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The Social Role of Imitation in Autism

Implications for the Treatment of Imitation Deficits

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Individuals with autism exhibit significant deficits in imitation skills. This article reviews the importance of imitation in typical development, focusing on the social function of imitation and its role in the development of social communication skills. Second, it reviews evidence suggesting an association between imitation deficits and social communication impairments in children with autism. Third, it discusses limitations of the current method for teaching imitation that targets only the learning function of imitation. Finally, it describes a new imitation intervention designed to teach the social use of imitation in young children with autism. **Key words:** *autism*, *early intervention*, *imitation*, *social communication*

CHILDREN WITH AUTISM exhibit significant impairment in imitation skills. These deficits have been reported on a variety of tasks including symbolic and nonsymbolic body movements, symbolic and functional object use, vocalizations, and facial expressions (for review, see Smith & Bryson, 1994; Williams, Whiten, & Singh, 2004). In typical infants, imitation emerges early in development (Meltzoff & Moore, 1977) and plays a crucial role in the development of cognitive and social communication behaviors, such as language, play, and joint attention (Rogers & Pennington, 1991). This association, as well as evidence for the specificity of the imitation deficit in autism (eg, Charman et al., 1997; Rogers, Hepburn, Stackhouse, & Wehner, 2003; Stone, Ousley, & Littleford, 1997), has led some researchers to propose imitation as a primary deficit that has a profound effect on learning and development in children with autism (Meltzoff & Gopnik, 1994; Rogers & Pennington, 1991), making it an important focus of intervention.

This article reviews the importance of imitation in development. In particular, it focuses on the social function of imitation and its role in the development of social communication skills. Second, it reviews evidence suggesting an association between imitation deficits and social communication impairments in children with autism. Third, it discusses limitations of the current method for teaching imitation that targets only the learning function of imitation. Finally, it describes an imitation intervention designed to teach the social use of imitation in young children with autism.

ROLE OF IMITATION IN DEVELOPMENT

In typical infants, imitation emerges early in development (Meltzoff & Moore, 1977) and serves 2 distinct functions: a *learning function*, through which infants acquire new skills and knowledge, and a *social function*, through which infants engage in social and emotional exchanges with others (Uzgiris, 1981). It is through this *social* use of imitation that typically developing infants acquire

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the social communication skills that are found to be deficient in children with autism.

For example, in typical infants, early face-to-face interactions with caregivers are often characterized by mutual or reciprocal imitation in which both the caregiver and the infant engage in imitation of the others' vocalizations and facial expressions. It is through these reciprocal imitation games that infants communicate social interest in their partner (Nadel, Guerini, Peze, & Rivet, 1999; Uzgiris, 1981, 1999), develop a sense of shared affective experience (Malatesta & Izard, 1984), and engage in conversational turn-taking eventually necessary during spoken communication (Trevarthen, Kokkinaki, & Fiamenghi, 1999).

Toward the end of the first year, play between the infant and caregiver becomes more object focused and the infant begins to imitate the caregiver's actions with toys (eg, Uzgiris, 1990). In the second year, imitation games often involve affective gestures (Kuczynski, Zahn-Waxler, & Redke-Yarrow, 1987). Among mother-child dyads, imitation remains one of the most common, stable patterns of interaction throughout early childhood (Halliday & Leslie, 1986). Reciprocal imitation serves to express interest and engagement between the child and caregiver (Waxler & Yarrow, 1975) and is a strategy through which the child learns conventional actions with toys (Uzgiris, 1990) and affective gestures (Kuczynski et al., 1987).

Reciprocal imitation also plays a key role in early peer interactions. Performance of the same act on the same object initiates interactions between toddlers (Mueller & Lucas, 1975) and often results in maintained or increased social interaction including counterimitation (Eckerman & Stein, 1990; Grusec & Abramovitch, 1982). Sustained reciprocal imitation is the predominant mode of social interaction and preverbal communication between same-aged toddlers (Baudonniere, 1988; Eckerman, 1993). These imitative exchanges appear to foster continued social interaction by communicating a common understanding of ongoing activities (Eckerman, 1993) and play a role in the acquisition of more sophisticated play skills (Morrison & Kuhn, 1983). Imitation of peers serves to increase and refine peer interactions during early childhood and remains a strong elicitor of social interest throughout childhood.

