
Mothers' use of imitative play for facilitating social responsiveness and toy play in young autistic children

GERALDINE DAWSON^a AND LARRY GALPERT^b

^a*Department of Psychology, University of Washington, Seattle; and* ^b*Institute of Psychiatry, Northwestern Memorial Hospital, Chicago, IL*

Abstract

The effectiveness of imitating an autistic child's actions as a means for promoting social responsiveness and creative toy play was explored. Fifteen autistic children between the ages of 2 and 6 years and their mothers were assessed before and after a 2-week period during which they engaged in imitative play for 20 minutes per day. At the pre-intervention assessment, autistic children's gaze at mother's face was of longer duration, and their toy play was more creative during imitative play than during a free play session. At the post-intervention assessment, significant cumulative increases in duration of gaze at mother's face and creative toy play were found. Children's positive behavior changes were not found to be a function of developmental level of imitative ability, play skills, Vineland social age, IQ, or severity of autistic symptoms. Instead, the majority of children showed positive responses to this interactive strategy, regardless of these individual characteristics.

The severe social handicaps of autistic children pose a challenging problem for parents and clinicians. Social skills training programs have been fairly successful in teaching autistic children specific social routines, such as how to greet another person (Olley & Stevenson, 1989). Other important aspects of learning how to relate to others, however, have been very difficult to teach. Among the difficulties of most young autistic children are a failure to imitate the body movements and facial expressions of others (Dawson & Adams, 1984), a lack of intentionality in relating to others (Prizant &

Wetherby, 1987), and a failure to engage in reciprocal interactions (Rutter, 1983). These early, basic aspects of relating to others normally develop in the context of parent-infant, face-to-face interaction. In the present study, we investigated the use of a developmentally based approach for facilitating face-to-face interaction between young autistic children and their mothers. Specifically, we studied the effectiveness of imitating an autistic child's actions with toys (imitative play) for promoting social engagement.

Our interest in imitative play arose from a previous study (Dawson & Adams, 1984) in which we found that simultaneous imitation of autistic children's actions with toys significantly increased their eye contact and general social responsiveness, as well as their creative toy play, as reflected in the numbers of toys and schemes used. Tiegerman and Primavera (1981, 1984) reported similar results from their studies of imitative play with autistic children.

We hypothesized that imitative play may

We wish to express our gratitude to the autistic children and their mothers for their cooperation with the study, and the staff at Division TEACCH, University of North Carolina, for their assistance in contacting and assessing the children. Susan Brinn, Margaret Douglas, and Alisa Murray coded the videotapes. The study was supported by a grant from the University of North Carolina Graduate School.

Address all correspondence to: Dr. Geraldine Dawson, Department of Psychology NI-25, University of Washington, Seattle, WA 98195.

be helpful for young autistic children for several reasons. To begin, in the first year of life, parents of normally developing infants commonly imitate their infants' expressions and body movements, often in an exaggerated form (Malatesta & Izard, 1984; Papousek & Papousek, 1977). As a communicative act, parental imitation is believed to promote a sense of shared mutuality, the significant element being the connection or congruence experienced by both partners (Uzgiris, 1981). The fact that infants often smile in response to their mothers' imitations (Papousek & Papousek, 1977) underscores the social nature of this kind of exchange. In a previous study (Dawson & Adams, 1984), we found that many of the preschool-age autistic children we observed were functioning at developmental levels similar to 2- to 6-month-old infants. Thus, by adopting a very simple interactive strategy, imitative play may provide a social experience that is developmentally appropriate and, thus, meaningful to the young autistic child.

Furthermore, imitating the autistic child allows the child to take active control of the interaction, which may facilitate social initiation and intentionality. By providing a highly predictable and salient response to the child's actions, this strategy maximizes the possibility that the child will learn to expect and effectively elicit a response from another person, in this way providing a foundation for reciprocal interaction. Finally, because the interaction is led by the child, he or she can regulate the amount and type of stimulation received, thus ensuring that the interaction is not overstimulating or too complex.

