giving an unrelated reinforcer (for correct labeling). The results showed that correct requesting and labeling increased with intervention and that performance was maintained after intervention. The unique aspect of this study was that the man received concurrent instruction on two types of mands (general and explicit requests) and a tactual skill (i.e., object labeling). The delayed multiple baseline design strengthens the authors’ claim for a positive intervention effect (Reichle & Brown, 1986). Subsequent work by Reichle and his colleagues (Johnston, Reichle, Feely, & Jones, 2012; Reichle et al., 1991) has provided confirming evidence for picture-based communication approaches for individuals with ASD and other developmental disabilities.
The PECS is a manualized program for teaching functional communication via graphic symbols (Frost & Bondy, 2002). Compared with other picture-based communication approaches, the PECS is unique in that the person is taught to select a graphic symbol (e.g., line drawing, colored picture cards, photographs) and hand it over to a listener, rather than simply touching or pointing to the symbol. For individuals who are ambulatory, this response requirement has the potential advantage of promoting social interaction and gaining the listener's attention. The PECS protocol targets communication skills that are closely aligned with Skinner's (1957) analysis of communicative functions and relies on well-established intervention procedures, such as various response prompting and prompt fading tactics, as well as shaping, chaining, and differential reinforcement. With the PECS, intervention begins by teaching the person to exchange a single picture card to mand (request) a highly preferred object. The person is then taught to seek out the communicative partner before making the exchange. Later, additional mands—requiring symbol discrimination and multisymbol (i.e., sentences) responses—are taught. Additional steps in the PECS protocol target tacts and intraverbals.

Ganz, Davis, Lund, Goodwyn, and Simpson (2012) provided a systematic review and meta-analysis of studies evaluating the effectiveness of the PECS. This team identified 13 studies in which the PECS was implemented with participants with ASD and evaluated them using proper single-case experimental designs (e.g., multiple baseline across participants; Kennedy, 2005). Selected studies also had to have included objective outcome data to enable the calculation of an effect size. These 13 studies included a total of 32 participants, ranging from 3 to 17 years of age. The results of this meta-analysis revealed an overall moderately positive effect, suggesting that there is empirical support for the PECS, at least for teaching functional communication skills to children and adolescents with ASD. Its effectiveness with adults has not yet been sufficiently well researched. However, Ganz and colleagues noted that the results were more positive with younger children versus adolescents. Although speculative, the age trend noted by Ganz and colleagues could suggest that the PECS might be less effective with adults. Conversely, a similar review conducted by Tincani and Devis (2011) found no relationship between PECS acquisition and several learner characteristics, including adult versus child. More research involving the use of the PECS with adults with ASD will likely be needed to elucidate this question.

In another appraisal of the evidence in this area, Lancioni and colleagues (2007) reviewed studies that evaluated the PECS, as well as closely related picture-based communication systems, such as the system used by Reichle and Brown (1986). They identified 17 studies that aimed to teach individuals with ASD and other developmental disabilities to point
to, touch, exchange, or otherwise select graphic symbols (e.g., line drawings, picture cards, photographs). These 17 studies included a total of 173 participants ranging from 3 to 40 years of age. Most of these 173 participants were diagnosed with autism \((n = 169)\), but the total participant pool included individuals with other types of developmental disabilities (e.g., Rett syndrome, intellectual disability, and cerebral palsy). Positive results were noted for 170 of the 173 participants, and one of these treatment failures was due to participant illness. The positive results primarily indicate that participants learned to use the PECS or a related picture-based system to request (i.e., mand) preferred objects. This skill equates to Phase I of the PECS protocol. However, some studies taught more complicated requests that required discriminating between picture cards and seeking out the listener before making a request (e.g., Phases II and III of the PECS protocol). Important for this chapter was the fact that two studies evaluated the use of the PECS with adults with ASD (i.e., Bondy & Frost, 1993; Chambers & Rehfeldt, 2003). Both of these studies reported positive outcomes.

Overall, this overview of studies suggests there is sufficient high-quality evidence to support the use of the PECS and related picture-based communication approaches. The data are especially strong for using this approach to teach children with ASD to request (i.e., mand for) preferred objects. The evidence base for adults is less substantial, but the few existing positive reports do suggest that the approach is promising for adults with ASD.

**Teaching Functional Use of SGD s**

SGDs represent another potential communication option for individuals with ASD (Lancioni, Sigafos, O’Reilly, & Singh, 2013; Mirenda, 2003; Schlosser, Sigafos, & Koul, 2009). SGDs typically consist of a visual display that can be configured with various graphic symbols, such as printed words, line drawings, or photographs. These graphic symbols represent the person’s available vocabulary. With the vocabulary in place, the SGD is then programmed so that touching or otherwise selecting one of the graphic symbols leads to corresponding digitized or synthesized speech output. For example, selecting a line drawing of an umbrella might lead to some relevant corresponding phrase (e.g., “Looks like rain. Can you get me my umbrella, please?”).