In sum, the social use of imitation in infancy and early childhood is associated with the development of more sophisticated social communication skills. This research would suggest that a disruption in the early social use of imitation might have a significant impact on the development of other social communication skills, a hypothesis proposed by others (Meltzoff & Gopnik, 1994; Rogers & Pennington, 1991).

RELATIONSHIP BETWEEN IMITATION AND SOCIAL COMMUNICATION BEHAVIOR IN AUTISM

Indeed, the research on autism suggests a relationship between imitative performance and other social communication skills, including language, play, and joint attention. There is considerable support for an association between imitation and language abilities in children with autism. Dawson and Adams (1984) found that children with autism categorized as high imitators verbalized to the experimenter significantly more than children categorized as low imitators. Sigman and Ungerer (1984) found that children with autism exhibited specific deficits in vocal and gestural imitation compared with typical children and children with developmental delay. These skills were correlated with receptive language for all 3 groups, and vocal imitation was correlated with expressive language in typical children and children with autism.

A longitudinal study of imitation and language in children with autism found an association between gestural imitation and the development of expressive language 6 months later in young children with autism (Stone et al., 1997). In another longitudinal study, Stone and Yoder (2001) found that motor imitation ability at age 2 significantly predicted language outcomes at age 4, suggesting the strong correlation between motor imitation

and language development in children with autism. In contrast, after controlling for developmental age, Rogers et al. (2003) did not find a relationship between imitation skills (oral, object, or body) and concurrent language age in young children with autism. This finding may be due to the use of different imitation tasks (oral-motor vs verbal) or may suggest that the relationship between imitation and language is mediated by other factors.

The research also supports a relationship between imitation and play skills in autism. A variety of studies have indicated that young children with autism are impaired on the imitation of functional and arbitrary actions with play materials (eg, Charman et al., 1997; 1998; DeMyer et al., 1972; Stone et al., 1997). Hammes and Langdell (1981) found that children with autism performed significantly worse than children with learning difficulties on imitation tasks involving 1 real object and 1 imaginary object or pantomime of an action with 2 imaginary objects. Libby, Powell, Messer, and Jordan (1997) found that children with autism demonstrated specific difficulties with the imitation of a series of pretend acts that formed scripts compared with typical children and children with Down syndrome. These findings are notable because children with autism also display similar deficits in their spontaneous play (Jarrold, Boucher, & Smith, 1993).

In addition, Stone et al. (1997) found that for children with autism, imitation of actions with objects at 2 years of age was highly correlated with the development of play skills 1 year later, suggesting the ability to imitate functional and symbolic actions is related to the development of play skills. Ingersoll and Schreibman (2006) found an increase in the use of spontaneous pretend play in 2 young children with autism after teaching them to imitate actions with objects. However, Rogers et al. (2003) found that object imitation was not correlated with a concurrent measure of play skills in children with autism after controlling for developmental age, whereas it was for children with developmental disabilities. These findings suggest that that there is a relationship between the ability to imitate actions with objects and the development of higher level play behaviors; however, the relationship may be mediated by developmental age.

Imitation deficits may further disrupt the development of peer play, as early peer interactions are heavily based on reciprocal imitation with toys (Eckerman & Didow, 1996; Eckerman & Stein, 1990). Indeed, Stone and Lemanek (1990) found that parents of preschool-aged children with autism reported that their child displayed significantly less imitation of another child at play compared with parents of children with developmental delays.

Several studies have found a correlation between imitation and joint attention in autism. In nonverbal children with autism, Curcio (1978) found that higher gesture imitation performance predicted more sophisticated communicative gestures. In another study, Abrahamsen and Mitchell (1990) found that vocal imitation was highly correlated with the number of pragmatic functions including joint attention that children with autism used during spontaneous communication. Carpenter, Pennington, and Rogers (2002) found object imitation and coordinated joint attention were correlated in preschool-aged children with autism, with object imitation preceding the development of joint attention. Rogers et al. (2003) found that both object imitation and oral imitation were correlated with initiating joint attention in the Early Social Communication Scales (Mundy, Hogan, & Doehring, 1996) in young children with autism after controlling for developmental age.