In the present study, we explored whether imitative play, when used daily by mothers over a 2-week period, would result in cumulative increases in social engagement and creative toy play. In addition, we investigated whether the effectiveness of this strategy was a function of developmental level of the child. We predicted that, since imitative play is developmentally appropriate for young infants, this strategy would be most effective for autistic children who are

Method

Participants

Seventeen autistic children were recruited through the TEACCH (Treatment and Education of Autistic and Communication-handicapped Children) program, a state-wide treatment and community-outreach program at the University of North Carolina. Four of the children had not yet begun the TEACCH intervention program; the others had been participating in the TEACCH program for varying periods of time (up to 2 years). Participation in the study was entirely voluntary.

Criteria for inclusion in the study were a chronological age below 7 years and a diagnosis of autism as determined by the Childhood Autism Rating Scale (CARS; Schopler, Reichler, DeVellis, & Daly, 1978). Having met these criteria, two additional selection criteria were used: (1) the child was able to sit opposite his or her mother at a table for at least 5 minutes at a time; and (2) the child had a modicum of toy-manipulative behavior, in order for there to be some behavior for the mother to imitate. Of the 17 children, 2 did not meet the last two criteria: one child did not manipulate the toys, and one would not sit at the table and cried. Table 1 provides a brief profile of the children who participated in the study.

Of the 15 children who began the study, all but one (participant no. 9) completed it. In this case, for a combination of personal and circumstantial difficulties, the mother was unable to perform the intervention on a daily basis. Data from this child were only used to analyze the immediate effects of imitation during the pre-intervention assessment.

Procedure

Each of the following assessments was videotaped, and ratings were made from the videotaped recordings.

Imitative ability. At the initial assessment, the Uzgiris-Hunt Scale of Gestural Imita-

Table 1. *Characteristics of participants*

Participant	Age (mos.)	Sex	IQ	SQ	CARS
1	43	F	50	81	36.5
2	48.5	F	22	46	40
3	29	M	38	54	37
4	45	M	71	54	40
5	34	M	29	56	40
6	20	M	41	59	40.5
7	64	M	49	51	44.5
8	54.5	M	91	72	40
9	53	M	22	43	38
10	48.5	M	50	53	42
11	43	M	73	69	30.5
12	77	F	53	61	33
13	50.5	M	59	68	41.5
14	66	M	100	54	34.5
15	36	M	69	88	37
<i>M</i>	47.5	F = 3 M = 12	54.5	60.6	38.3

Note: CARS, Childhood Autism Rating Scale

tered. The scale consists of imitation tasks at four levels of cognitive complexity, corresponding to Piaget's four stages of imitation development. At each level, several actions were modeled by the experimenter until he was confident that a clear assessment of the child's ability was possible. The child's response to each modeled action was scored as follows: (1) *immediate success*, (2) *gradual success* (after at least one attempt), (3) *approximation*, (4) *failed attempt*, or (5) *failure without attempt*. A child was considered as having achieved a certain developmental level if his or her average score across trials within that level indicated at least gradual success. All children who were functioning at or above stage III were considered High Imitators; those functioning below this level were considered Low Imitators. All subjects were scored independently by two raters. Interrater reliability (percent perfect agreement for classification as High or Low) was 1.00.

Toy play. From videotapes of each child's play with toys, which were recorded during the pre-intervention assessment, a classification of developmental level of play was made. Each separate toy action (scheme) the child used was classified as either simple

(nonfunctional scheme with one object, e.g., bangs block on table), relational (nonfunctional scheme combining two objects, e.g., bangs two blocks together), functional (object was used to perform appropriate function, e.g., stirs with spoon), or symbolic (evidence of imaginary play was present, e.g., pretends block is a pillow). The classification was based on the highest level of play performed. Interrater reliability for coding of toy schemes is discussed later.