Researchers have speculated that SGDs might have several potential advantages as a communication approach for individuals with ASD compared with manual signing or picture-based communication. One potential advantage is that SGDs can be programmed to produce
age-appropriate communication with minimal response effort (Mirenda, 2009; Schlosser et al., 2009). The synthesized or digitized speech output might also help to gain the attention of the listener and provide useful feedback that a communication response has occurred (Boesch, Wendt, Subramanian, & Hsu, 2013). An important question is whether functional SGD use can be taught to adults with ASD.

The results of a study by Banda, Copple, Koul, Sancibrian, and Bogschutz (2010) suggest that the answer to this question might be yes. These researchers investigated the effectiveness of video-based instruction for teaching individuals to request preferred objects using an SGD. The two male participants were 17 and 21 years of age, had been diagnosed with autism, and were described as having no functional speech. Participants received the following sequence of intervention phases: (1) baseline, (2) video modeling, and (3) generalization. These phases were arranged in a multiple-baseline across-subjects design (Kennedy, 2005), and thus the study can be considered to have a high-quality experimental design. At the beginning of the study, a number of preferred (e.g., chips, pudding) and nonpreferred (clipboard, paper napkins) stimuli were identified. The aim of the intervention was to teach the participants to request the preferred stimuli by touching the corresponding photograph of the item from the SGD display. The SGD was available during baseline, but participants were never prompted to request with the device. For the intervention sessions, participants viewed a 10- to 15-second video clip. The clip showed an adult activating the SGD to make a request. After viewing the video, the participants were given the opportunity to use the SGD for up to 30 minutes. After intervention, generalization was assessed with a new set of preferred items. The results were positive in that both participants learned to make requests with the intervention. However, the overall increase in requesting was modest, and one participant never reached the 80% acquisition criteria. It could be that this innovative prompting procedure (i.e., video prompting) might have been more effective if it had been combined with the more direct response prompting procedures that have been used for teaching manual signs and picture-based communication skills.

Lancioni and colleagues (2007) reviewed 16 studies that focused on teaching individuals with developmental disabilities to use SGDs for functional communication purposes. The aim of most of these studies was to teach participants to touch one or more graphic symbols from the SGD display to request corresponding preferred objects. The studies provided intervention to a total of 39 individuals from 3 to 42 years of age, including some adults with ASD. The outcomes from these 16 intervention studies were similar to what Lancioni and colleagues had found for the
PECS studies. Specifically, the vast majority of participants (36 of the 39) acquired the targeted SGD-based communication skills.

In another review, van der Meer and Rispoli (2010) identified 23 studies that aimed to teach individuals with ASD to use SGD for functional communication. These 23 studies provided intervention to a total of 51 participants, ranging from 3 to 16 years of age. Fourteen different types of SGD were used in these studies, including (1) GoTalk, (2) BiGmack switch, (3) Vantage, (4) Lightwriter, (5) Tech/Talk, and (6) IntroTalker. The targeted communication skills were not always able to be matched to Skinner’s (1957) categories, but included (1) mands—that is, requesting preferred objects or activities; (2) facts—that is, social commenting; and (3) intraverbals—that is, answering questions. Additional intervention targets included (1) teaching spelling, (2) reducing perseverative speech, and (3) repairing communicative breakdowns. Most studies (70%) focused on one subclass of the mand—specifically requesting preferred objects. The intervention mainly used familiar and well-established instructional tactics derived from principles of applied behavior analysis (i.e., response prompting, prompt fading, and differential reinforcement; Duker et al., 2004; Fitzer & Sturmey, 2009). Van der Meer and Rispoli classified the outcomes from these 23 studies as (1) positive, if all participants in the study learned the targeted communication skill(s); (2) negative, if none of the participants in the study learned the targeted communication skill(s); or (3) mixed, if some but not all of the participants in the study learned the targeted communication skill(s). Using this classification system, 87% of the studies reported positive outcomes, and 13% reported mixed outcomes. None of the studies reported negative outcomes. This review supports Lancioni and colleagues’ (2013) conclusion that SGDs can be taught as a mode of functional communication. However, no adults were included in these 23 studies, and so a more cautious conclusion is warranted with respect to the use of SGDs with adults with ASD.

Common Steps in Teaching Functional Communication

The research covered in this chapter points to the general efficacy (and perhaps the explicit need for) careful implementation of well-established systematic instructional tactics. The effective instructional tactics common to the studies reviewed herein can, in turn, be closely associated with the field of applied behavior analysis. Showing and telling a person how to communicate with the PECS or an SGD, for example, appears insufficient. Instead, intervention success appears to depend on the four generic intervention steps.
1. Creating frequent opportunities and motivation for communication—for example, by withholding highly preferred objects until the person makes a request.

2. Using effective response prompting strategies to ensure that the person makes frequent correct responses, which can then be reinforced.

3. Using procedures to fade out the need for prompting, so as to ensure that the person becomes more independent in communicating.

4. Providing immediate (listener-mediated) reinforcement. This step would seem critical for teaching and maintaining the person's communication skills. Listeners need to be highly responsive to the person's communicative attempts and provide the right type of reinforcement at the right time.