In a more direct analysis of the relationship, Ingersoll and Schreibman (2006) demonstrated that teaching object imitation skills to young children with autism increased coordinated joint attention. Interestingly, Whalen, Schreibman, and Ingersoll (2006) found that training joint attention initiations (coordinated joint attention, showing, and pointing) in young children with autism resulted in increases in object imitation. These findings suggest that in autism, imitation and joint

attention behaviors are related and increases in one positively affect the other. It may be that joint attention and imitation, particularly with objects, both involve triadic engagement and that either one can support the use of the other.

In summary, children with autism exhibit significant deficits in imitation that are associated with impairments in other social communication skills. It unclear whether imitation is mediating these relationships directly (Rogers & Pennington, 1991), or whether they are due to some other developmental variable that is also reflected in the measurement of imitation skills. For example, imitation has also been shown to be highly correlated with developmental age and autistic symptoms (Rogers et al., 2003), as well as social responsivity (McDuffie et al., 2007; Rogers et al., 2003), all of which may affect social communication development more generally. It is also possible that engagement in specific social communication behaviors influences the development of imitation skills. Regardless of the direction of the relationship, since imitation serves both as learning tool and as social strategy, its disruption is likely to have a profound effect on learning and development (Rogers, 1999; Rogers & Pennington, 1991). This possibility highlights the importance of interventions that teach imitation early in development.

LIMITATIONS OF CURRENT IMITATION INTERVENTIONS

The structured behavioral approach for teaching imitation skills, often referred to as *discrete trial training*, is a commonly used approach in early intervention programs. This approach targets imitation as a learning skill, rather than a social skill, which, once established, is used to teach other more complex behaviors (Lovaas, Freitas, Nelson, & Whalen, 1967). The learning environment is highly structured and adult directed, usually with the child and adult facing each other at a table (eg, Lovaas, 1987; Maurice, Green, & Luce, 1996). Imitation is broken down into discrete subskills, which are presented over multiple, successive trials. The adult selects specific subskills, such as individual nonverbal actions, from meaningful and arbitrary actions the child is not yet performing. The child is taught to imitate in response to the adult's discriminative stimulus "Do this" through the use of explicit prompting, prompt fading, and contingent reinforcement with food or other artificial reinforcers.

Although this method is successful for teaching verbal and nonverbal imitation in a controlled setting (Baer, Peterson, & Sherman, 1967; Lovaas, Berberich, Perloff, & Schaeffer, 1966; Metz, 1965), it has been criticized for several reasons. First, the adult-directed nature of the instruction and tight stimulus control can compromise the spontaneous use of skills (Carr, 1981). Second, the highly structured teaching environment (Lovaas, 1977) and use of artificial reinforcers (Koegel, O'Dell, & Koegel, 1987) can prevent generalization to the natural environment (eg, Spradlin & Siegel, 1982). Third, imitation is taught in isolation, rather than in the context of co-occurring social communicative behaviors, making it unrepresentative of natural adult-child interactions, and potentially limiting its use by parents and other family members (Schreibman, Kaneko, & Koegel, 1991).

Most important, this approach targets only the *learning* function of imitation. Although imitation in this form may be useful for teaching other behaviors such as self-help skills, it likely does not serve as a building block for more advanced social communication behaviors. Teaching imitation's *social* function may be especially important, given recent research that suggests that children with autism are particularly impaired in their spontaneous social use of imitation (Ingersoll, in press; McDuffie et al., 2007; Rogers et al., 2003). For example, Whiten and Brown (1998) found that although individuals with autism were able to imitate after being briefly taught to imitate through a series of prompts, they did not imitate spontaneously, as well as young typical and developmentally delayed children. The authors suggested that individuals with autism are

capable of imitation, as evidenced by their imitation performance in the elicited condition, but lack the social motivation to imitate spontaneously.