Standardized measures. In addition, the child's level of functioning was estimated from each child's IQ (based on a standardized intelligence test, that is, either the Stanford Binet, Wechsler Full Scale IQ, or Leiter), Social Quotient (SQ) (based on the Vineland Social Maturity Scale), and Childhood Autism Rating Scale (CARS) score, all of which were obtained from medical records.

Pre-intervention assessment of mother-child interaction

Free Play 1. In Free Play 1, the mother and child were asked to sit opposite each other at a small table, and a single set of five toys was placed between them. The toys con-

sisted of a wooden dog on wheels, a bucket and shovel, a rattle, a squeaky rubber frog, and a small plastic truck. The mother was instructed to play with her child in the manner she normally would for the next 7 minutes. If the child attempted to leave the table, he or she was gently redirected to return to the table by the mother or experimenter.

Imitation 1. Next, a second set of five toys, identical to the first, was placed on the table, one set before the mother, the original before the child, in mirror-image fashion. The mother was told to "do exactly the same thing as her child did" using her identical toy, to place her toys in a position on the table that could be easily seen by her child, and to stop imitating her child every time her child stopped manipulating a toy. She was asked to imitate all actions the child performed with the toys except destructive ones, such as throwing them or hitting herself or others with them. If the child mouthed the toys, she was asked to simply place her toy near her face. She also was told to concentrate on imitating her child's toy play, but to feel free to imitate facial expressions, body movements (e.g., clapping, bouncing in the chair), and vocalizations, (including noncommunicative babbling). After the mother had been coached for a few minutes in imitating her child, she was instructed to spend the next 7 minutes imitating her child.

2-week intervention. Mother and child were sent home with two sets of identical toys (the same ones used for the initial assessment) with instructions to perform the imitation procedure she had just learned for 20 minutes each day for the next 2 weeks. The instructions for the imitation procedure also were provided in written form, along with the following suggestions. (1) She was asked to conduct the procedure in a quiet, distraction-free place at a small table, sitting across from the child. (2) If the child refused to sit at the table, the mother could ask a family member to assist her in keeping the child at the table by gently redi-

recting the child. However, if the child continued to protest, it was recommended that the imitation procedure be postponed until a later time that same day. (3) If needed, the procedure could be broken down into four 5-minute sessions, although longer sessions were encouraged. (4) Several suggestions for handling negative behavior were provided (e.g., mother was told to ignore child's throwing of toys). The mother also was encouraged to call the experimenter if problems were encountered, particularly if the child was not cooperative. No mother reported more than a mild and transient problem with cooperation on the part of her child. Most mothers reported no difficulties with cooperation.

The mother was asked to record some basic information about each session and to make note of her child's response to each session. These were collected at the end of the 2-week period and used to assess mother's compliance with the procedure. During the 2-week period, two phone calls were made to each mother to "check in"—offer support, answer questions, and encourage compliance with the intervention.

Post-intervention assessment of mother-child interaction

Free Play 2. After 2 weeks, the mother and child returned to assess the effects of the intervention. The first assessment, Free Play 2, was structured identically to Free Play 1 except that an unfamiliar (novel) set of toys was used, which was matched to the first set according to function and general degree of complexity. These toys consisted of a wooden helicopter on wheels, a pot and spoon, a rattle (different from the familiar one), a squeaky, rubber centipede, and a small plastic truck (different from the familiar one). The novel toys were used in order to make this condition as similar as possible to Free Play 1, during which the child was unfamiliar with the toys.

Imitation 2—Novel toys. Next, a second, identical set of toys was introduced, and a 7-minute imitation session was carried out

by the mother and child. The purpose of using the novel set of toys during this condition was to assess whether the effects of the home intervention generalized to unfamiliar materials.

Imitation 2—Familiar toys. Finally, a 7-minute imitation session with the original, familiar toys was carried out by mother and child.

