Siblings, Peers, and Adults: 
Differential Effects of Models for Children With Autism

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Employing typically developing children and adults as models of appropriate behavior for children with autism and other developmental disabilities has been a common practice for more than four decades, and peer modeling serves as one of the theoretical cornerstones of inclusion and related innovations. In addition to examining adult and peer modeling, this study extends previous modeling research by including a subset of peers—siblings. The authors employed a parallel-treatments single-subject design counterbalanced across stimulus sets and replicated across three participants to extend previous research on the effectiveness of peers, siblings, and adults as models for teaching novel language skills to children with autism spectrum disorder. Participants learned the target skills under all three modeling conditions.

In June of 2001, the National Research Council’s report on educating children with autism declared that an important, if not crucial, aspect of effective educational programs for children with autism spectrum disorder (ASD) is to provide as much intervention as possible in settings with typically developing, same-age peers (National Research Council, 2001). Although some educators proposed inclusive placements for children well before the passage of the Education for All Handicapped Children Act in 1975, inclusive education has become more commonplace in the last decade (U.S. Department of Education, 2001). One primary benefit of inclusion cited by many families, researchers, and advocates is the increased opportunity for children with disabilities to observe and learn from their typically developing peers. Despite the common belief that observational learning is a benefit of inclusive education, very little research examining how best to teach children with disabilities (specifically, autism) to become observational learners is available.

For observational learning to occur, a child must first monitor the activities of a model and then reproduce the relevant and appropriate behavior of that model when presented with similar environmental contingencies. Garfinkle and Schwartz (2002) thus suggested that one prerequisite skill for all observational learning is imitation. The importance of learning through imitation is often acknowledged in everyday life and in the developmental literature (e.g., Bandura, 1986; Bijou & Baer, 1961; Piaget, 1962; Schunk, 1987). Indeed, the idea that students with disabilities would imitate their peers and acquire skills through observational learning was often cited as one of the initial arguments in favor of inclusion (Greenwood et al., 1987; Guralnick, 1976; Wolfensberger, 1972). Evidence for inclusive practices therefore should include studies that examine imitation and modeling strategies that work for children with ASD and other disabilities.

Research has indicated that in most effective modeling programs for children with disabilities, four factors—attention to model, model competency, nature of the model/learner relationship, and length of the model/learner relationship—appear to be prevalent (Bandura, 1977; Carr & Darcy, 1990; Peck, Cooke, & Apolloni, 1981; Strain, Cooke, & Apolloni, 1976). Of these factors, attention to model and model competency have been the most commonly cited in the research literature (Bandura, 1977; Carr & Darcy, 1990; Strain et al., 1976). This in turn suggests that the type of peer model used may play an important role in the effectiveness of a modeling intervention. Peck et al. (1981) postulated that the nature and length of the child’s social history will also facilitate effective imitation. As a result, the type of rela-
The literature contains conflicting evidence regarding the effectiveness of using peer models as a method for teaching children with ASD. However, there is substantial evidence showing the positive effects of using typically developing children as models of appropriate behavior for children with ASD or developmental disabilities (Barry & Overmann, 1977; Egel, Richman, & Koegel, 1981; Garfinkle & Schwartz, 2002; Kohler, Strain, Hoyson, & Jamieson, 1997; Lanquetot, 1989). Peers have been used as exemplars for teaching behaviors such as language (Charlop, Schreibman, & Tryon, 1983), social play (Carr & Darcy, 1990; Peck, Apolloni, Cooke, & Raver, 1978), social interaction (Garfinkle & Schwartz, 2002), vocational skills (Sundel, 1994), and motor responses (Apolloni, Cooke, & Cooke, 1977).

On the other hand, findings from different investigations have caused researchers to question the effectiveness of peer modeling as an instructional strategy for children with ASD. In these studies, the use of peer imitation and modeling to teach concrete or novel behaviors was sometimes inefficient (Ihleg & Wolchik, 1988) or unsuccessful (Charlop & Walsh, 1986). In addition, although in some studies peer models succeeded in teaching novel behaviors, additional prompting or adult intervention was necessary before the subjects provided any consistent imitative response (Blew, Schwartz, & Luce, 1985; Carr & Darcy, 1990; Peck et al., 1978). Some researchers thus have suggested that unless the peer model is to be used on multiple occasions to teach multiple students, this strategy may require too much valuable teacher time that could be better used for direct instruction (Young, 1981).