Hobson and Lee (1999) compared children with autism and developmental delay on an object imitation task in which the experimenter modeled the action in either a "harsh" or "gentle" style. They found that although children with autism imitated as many goal-directed actions as developmentally delayed children, they did not imitate the experimenter's style. They suggested that children with autism have difficulty with self-other knowledge, which could lead to lack of self-identification via imitation (Hobson & Lee, 1999), suggesting that imitation deficits in autism may reflect difficulty with the social use of imitation.

Ingersoll, Schreibman, and Tran (2003) found that children with autism were more likely to imitate actions with objects that produced a sensory effect in the form of flashing lights and sounds than those that did not. Typically developing children matched for mental age did not show this discrepancy and imitated all actions equally well. The typically developing children also used more social behaviors during imitation than the children with autism. The authors suggested that typical children are motivated to imitate by the social feedback (ie, eye contact with experimenter, exchange of positive affect) they receive during the interaction, whereas the children with autism, who are not motivated by social feedback, prefer to imitate only when provided with a nonsocial reward (ie, sensory feedback).

Stone, Ulman, Swanson, McMahon, and Turner (2004) examined immediate imitation skills in young children with autism in 3 conditions, a structured-elicited condition, a naturalistic social condition, and a spontaneous-instrumental condition in which children observed an experimenter activate a mechanical device to produce lights and sounds and were then given the opportunity to imitate without instructions. Their study found that the children with autism imitated significantly better in the structured-elicited and the spontaneous-instrumental condition than in the naturalistic social condition (Stone et al., 2004). In a related study, Ingersoll (in press) found that young children with autism were less likely to imitate in a naturalistic setting compared with a structured setting; however, typically developing children did not exhibit this discrepancy. This finding suggests that for children with autism, the ability to imitate in a structured setting does not translate to imitation in more naturalistic play settings. It also suggests that children with autism are particularly impaired in their ability to imitate when the function of imitation is purely social. McDuffie et al. (2007) also found that imitation in structured-elicited and spontaneous-instrumental conditions were associated with attention-following skills, whereas performance in the naturalistic social condition was associated with reciprocal social interaction, suggesting imitation serves different functions in different contexts and may be mediated by different underlying skills (Rogers et al., 2003).

In summary, the current method for teaching imitation to young children with autism may not adequately address the social function of imitation. It is likely that the social use of imitation is involved in the development of other social communication skills (Rogers et al., 2003). Thus, intervention programs that promote the social use of imitation would be most effective at promoting the development of other social communication skills (McDuffie et al., 2007).

TARGETING THE SOCIAL USE OF IMITATION

Reciprocal imitation training (RIT) is a naturalistic imitation intervention designed to teach the social use of imitation to young children with autism during play (Table 1). It is based on a naturalistic behavioral model, and thus shares several features with other naturalistic behavioral approaches such as pivotal response training (Koegel et al., 1987, 1989), incidental teaching (Hart & Risley, 1968;

Table 1. Goals, techniques, and rationale for reciprocal imitation training

Goal	Teaching component	Rationale
Increase child responsivity	*Contingent imitation:* The partner imitates the child's actions with toys, gestures/body movements, and vocalizations at the same time as the child.	Increases eye contact and coordinated joint attention. Prepares child to imitate partner and teaches reciprocity.
Increase imitative language	*Linguistic mapping:* The partner describes what the child is attending to and/or doing using simplified language (eg, "Dog is walking") or sound effects.	Provides appropriate language models. Increases imitative and spontaneous language.
Teach imitation	The partner implements the imitation training procedure once a minute on average during play. Once the child has successfully imitated the partner, the partner returns to imitating child and using linguistic mapping.	Teaches reciprocal turn-taking, allows child to take turns leading and following play partner. Enhances social components of imitation.
	Model: The partner models an action paired with a verbal marker that describes the action up to 3 times.	Verbal marker provides cue to imitate but, since it is consistently varied, it does not lead to prompt dependence.
	The partner begins modeling familiar actions with the object the child is engaged with. As the child becomes more imitative, the partner begins to intersperse novel actions.	Beginning with familiar actions and following the child's lead enhances motivation and encourages spontaneous imitation. Gradually introducing novel actions builds play skills.
	The partner models a descriptive gesture that is functionally related to the child's play. Descriptive gestures include conventional, affective, object, attribute, and action gestures.	Gestures are modeled within context to encourage spontaneous gesture use of meaningful gestures.
	Prompting: The partner uses physical guidance to encourage the child to imitate the modeled action if the child does not spontaneous imitate after the third model.	Provides child with information on what to do, assists with motor planning, and encourages future imitation via negative reinforcement.
	Contingent reinforcement: The partner praises the child after imitating and allows the child continued access to the toys.	Encourages future imitation via positive social reinforcement (praise) and tangible reinforcement (continued access to materials).