Questionnaire

A follow-up questionnaire was sent to all the mothers who had participated. The questionnaire consisted of three questions that sought the mother's opinion regarding how effective the imitation procedure had been for promoting her child's communicative or social behavior, one question regarding whether the mother had continued to use the procedure after the study was completed, and two questions that sought the mother's feedback regarding ways to improve the procedure. Ten out of 14 questionnaires were returned.

Behavioral coding

From the videotaped pre- and post-intervention observations of mother-child interaction, for each 5-second interval, it was coded whether each of the following child behaviors occurred: vocalizations, positive affect, negative affect, and stereotyped motor behaviors (e.g., hand-flapping). Spontaneous imitation by the child and reciprocal games (sustained interactions involving turn-taking) were coded on a 5-second interval basis for the free play conditions only. Of these coding categories, only vocalizations and positive affect occurred with sufficient frequency to be used in the analyses. One-fourth of the data was coded independently by two raters. Interrater reliability (percent agreement) for vocalizations and positive affect, based on total frequency, was .95 and .89, respectively.

Real-time duration and frequency of gaze at mother's face and gaze at mother's actions were coded for all mother-child in-

teractions conditions in two additional passes through the videotapes. Interrater reliabilities (percent agreement), based on independent coding of one-fourth of the videotapes, were as follows: duration of gaze at face, .94; frequency of gaze at face, .91; duration of gaze at actions, .95; frequency of gaze at actions, .75. Reliability calculations for duration measures were based on durations for each separate gaze, whereas for frequency measures, calculations were based on total frequency.

Finally, toy play was coded for the three imitation conditions. Toy play was not coded for the free play conditions, since during these conditions, the mothers tended to actively direct the child's use of toys, and we were interested in the child's spontaneous use of toys. Each action the child performed with the toys was recorded (e.g., banging, mouthing, rolling). Then the number of times the child changed from one toy to another (toy changes) and the number of different schemes the child used were calculated. Based on independent coding of one-fourth of the videotapes, interrater reliabilities were .83 for total number of toy changes, and .78 for total number of different schemes.

Behavioral measures were divided by the number of seconds of codeable time for each child which varied according to the length of time the child was visible on the videotape.

Results

Immediate effects of imitative play on child's behavior

Gaze at mother's face. The first set of analyses examined whether the children showed an immediate increase in gaze at mother's face (as measured by average and total duration of gaze) in each imitation condition as compared to the free play condition that directly preceded it. The average and total durations of child's gaze at mother's face for the free play conditions (Free Play 1 and 2) and for the imitation conditions (Imitation 1 and Imitation 2—Novel and Familiar

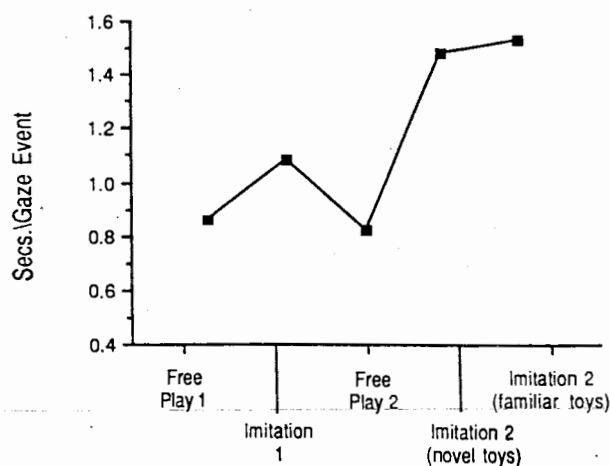


Figure 1. Mean duration of gaze at mother's face (average number of seconds per gaze) for 15 autistic children during each of five conditions: (1) free play with mother, pre-intervention (Free Play 1); (2) mother imitates child's play, pre-intervention (Imitation 1); (3) free play with mother, post-intervention (Free Play 2); (4) mother imitates child's play with unfamiliar toys, post-intervention (Imitation 2—Novel Toys); and (5) mother imitates child's play with familiar toys, post-intervention (Imitation 2—Familiar Toys).