Siblings represent a special case of peer model that has received insufficient attention in the research literature. If one takes the four previously mentioned characteristics of an effective model (attention to model, model competence, nature of social history, length of social history) as a whole, it would appear that a sibling should make the ideal model. Because of longer and typically positive social histories, as well as more educational opportunities with siblings in the home environment, one might speculate that children with ASD stand to learn more from observing siblings' behavior than from observing the behavior of peers or adults.

Various aspects of the relationship between children with disabilities and their nondisabled siblings have been studied, although the majority of these studies focused on the following three areas:

- the effect that a child with disabilities had on his or her typically developing sibling (Lobato, 1983, 1985),
- the behavior of children with disabilities when interacting with their typically developing siblings (Koegel, Stiebel, & Koegel, 1998), or
- sibling correlates in etiological studies (Rutter, 2000).

Unfortunately, few studies have directly examined the effect of a sibling model on the development of novel behaviors in children with ASD. The small number of studies that have been conducted demonstrated that sibling modeling and direct sibling-to-sibling instruction can be useful educational methods (James & Egel, 1986; Taylor, Levin, & Jasper, 1999). Taylor and colleagues used a video modeling procedure to increase the number of play-related statements that two children with ASD made to their siblings. After viewing videotaped play interactions between their respective siblings and an adult, the target children made a higher number of play comments across three different play situations. Although these studies indicated that sibling modeling can be an effective modeling procedure, they were not able to distinguish exactly how effective sibling models can be because other types of modeling groups were not evaluated.

The purpose of this study was to extend the research base on peer modeling with children with ASD by independently examining the effectiveness of peers, siblings, and adults as models for teaching novel language skills. We included two different child models to provide an initial view of the potential differential effectiveness of these models. To evaluate the three models, we measured the number of correct responses the target children gave to questions about previously modeled picture cards and maintenance of these newly taught language skills.

**Method**

**Participants**

Three preschoolers with ASD were the primary participants in this study. Grouped with each of these primary participants were three models: one typically developing sibling model who attended the same school, one typically developing peer model, and one adult model (see Table 1). In this study, each set of four participants (target child with ASD, sibling model, peer model, and adult model) is referred to as a group (see Note). The target children were between the ages of 45 months and 62 months and had been diagnosed with ASD by a pediatrician or clinical psychologist. All of the children attended an urban, university-based early childhood education preschool and kindergarten that integrates chil-
Table 1. Age and Gender of Participants and Order of Model Presentation by Group and Stimulus Set

<table>
<thead>
<tr>
<th>Group</th>
<th>Target child</th>
<th>Sibling</th>
<th>Peer</th>
<th>Adult role and gender</th>
<th>Set &amp; model presentation order</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>45 mos female</td>
<td>60 mos female</td>
<td>48 mos male</td>
<td>Assistant teacher female</td>
<td>Set 1 (Actions): peer, sibling, adult</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Set 2 (Professions): sibling, adult, peer</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Set 3 (Opposites): adult, peer, sibling</td>
</tr>
<tr>
<td>2</td>
<td>47 mos male</td>
<td>60 mos female</td>
<td>48 mos male</td>
<td>Head teacher female</td>
<td>Set 1 (Actions): peer, adult, sibling</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Set 2 (Professions): adult, sibling, peer</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Set 3 (Opposites): sibling, peer, adult</td>
</tr>
<tr>
<td>3</td>
<td>62 mos female</td>
<td>42 mos female</td>
<td>48 mos female</td>
<td>Head teacher female</td>
<td>Set 1 (Actions): peer, sibling, adult</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>Set 2 (Professions): sibling, adult, peer</td>
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</table>

Children with disabilities with same-age typically developing peers. The target children were selected on the basis of the availability of a sibling attending the same school, previous demonstration of adequate verbal imitation, and one-word expressive communication abilities. Peers were identified from teacher suggestions about children with whom the target child spent the majority of time. Adults were selected based on their previous experiences in teaching the target child (> 6 months).