Interestingly, the studies reviewed in this chapter reveal that these steps have been successfully used for teaching functional communication skills regardless of whether the mode of communication involved manual signs, picture exchange, or SGD-based communication. For example, the therapist might use the same prompting procedure (e.g., perhaps using the least amount of physical guidance necessary or graduated guidance) to prompt the targeted manual sign, to prompt the person to exchange the correct line drawing from a PECS board, or to prompt the person to touch the correct graphic symbol from the display of an SGD. In addition, after a number of correct communication responses have been prompted, successful interventions include implementing a procedure to fade out the use of response prompts, such as by gradually waiting longer and longer before delivering a prompt (i.e., a time-delay procedure) and/or by reducing the amount of prompt given. These prompt-fading strategies have also been successfully applied whether in teaching manual signs, picture exchange, or SGD use. However, such procedures might not be directly applicable for teaching speech because speech cannot be so easily prompted, except perhaps by first establishing some imitative speech. As noted before, this latter objective has been accomplished using shaping procedures similar to those described by Lovaas and colleagues (1966).

Overall, the generic steps or procedures that appear to represent the keys to intervention success have also been successfully used for teaching a wide range of other adaptive skills to individuals with ASD (Duker et al., 2004; Fitzer & Sturmey, 2009). So although these general intervention procedures may not yet have been widely applied to the teaching of functional communication skills to adults with ASD, they must still be seen as having considerable generality and as being empirically validated.
(Horner et al., 2005). Given the extensive evidence base supporting the use of these procedures, successful intervention outcomes for any given adult with ASD are perhaps likely to depend more on the application skills of the therapist than on the specific age of the participant.

Case Example

This case study illustrates the application of the empirically validated steps outlined herein to teach an initial mand to an adult with ASD. The case is taken from a larger study that included a 16-year-old and a 20-year-old (Sigafos et al., 2004). The adult in this study (Megan) was a female diagnosed with autism, intellectual disability, and bilateral hearing loss. Megan had no speech, and her vocal output was restricted to occasional whining and humming. She had no formal method of alternative communication prior to her participation in the study. An initial assessment was undertaken to identify whether Megan had any current way of indicating when she wanted something. This assessment revealed that Megan would reach for and/or lead a person’s hand to objects that she wanted. We also conducted a systematic preference assessment (Duker et al., 2004) to identify a number of preferred foods that we could then teach Megan to request using a single general request form (WANT). Starting with a single general request that can be used to request a number of highly preferred objects is consistent with Reichle and colleagues’ (1991) approach for beginning an AAC intervention.

The study that Megan participated in involved a baseline phase and then the intervention. These two phases were arranged in a multiple-baseline across-participants design (Kennedy, 2005). The AAC mode selected for her was a BIGmack switch (AbleNet, Inc.). We put a single graphic symbol (WANT) on the switch, which was programmed with the message “I want more.” During each baseline and intervention session, Megan received six opportunities to make a request for a number of preferred foods that were offered. During baseline, she gained access to the foods through reaching or leading or by pressing the BIGmack switch to activate the recorded message “I want more.” We reinforced whichever response occurred first with a preferred food, except in one of the five trials, in which we ignored the use of reaching or leading. This was done to assess what, if anything, Megan would do in an attempt to repair the communicative breakdown. Specifically, we were interested in seeing whether she would switch from reaching and leading to using the SGD. We discovered that even when reaching and leading were ignored, Megan never used the SGD in baseline.
Getting her to use the SGD when reaching and leading were ignored thus became the intervention objective. To teach this, we implemented a set of teaching procedures when a communicative breakdown occurred (i.e., when the listener temporarily ignored Megan’s reaching and leading). The teaching procedures consisted of (1) ignoring reaching and leading for 10 seconds; (2) reinforcing SGD use by giving her access to preferred foods, if SGD use occurred independently within the 10-second period; (3) prompting SGD use, using the least amount of physical guidance necessary, if correct SGD use did not occur within 10 seconds; and (4) reinforcing any prompted SGD use by giving her access to preferred foods.

The results suggested that the procedures were effective in getting Megan to use the SGD to repair communicative breakdowns. Specifically, SGD use did not occur during baseline but reached the 80–100% correct level within three teaching sessions. This finding suggests that SGD use might represent a viable communicative repair strategy. This is an important finding because communicative breakdowns are frequently experienced by individuals with ASD, making effective repair strategies highly functional (Brady & Halle, 2002).

Summary and Conclusion

Overall, the studies summarized in this chapter reported generally positive results. Although some participants failed to show much progress, most of the participants in these studies did acquire the targeted communication skills. However, most studies focused mainly on teaching one type of mand (i.e., requesting preferred objects), and few adults with ASD were included in most of the studies. Still, the general intervention approaches and specific teaching procedures that were used in the studies reporting positive results shared a number of common elements, and these common elements have wide generality and considerable empirical support. There are therefore good reasons to suspect that these types of procedures would also be effective for teaching functional communication skills to adults with ASD.

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