Toys) are displayed in Figure 1 (average duration) and Figure 2 (total duration).

The following comparisons of both average and total duration of gaze at mother's face were made: Free Play 1 versus Imitation 1; Free Play 2 versus Imitation 2—Novel Toys; and Free Play 2 versus Imitation 2—Familiar Toys. As shown in Table 2, five of the six comparisons indicated significant increases in gaze at mother's face; the sixth comparison was marginally significant. Interestingly, significant increases were not found in the frequency of child's gaze at mother's face.

Gaze at mother's actions with toys. In order to assess the immediate effect of imitation on the child's gaze at mother's actions with the toys (rather than her face), identical comparisons were carried out for the measures, average and total duration of child's gaze at mother's actions, the results of which are shown in Table 2. The average and total duration of child's gaze at mother's actions with toys, for each condition, are displayed in Figures 3 and 4.

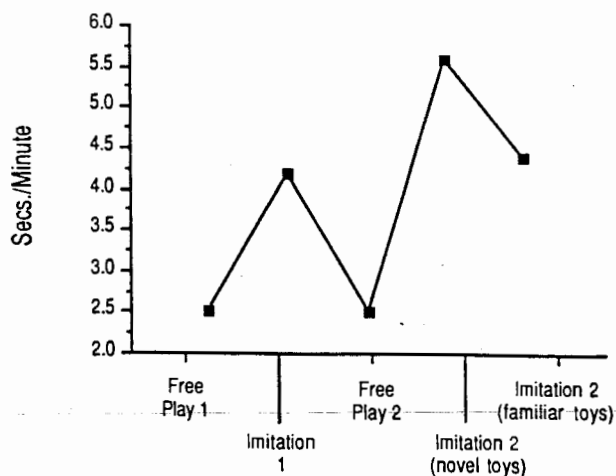


Figure 2. Total duration of gaze toward mother's face (divided by the number of minutes spent in each condition, which varied slightly across children) for 15 autistic children during each of the five conditions described for Figure 1.

As seen from the data in Figure 3, the direction of changes in the average duration of gaze at mother's actions was opposite to that found for gaze at mother's face. That is, whereas gaze at mother's face increased, gaze at her actions with toys decreased. When Free Play 1 was compared to Imitation 1, a significant decrease in average duration of gaze at mother's actions was found. The same pattern was found when Free Play 2 was compared to Imitation 2—Familiar Toys. Furthermore, a marginally significant decrease in the average duration of gaze at mother's toys was found when Free Play 2 was compared to Imitation 2—Novel Toys. For total duration of gaze at mother's actions, marginally significant decreases were found when Free Play 1 was compared to Imitation 1 and when Free Play 2 was compared to Imitation 2—Familiar Toys.

Significant changes in amount of vocalizations and positive affect as a result of the imitation procedure were not found.

Cumulative effects of the 2-week intervention

Gaze at mother's face. A central question of this study was whether behavioral improvements occurred as a result of the 2-

Table 2. Effects of imitative play on gaze and toy play

	Immediate Effects of Imitative Play Compared with Free Play ^a					
	FP1 vs. IM1		FP2 vs. IM2N		FP2 vs. IM2F	
	<i>t</i>	<i>p</i>	<i>t</i>	<i>p</i>	<i>t</i>	<i>p</i>
Gaze at face^b						
Average duration	1.65	.06	2.34	.02	3.45	.005
Total duration	1.77	.05	2.60	.01	2.93	.005
Gaze at actions^c						
Average duration	-2.51	.02	-1.53	.08	-3.74	.005
Total duration	-1.40	.09	-.36	n.s.	-1.58	.07
Effects of 2-week Intervention^a						
	IM1 vs. IM2-F		IM1 vs. IM2-N			
	<i>t</i>	<i>p</i>	<i>t</i>	<i>p</i>	<i>t</i>	<i>p</i>
Gaze at face^b						
Average duration	1.95	.05			1.68	.05
Total duration	.63	n.s.			1.16	n.s.
Gaze at actions^c						
Average duration	-1.17	n.s.			.10	n.s.
Total duration	-2.98	.005			.01	n.s.
Toy Play						
Number of toy changes	1.46	.09			2.31	.02
Number of schemes	.99	n.s.			2.38	.02