**Group 1.** This group consisted of Target Child 1, Sibling 1, Peer 1, and Adult 1. Target Child 1 (Erin) was a 45-month-old White girl who had been diagnosed with ASD 9 months earlier. She typically communicated using one-word responses to questions but, according to teacher reports, rarely initiated communication. Although Erin often displayed numerous behaviors associated with ASD (i.e., social withdrawal, stereotypies), she was making progress in several domains targeted by her Individualized Education Program (IEP). During the school year she acquired a relatively large functional vocabulary (approximately 200-300 words), increased her social interactions with peers, and increased her attention skills.

Sibling 1 was a 5-year-old typically developing girl who was in the same inclusive classroom as her younger sister. Sibling 1 showed appropriate language skills for her age, and both her mother and teachers reported that she had a positive relationship with her sister. Peer 1 was a 4-year-old typically developing boy who attended the same classroom as Erin. He was identified by the classroom teacher as a good friend of Erin’s with whom she often spent time in the classroom. Adult 1 was the assistant teacher in Erin’s classroom. This teacher had more than 9 months’ experience working with Erin in the classroom and described her relationship with Erin as very positive.

**Group 2.** This group consisted of Target Child 2, Sibling 2, Peer 2, and Adult 2. Target Child 2 (Jerry) was a 47-month-old White boy who had been diagnosed with ASD at 24 months. Jerry was able to express himself using short sentences and was working in therapy sessions on expanding his communication abilities. Although Jerry rarely initiated interactions (except to request preferred items or activities), he maintained a large functional vocabulary. In addition, he had made remarkable progress in the preschool program, especially in the area of peer social interactions.

Sibling 2 was a 5-year-old White girl who attended an inclusive kindergarten classroom in the same school as her brother. She had language skills that were developmentally appropriate for her age, and she indicated that she had a positive relationship with her younger brother. Peer 2 was a 4-year-old typically developing boy who attended the same classroom as Jerry. Peer 2 was identified by the classroom teacher as one of the children with whom Jerry spent most of his time. Adult 2 was Jerry’s classroom head teacher. She had worked with Jerry for 6 months and, according to Jerry’s mother, was one of the primary influences on his dramatic increase in social skills.

**Group 3.** This group consisted of Target Child 3, Sibling 3, Peer 3, and Adult 3. Target Child 3 (Jennifer) was a 62-month-old White girl who had been diagnosed with ASD at 24 months. Jennifer communicated with peers and adults when approached, but she used one- and two-word phrases during these interactions. According to her mother, Jennifer maintained a large functional vocabulary and communicated in complete sentences but would often revert to short, simple phrases and words (such as common labels and actions) when approached by other children. She maintained frequent social interactions with her peers during play, although these interactions typically consisted of requests and demands by Jennifer.

Sibling 3 was a 3½-year-old White girl who attended a preschool classroom down the hallway from Jennifer. She was described by her teacher as having typically developing cognitive, social, and language skills that were appropriate for her age. Jennifer’s mother also described the sibling relationship as positive although incredibly
competitive. Peer 3 was a 4-year-old typically developing girl who attended the same classroom as Jennifer. Peer 3 was identified by her classroom teacher as one of two children with whom Jennifer spent the majority of her time. Although both Sibling 3 and Peer 3 were quite younger than Jennifer, both were described by the head teacher as “well ahead” of Jennifer in their respective language comprehension and expression skills. Adult 3 was Jennifer’s teacher for more than 18 months and felt that she “understood” Jennifer quite well.

**Setting and Materials**

All of the baseline and experimental sessions took place in the hallway immediately outside of the target child’s classroom. The hallway was largely unpopulated during testing sessions, and distractions were kept to a minimum. Sessions were conducted at a 1 m × 1 m child-size table where the participant sat facing a brick wall and thus had little visual stimulation. All study sessions were conducted during scheduled free-play time. For study sessions, the experimenter invited the children to come outside the classroom to do “special work.”

Study materials consisted of 4" × 6" laminated picture cards. Various pictures from three categories (actions, opposites, professions) were presented to the target child to develop a core set of cards that could not be labeled correctly by the child (see the prebaseline procedures). Table 2 describes the specific stimuli used for each target child. All of these pictures were presented on a plain white background to avoid distracters in the pictures that might act as unintentional discriminative stimuli. Pictures were taken from the Picture This® computer software, printed using a color printer, and then laminated.