McGee, Krantz, Mason, & McClannahan, 1983), and milieu teaching (Alpert & Kaiser, 1992; Kaiser, Yoder, & Keetz, 1992), including following the child's lead, explicit prompting, reinforcing attempts, and natural reinforcement. It also incorporates several intervention techniques drawn from the developmental literature such as contingent imitation and linguistic mapping (eg, Warren, Yoder, Gazdag, & Kim, 1993).

The goal of RIT is to teach imitation skills within ongoing social interactions with an adult. This approach uses several naturalistic strategies to teach imitation that are designed to increase social responsiveness and intrinsic motivation. First, the adult contingently imitates the child's actions with toys, gestures, body movements, and vocalizations during play. Duplicate sets of developmentally appropriate toys are used in each session to facilitate contingent imitation. Research indicates that contingent imitation enhances social responsiveness and coordinated joint attention (Escalona, Field, Nadel, & Lundy, 2002; Ingersoll & Schreibman, 2006; Lewy & Dawson, 1992; Tiegerman & Primavera, 1984), which helps the child attend to the adult during modeling, increasing the likelihood of an imitative response. During contingent imitation, the adult describes the actions that the adult and child are performing using simplified language. This form of indirect language stimulation has been shown to increase spontaneous and imitative language in young children with autism (Ingersoll, Dvortcsak, Whalen, & Sikora, 2005; Ingersoll & Schreibman, 2006).

Once the child begins to show an awareness of the adult's contingent imitation, the child is taught to imitate the adult's behavior. There are several goals in teaching the child to imitate the adult. The first goal is to maintain imitation in the natural environment by becoming intrinsically motivating. It is important for the child to see imitation as an effective strategy for both learning *and* interacting. Therefore, actions are modeled that are familiar and directly related to the child's current play. For example, if the child typically plays with a car by rolling it back and forth or spinning its wheels, the adult might model rolling it back and forth, while the child is spinning the wheels. Initially, familiar actions that are self-stimulatory, such as spinning the wheels of a car, may be modeled unless they are disruptive. Starting with familiar actions, increases the child's natural motivation to complete the action. Once the child begins to imitate familiar actions, novel actions are introduced, such as crashing the car into a wall or placing a person in the car. Over time, self-stimulatory actions are replaced with more appropriate actions. However, at all times, imitation is taught around the child's current focus of interest. In addition, the adult uses social praise and contingent imitation once the child imitates. These social reinforcers often occur during natural adult-child imitative interactions and are likely to continue outside the treatment environment; thus, it is hoped that natural, social reinforcement will maintain imitation over time.

The second goal is for imitation to become spontaneous such that the child imitates when he or she sees others perform interesting actions rather than in response to a specific verbal demand. Therefore, specific commands such as "Do this" are avoided. Instead, modeling of the action is paired with a distinct, verbal marker that draws the child's attention to the action. The verbal marker provides a sound effect or describes the modeled action and is consistently varied to prevent the child from becoming prompt dependent. For example, in placing a person in the car, the adult might say, "Vroom, vroom" or "Boy is driving." Although the verbal marker provides a description of the action, specific verbal directions or commands (eg, "Push the car") are avoided.