^aAll comparisons are one-tailed matched *t* tests.

^bAll significant changes are increases.

^cAll significant changes are decreases.

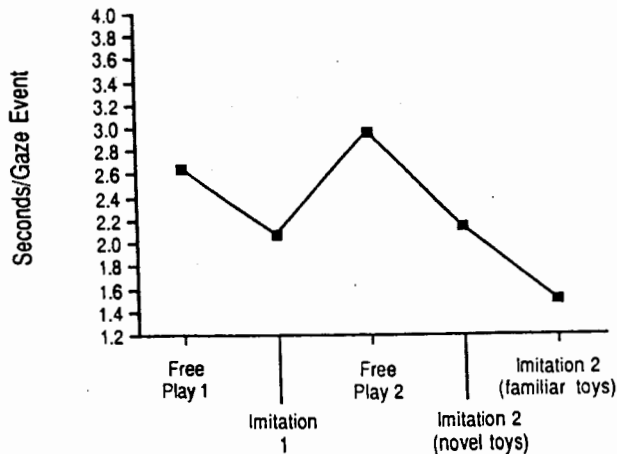


Figure 3. Mean duration of gaze at mother's actions with toys (average number of seconds per gaze) for 15 autistic children during each of the five conditions.

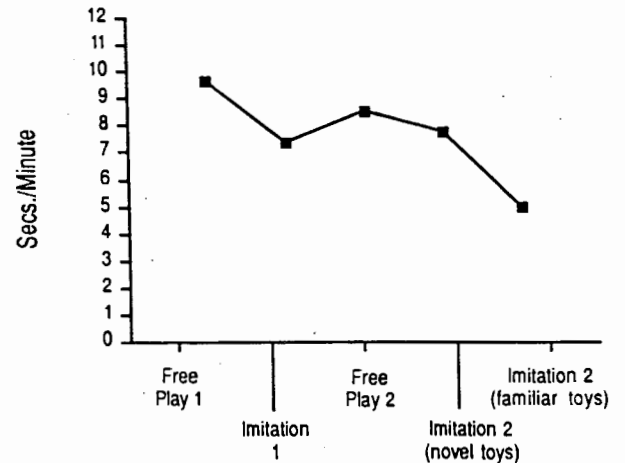


Figure 4. Total duration of gaze toward mother's actions with toys (divided by the number of minutes spent in each condition) for 15 autistic children during each of the five conditions.

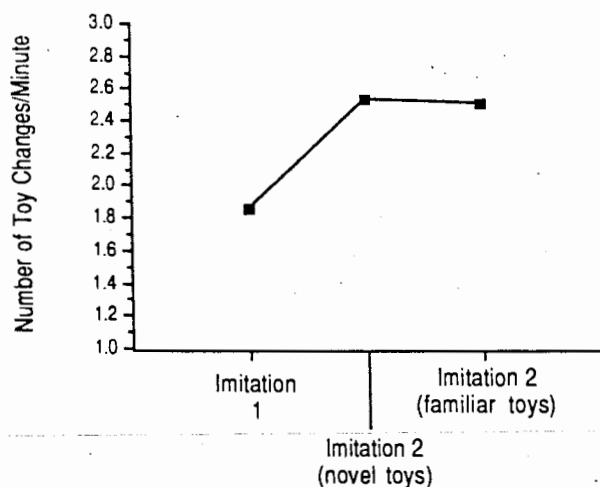


Figure 5. Mean number of changes from one toy to another (per minute) shown by 15 autistic children during each of three conditions: (1) mother imitates child's play, pre-intervention (Imitation 1); (2) mother imitates child's play with unfamiliar toys, post-intervention (Imitation 2—Novel Toys); and (3) mother imitates child's play with familiar toys, post-intervention (Imitation 2—Familiar Toys).