**Experimental Design**

In this study, we used a parallel-treatments design (PTD) replicated across three stimulus sets (two sets for Jennifer). A PTD counterbalanced across stimulus sets was used because it has been described as the best method for examining the effectiveness of more than one instructional procedure on the acquisition of independent but comparable skills (Gast & Wolery, 1988). In addition, Gast and Wolery noted that the PTD is more useful than other designs for independently examining the effectiveness of instructional procedures on the acquisition of novel skills. An additional maintenance phase was included for follow-up examination of the newly learned skills.

The initial order of models to which each target child was exposed was determined randomly across children. This order of models remained consistent throughout the initial stimulus set. In subsequent sets, the order was again determined randomly (albeit with the first order removed from the possible combinations), and that order remained consistent throughout that stimulus set. Finally, this randomization of model order was again performed for a third stimulus set. The order of models for each stimulus set across each target child is shown in Table 1. This randomization of model order across stimulus sets and the replication across target children were done to alleviate possible sequencing effects that might result from exposure to multiple interventions.

An added advantage of the PTD is that similar to a multiple probe design, it does not require continuous baseline data collection for behaviors that have yet to be introduced to the design. Hence, the problem of excessively long testing sessions and extended practice of incorrect responding that can occur in a multiple baseline design is alleviated. Researchers conducting previous studies have had success using a PTD to independently examine individual interventions on comparable but independent behaviors (Boulware, 2001; Gast & Wolery, 1988; Schloss, Alper, Young, & Arnold-Reid, 1995). For example, Schloss et al. examined two methods for teaching the acquisition of functional sight words to three adolescents with disabilities.

The visual representation of data in this study looks similar to a multiple baseline design across three stimulus sets and replicated across three models within each set. What differentiates this study from a true multiple baseline design is the fact that each target child was exposed to all three interventions (i.e., models) on the same day and in the same order each day throughout an entire phase (i.e., stimulus set). In a true multiple baseline design, the target child is only exposed to one intervention (model) during each phase of the study.

**Procedure**

Prebaseline. The goal of the prebaseline sessions was to identify 27 test stimuli (i.e., stimuli that the target child could not accurately label) for each child. These selected stimuli were used during baseline and then randomly assigned to each model during the intervention phase. For each of the three stimulus classes (actions, professions, opposites), the target child was shown a picture and given a class-specific prompt:

- “What is this person doing?” (Actions)
- “Who is this person?” (Professions)
- “If this is (e.g., open), then this is _______?” (Opposites)

The target children were given the opportunity to respond to questions about the pictures during 81 different trials in each prebaseline session (each of the 27 different responses was assessed three times per session). After each question prompt and picture presentation, the partici-
TABLE 2. Specific Picture Stimuli Used for Each Target Participant

<table>
<thead>
<tr>
<th>Target child</th>
<th>Picture stimuli</th>
</tr>
</thead>
</table>
| 1            | Actions: diving, hiding, crawling, marching, pointing, digging, waving, throwing, skating  
Professions: fisherman, mechanic, archer, pilot, baker, farmer, dentist, plumber, lifeguard  
Opposites: apart/together, frozen/melted, rough/smooth, open/closed, same/different, front/back, empty/full, heavy/light, skinny/fat |
| 2            | Actions: pointing, diving, hiding, digging, crawling, waving, marching, chopping, skating  
Professions: fisherman, mechanic, archer, pilot, baker, farmer, cashier, dentist, plumber  
Opposites: apart/together, frozen/melted, rough/smooth, open/closed, same/different, front/back, empty/full, heavy/light, skinny/fat |
| 3            | Actions: diving, hiding, digging, waving, marching, chopping, blowing, throwing, skating  
Professions: soldier, dentist, waitress, lifeguard, plumber, archer, pilot, baker, farmer |

Pants were given 5 s to respond. Correctly identified pictures were discarded and new pictures were substituted. The lead author conducted all experimental sessions—prebaseline, baseline, intervention, and maintenance—during short free-play periods to avoid pulling the target child from structured instruction time in the classroom.

Baseline. Similar to the prebaseline sessions, baseline sessions were conducted with the target child and experimenter only. In addition to establishing an initial zero-level baseline across all three response classes on at least 2 successive days, 1 or 2 additional baseline data points were taken 1 day prior to each intervention phase to ensure baseline stability and no carryover effect from one intervention phase to another. For a more detailed explanation of the rationale behind baseline data collection in the multiple probe design (and, consequently, the PTD) see Gast, Skouge, and Tawney (1984) or Gast and Wolery (1988).