The third goal is for imitation to be generalized. In typical development, mutual engagement in the same activity conveys meaning rather than the exact duplication of an action. Therefore, the attempt to imitate is more important than the accuracy of the action. Thus, all attempts made by the child to imitate are reinforced with praise. In addition, the adult models a variety of interesting actions from the beginning rather than training

a specific action to criterion. By targeting a variety of actions at once, it is possible to keep the child interested and achieve generalized responding with limited intervention.

If the child does not imitate on his or her own after 3 opportunities, the adult uses physical guidance to assist the child in completing the action. This guidance serves several purposes. First, it helps the child learn that he or she is expected to imitate the model. Second, it provides the child with a motor plan to complete new actions that may be especially helpful for those children who have difficulties with motor planning. Third, it can be seen as a form of negative reinforcement in that children can learn to avoid physical manipulation by completing the act spontaneously.

This intervention was originally designed to teach object imitation (Ingersoll & Schreibman, 2006), but has recently been modified to target gesture imitation (Ingersoll, Lewis, & Kroman, 2007). When teaching gesture imitation, conventional (eg, waving as a greeting; palms up to indicate "Where did it go?"), affective (eg, clapping to indicate "good job"; hands on hips to indicate "mad"), and descriptive (eg, arms out to indicate "big"; point in air to indicate "up") gestures are specifically targeted. Rather than modeling an action with an object, the adult models a gesture related to the child's play with a related verbal descriptor. For example, if the child is rolling a car back and forth, the adult might model a sweeping hand motion ("Car is fast") or a circular hand motion ("Wheels are spinning"). Because object imitation is easier (DeMyer et al., 1972) and more intrinsically motivating, the adult typically targets object imitation before focusing on gesture imitation.

RESEARCH ON EFFICACY

There have been several studies conducted on the effectiveness of this approach. The first study used a multiple baseline design across 5 young children with autism to examine the effectiveness of RIT for teaching object imitation (Ingersoll & Schreibman, 2006). The children in this study ranged in age from 29 to 45 months (mean chronological age [CA] = 36.6 months). All children exhibited significant developmental delay (mean mental age [MA] = 19.1 months) language age and 2 of the children were nonverbal (mean language age [LA] = 16 months) at intake. The children received three 1-hour sessions per week of RIT for 10 weeks targeting object imitation. Generalization probes were conducted at the end of treatment and at 1-month follow-up to assess generalization of skills to novel environments. During baseline, the children exhibited low rates of spontaneous imitation. After the onset of treatment, they showed substantial gains in their use of object imitation. Four of the 5 children maintained these gains after the removal of treatment and generalized their ability to imitate actions with objects to novel play materials, a therapist, and a setting. One-month follow-up data indicated that all children maintained higher than baseline rates of object imitation. Changes in object imitation were also evident on a structured imitation assessment and during a naturalistic, structured observation with the therapist and the caregiver.

In addition, the children made gains in other nontargeted, social communicative behaviors. All children increased their imitative language. Four of the children used more coordinated joint attention and pretend play. For most of the children, increases in the nontargeted, social communicative behaviors maintained after treatment was withdrawn and at 1-month follow-up. Perhaps, more exciting, naïve observers blind to treatment status rated the participants as exhibiting significantly more appropriate social communication skills and appearing more typically developing on a 7-point Likert-type scale at posttreatment than pretreatment, suggesting that this treatment led to socially valid changes for the participants.

A second study targeted the imitation of meaningful gestures (Ingersoll et al., 2007). This study used a multiple baseline design across 5 young children with autism who had difficulty with the imitation and spontaneous

use of gestures. The children in this study were slightly older (mean CA = 41.1 months) and had slightly higher mental ages (mean MA = 24.4 months) than the children in the object imitation study and all were verbal (mean LA = 23.4 months) at intake. Children received two 1-hour sessions of RIT targeting gesture imitation per week for 10 weeks. Generalization probes were conducted once a week throughout treatment and at 1-month follow-up to assess generalization of skills. During baseline, the children exhibited little to no episodes of gesture imitation or spontaneous gesture use. With the onset of treatment, all children exhibited an increase in their imitation of gestures. The imitation generalized to novel environments and maintained at 1-month follow-up. In addition, 3 children exhibited substantial gains, whereas the other 2 exhibited small but consistent gains in their spontaneous use of gestures. Naïve observers who were blind to treatment status rated the children as using more appropriate social communication skills during treatment than baseline. These findings suggest that RIT is effective for teaching gesture use and may have more global effects on social communication.