Training for Sibling, Peer, and Adult Models. After agreeing to participate in the study, the siblings and peers were told that they would be acting as “special teachers” for the identified target child. Each sibling, peer, and adult model was trained with direct instruction to respond appropriately by correctly labeling the target stimuli following a verbal prompt by the experimenter. No other instructions were provided to the models about how to interact with the target children during testing sessions.

Modeling Intervention. During intervention sessions, the models were instructed to respond appropriately to each of the experimenter’s questions according to how they had been trained. The order of the models was assigned randomly across each phase of the study but remained consistent within each phase/stimuli set. For example, during the Actions set for Erin, the order of models was consistently peer, sibling, adult; however, a different random ordering occurred during the other two phases (Professions, Opposites). During modeling sessions, the experimenter prompted the model by showing a picture card and asking a question about the picture, as described in the prebaseline section. After the correct model response, the experimenter provided verbal feedback to the model (e.g., “That’s correct”), then gave the same visual and verbal prompt to the target child and waited 5 s for a response.

If a target child responded correctly, the experimenter responded by saying, “That’s right,” recorded his or her answer, and continued with the next stimulus. If the target child responded incorrectly, the experimenter recorded his or her answer, remained silent, and moved on to the next stimulus. Because all of the models responded correctly during 100% of the intervention sessions, an error correction procedure was not required.

After nine trials with one model (three trials for each of three stimuli), the experimenter, the target child, and the model went back to the classroom. The experimenter and the target child then returned to the setting with one of the remaining models and repeated the process with different stimuli from the same stimulus class (e.g., more Actions or more Professions). The same modeling procedure was used for each model, and sessions lasted approximately 5 min per model. Altogether, each session required approximately 15 min per day.

The target children remained cooperative for the majority of sessions. The experimenter occasionally did need to redirect a target child’s attention back to the current session, but no sessions required further intervention due to excessively difficult or inappropriate behavior.

A criterion level for successful completion of a stimulus set with a particular model was achieved when a target child responded correctly to 66% of the target stimuli (six out of nine pictures were labeled correctly). Intervention for each phase/stimulus set lasted at least three
sessions and until the target child reached criterion with at least two models. The number of intervention sessions was kept to a minimum, and the criterion level was set modestly low to avoid training incorrect responses in the target child over repeated sessions. Hence, if a target child did not appear to be changing his or her incorrect responses when responding to a particular model, we did not want the child to overpractice incorrect responding.

**Maintenance.** Maintenance effects were measured for each target child in a manner similar to that used for the baseline procedures. The target children were assessed individually and without other models in the environment. Maintenance measures were taken from 1 day to 2 weeks after conclusion of the intervention, according to what the classroom and school schedule would allow.

**Data Collection.** All baseline, intervention, and maintenance trials were scored as correct or incorrect. All responses that occurred within 5 s of a prompt and included the correct noun or verb were scored as correct, regardless of utterance length or structure. In addition, correct articulation of the label was not necessary to score the attempt as correct as long as the participant was able to articulate the root of the label (e.g., *run* instead of *running*).

**Analysis.** To assess the initial effectiveness of a particular model, we examined whether the target child reached criterion on that stimulus set with that model. Further effectiveness was considered through examination of the overall level of correct responses with each model during the intervention and maintenance phases.

To ensure procedural integrity, a testing protocol was followed during each testing session. Procedural reliability data were not collected, however, due to the relative simplicity of experimenter behavior during each session. Regardless, settings, materials, verbal instructions, and procedures were held as consistent as possible across all sessions and participants.

**Interrater Reliability.** During baseline and each phase of the intervention, the first author recorded occurrence and nonoccurrence of target responses. Interrater reliability checks were conducted across all modeling conditions in approximately 21% (8 out of 39) of the sessions and no less than once per treatment phase across each stimulus set. During these sessions, an independent doctoral-level graduate student who had no knowledge of the experimental purposes recorded the target child’s responses (correct or incorrect) and compared her observations at the conclusion of the sessions. Reliability estimates were calculated using a point-by-point agreement ratio. Average reliability was 97% (range = 95%–100%) across children, and agreement never fell below 95%.

**RESULTS**

**Modeling**

The results for each of the target children can be seen in Figures 1 through 3. All of the target children quickly responded to the implementation of modeling across all stimulus sets and across almost all models. That is, the children learned the target behaviors when, and only when, the modeling intervention was introduced. Overall, of the 24 sets of stimuli that were introduced (9 for Erin, 9 for Jerry, 6 for Jennifer), the target children met criterion on 22 sets in a relatively short interval (at most, 4 days).

Although the target children responded positively to modeling, a clear preference for one particular model across or within all target children was not seen. Only Jennifer responded correctly more often in the sibling modeling condition across both stimulus sets in which she was tested. However, neither Jerry’s nor Erin’s data indicated a clear differential effectiveness of one model across the three stimulus sets. Although a clear distinction among the models for effectiveness was not found, in six of the eight stimulus sets, overall correct responding in one of the child modeling conditions (either sibling or peer) was nearly equal to or higher than correct responding in the adult modeling condition.

All of the target children reached the criterion level (correct responses to at least six of nine picture cards) with both sibling and peer models across all stimulus sets. In the adult modeling condition, Erin reached criterion on all sets, but Jerry did not reach criterion in the Opposites set and Jennifer did not reach criterion in the Professions set.

**Maintenance**

When removal of the models occurred during each phase and the target children were tested on each of the three stimulus sets again, Erin and Jerry were able to correctly label the picture cards at least 66% of the time. Interestingly, this includes one set of stimuli for which Jerry did not reach criterion during intervention. Maintenance of learned responses was also seen with Jennifer for the Actions stimulus set. The high response scores on maintenance probes up to 2 weeks after intervention suggest that the learned responses were maintained. Unfortunately, continued maintenance data collection for Jennifer, as well as data for the third set of stimuli, was discontinued because the school year ended.

**DISCUSSION**

This investigation examined the effectiveness of three different types of models on the acquisition of language
FIGURE 1. Frequency of correct responses for Erin during the baseline, peer modeling, and maintenance phases.
FIGURE 2. Frequency of correct responses for Jerry during the baseline, modeling, and maintenance phases.
skills in three children with ASD. The results of this study extend the evidence base concerning the efficacy of modeling as an instructional strategy to teach novel skills to children with ASD. In addition, this study provides more evidence in support of child modeling as a potentially effective educational strategy to use with children with ASD in inclusive environments.

All three target children responded quickly and positively when exposed to each model (adult and child) of appropriate behavior, as compared to baseline. Across all three target children, correct responding increased immediately with the implementation of modeling. Although there was no consistent pattern across the target children, child models were at least as effective, and often more effective, than the adult models across all of the target children.

Previous studies have had varying success using children as imitation models of appropriate behavior to teach new skills. Although imitation of adult models is a typical strategy in young children’s repertoires, for observational learning to be a positive side effect of inclusive education, children with disabilities must learn to imitate other children. Hence, in addition to examining adults as models, our study investigated the use of typically developing children as imitation models. Adult models were included in this study as an additional source of independent examination.

In some cases, child modeling has been criticized as a teaching strategy that may require too many outside resources or too much teacher time to completely train and employ individual models for effective use in educational settings (Young, 1981). Nonetheless, proponents of inclu-
sion feel that the potential benefits of child modeling outweigh these costs and further emphasize that social benefits, such as increased peer interaction, justify the necessity of using additional peer modeling strategies. The results of this modeling study strengthen the case that peers can serve as good models without extensive training (Garfinkle & Schwartz, 2002).

Although we did not systematically examine each of the four characteristics—attention to model, model competence, nature of the relationship, and length of the relationship—most often associated with model effectiveness, according to parent reports, all of these sibling-target child dyads enjoyed long, positive relationships and were competent in the modeling task. If the four characteristics are an exhaustive list of characteristics needed for a good model for a child with ASD, one would expect that the sibling model condition would have been the most effective. However, although the target children did learn in this condition, it was not more effective than the other conditions. This leads to two possible conclusions:

1. There are additional characteristics of effective modeling that were not included in the original description.
2. The inference that siblings make the best fit with the four characteristics is flawed.

We believe that a combination of these explanations is probable.