In a third study, 3 mothers were taught to implement RIT techniques with their child twice a week for 10 weeks in a clinic setting (Ingersoll & Gergans, 2007). The children ranged in age from 31 to 42 months (mean CA = 36.7 months; mean MA = 17.3 months), and 2 of the children were nonverbal (mean LA = 11 months) at intake. The mothers of the 2 nonverbal children were taught to use RIT to teach object imitation and the mother of the verbal child was taught to use RIT to target both object and gesture imitation in a multiple-baseline design. Generalization was assessed in the families' homes at the end of treatment and during 1-month follow-up. Findings indicated that the parents learned to use the intervention strategies and their children improved their imitation skills. The children's and parents' skills both generalized to the home and maintained over time. Parents rated the intervention as effective for improving a variety of social communication skills in their child, simple and easy to use, as well as enjoyable for them and their child. These findings suggest that RIT is appropriate as a parent training intervention.

Hwang and Hughes (2000) used a similar intervention that incorporated contingent imitation, expectant waiting, and communicative temptations to target eye contact, motor imitation, joint attention in 3 young children with autism. They found that the children increased their use of eye gaze and imitation of familiar actions that generalized to novel contexts. This study suggests that related interventions are also effective for increasing social communication skills in young children with autism.

Given the simplicity of the treatment techniques, this intervention would likely be suitable as a peer-mediated strategy. Peers or siblings could be taught to use RIT strategies with children with autism. In fact, given the importance of reciprocal imitation during peer play, it may be more important to teach young children with autism to imitate their peers than adults. A variety of research has focused on teaching children with autism and other developmental disabilities to imitate specific peers behaviors (eg, Apolloni, Cooke, & Cooke, 1977; Tryon & Keane, 1986). The majority of these interventions involve the adult training the peer to model specific actions, while the adult prompts the target child to imitate. A similar approach that incorporates training peers to imitate the child with autism may increase social interaction in addition to imitation. In some preliminary work, we found that typically developing children as young as $2\frac{1}{2}$ could be taught to contingently imitate the behavior of a peer with autism and that the use of contingent imitation corresponded to increases in the toddler with autism's use of coordinated joint attention (Ingersoll & Stahmer, 2002).

This approach may also be adapted for use in group settings. In one study, Garfinkle and Schwartz (2002) taught 4-year-old children with autism to imitate their typically developing peers using a small group intervention.

Each child in the group took turns being the "leader" during which time he or she modeled preferred actions with toys. The other children in the group were then prompted by the adult to imitate the leader's behavior with a duplicate set of toys and were praised for successful imitation. Generalization sessions taken during free play indicated that the intervention resulted in increases in social interactions between the children with autism and the typical peers. This study indicates that peer interventions incorporating contingent imitation and prompts for imitation may be effectively used in preschool classrooms.

In sum, RIT is a novel method for teaching the social use of imitation to young children with autism. The intervention is very efficient, producing meaningful changes in imitation within 20 to 30 hours of intervention. In addition, this intervention facilitates the use of other social communication skills in young children, which makes it a particularly effective intervention at this age. Although this approach produces spontaneous imitation in conjunction with other social communication behaviors, it is unclear whether the children become motivated to engage in imitation for purely social purposes. It is quite possible that their imitation is driven by some other function (eg, obtain continued access to desired materials). Future research is needed to determine whether RIT truly increases the social use of imitation in young children with autism.

In addition, although RIT seems more likely to produce social imitation and facilitate social communication development than the traditional structured approach, research comparing the 2 interventions has not yet been conducted. Future research is needed to determine which interventions are most likely to produce the best long-term outcomes in imitation skills, whether they teach similar or different imitative functions, as well as which interventions have the broadest impact on development. Finally, additional research is needed to determine the optimum intensity, best treatment environment, and for which children the intervention is most likely to be effective.

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