An additional contribution to effective modeling programs may be provided by two factors: motivation on the part of both model and target child to participate/engage in the exercise and overall satisfaction with the activity. Both of these socially based characteristics were observed by the first author as potential influential factors that may have facilitated correct responding in the target children and models. For example, the increased effectiveness of the peer model for Erin with the Opposites stimuli appeared to coincide with the model’s increased interest in and enjoyment of the activity (possibly a consequence of this child developing a better understanding of his role). In contrast, Erin’s sibling appeared almost bored with the task at the same point in the study, and her effectiveness consequently decreased. Unfortunately, systematic data collection on these characteristics as either primary or secondary factors was not included in the initial study design. The influence of these factors thus is mere conjecture at this point. Further investigations that examine their validity as potential mediating factors are necessary.

What is unclear from the results of this study is a comprehensive identification of additional model characteristics for predicting effective skill acquisition. It appears that focusing solely on the formal model-learner relationship may be too narrow a perspective. Rather, the examination of variables specific to the observational learning context and to the modeling relationship may be a more effective means of predicting individual differences in children’s success with different models. In other words, a sibling may not always be the ideal model. A preferred classmate during circle time or favorite cousin at the zoo might just be better in those particular instances. Understanding what makes an effective model and whether characteristics of models change across time and settings requires further research. Perhaps there are effective methods for assessing model preference that are similar in structure to those we already use to assess reinforcer preference (Fisher et al., 1992; Paclawskyj & Vollmer, 1995).

In a typical reinforcer assessment for children with disabilities, we expose the child to multiple types of potential reinforcers in a noncontingent process. To begin, we identify nine potential positive reinforcers. We then allow the child to have access to three of these items (e.g., blocks, a toy train, a squishy toy) and observe which item he or she chooses. After the child makes a choice, we give her or him the opportunity to play with that item for a brief time. The process is then repeated with the second and third sets of three items. The three preferred items, that is, the one in each set chosen by the child, are presented to determine which is the most preferred at that moment. This strategy assumes that children’s preferences and the reinforcing properties of different stimuli change frequently. Perhaps similar methods could be used to assess for model preference. A teacher could observe the child’s imitative behavior with a selection of different children in structured classroom situations to determine who might be a more effective model. However, as with reinforcer assessments, it is possible that the individual a child finds most rewarding and would like to work with may also fluctuate over time. The effectiveness of one particular child as a model may be much different on a subsequent day or even a different time of day. Obviously, more research is needed to determine the validity of this process.

Some issues must be taken into consideration when evaluating the results of this study. First, the age discrepancies between the target children and their peer and sibling models, as well as among the models, were not held constant across the three groups. For two of the target children, the peer model was notably younger (by 1 year) than the sibling model, whereas in the third grouping, the peer model was actually older than the sibling model. It is possible that age was a contributing factor to the effectiveness and efficiency of a particular model. For example, Jennifer was more than a year older than her typically developing sister, to whom she responded most effectively.

In addition to these age discrepancies, gender of model and target child was not held constant among the
three groups. One of the realities of conducting research within a school environment is that these factors cannot always be controlled. Because there was not an abundance of sibling pairs attending the same early childhood school together, we had to use the few sibling pairs that were available. The differences in these pairs did not allow us to control for all possible variables that might have contributed to variance in the target children's labeling behaviors.

One potential avenue for future research is to look for skill transfer into the classroom. The structured environment and stimulus presentation of this study allowed for more control over potentially confounding factors, such as noisy classroom distractions and interruptions. Because data on generalization were not collected, however, the question of whether skills learned from models will carry over into the classroom cannot be answered here. A measure of generalization would add to the strength of future studies in this area because the contingencies that governed the correct responding in the hallway could differ considerably from those that govern correct responding in the classroom.

Although we did not systematically measure generalization to the classroom, their teachers reported several instances of the target children using their new vocabulary. For example, Erin's teacher reported that Erin was observed crouching underneath the table during snack time. When asked what she was doing, Erin replied, "hiding," as portrayed in the picture card that she learned.

The results from this study should be useful to teachers and staff in special education classrooms. Educators must understand that when the possibility exists for using a sibling or peer as a potential model for teaching skills to children with ASD, he or she may be just as effective (if not more so) than exhausting the much-needed resources of the teacher or paraprofessional. ◆

NOTE
Although each set of four participants is referred to as a group in this study, we do not want to indicate that the design of this study is in any way a traditional group design. This is a single-subject design study replicated across three children.

REFERENCES