week intervention. This question was first addressed by comparing gaze at mother's face in the pre- versus post-intervention imitation condition with familiar toys (Imitation 1 vs. Imitation 2—Familiar Toys) and gaze at mother's face in the pre-intervention imitation condition versus the post-intervention condition with novel toys (Imitation 1 vs. Imitation 2—Novel Toys). These data are shown in Figures 1 and 2, which display the average and total duration of gaze at mother's face for these conditions. As summarized in Table 2, significant increases in the average duration of gaze at mother's face were found as a result of the 2-week intervention for both of these comparisons (familiar and novel toys). The finding of a significant increase in average duration of gaze at mother's face when novel toys were used indicates that the effects of the intervention generalized to unfamiliar stimuli. Although the total duration of gaze at mother's face also increased in the post-intervention imitation conditions as compared to the pre-intervention imitation conditions, as shown in Figure 2, these increases were not statistically significant. Furthermore, significant changes in frequency of gaze at mother's face were not found.

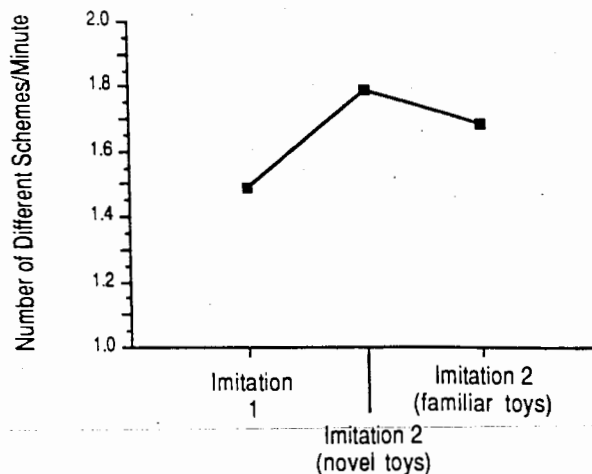


Figure 6. Mean number of different play schemes used per minute by 15 autistic children during each of the three conditions.

Gaze at mother's actions with toys. Next, comparisons of gaze at mother's actions with toys in the pre- versus post-intervention conditions with the familiar toys (Imitation 1 vs. Imitation 2—Familiar Toys) and gaze at mother's actions in the pre- versus post-intervention imitation conditions with novel toys (Imitation 1 vs. Imitation 2—Novel Toys) were made. As summarized in Table 2, only one of these comparisons was found to be statistically significant. The total duration of gaze at mother's actions decreased in the post-intervention imitation condition with familiar toys as compared to the pre-intervention condition. The frequency of gaze at mother's actions with toys did not significantly change over the 2-week period.

Toy play. To determine whether the 2-week intervention positively influenced the children's play with toys, the numbers of toy changes and different toy schemes used were compared for the Imitation 1 and Imitation 2 (Novel and Familiar Toys) conditions. As noted earlier, toy play was not coded in the free play conditions. These data are displayed in Figures 5 (toy changes) and 6 (different schemes). As indicated in Table 2, significant increases in both the number of toy changes and different schemes used were found when Imitation 1 and Imitation 2—Novel Toys were compared. When Imitation 1 and Imitation 2—Familiar Toys were compared, a near signif-

icant increase in number of toy changes was found.

No significant increases in vocalizations and positive affect were found as a result of the 2-week intervention. However, it was discovered from mother's records of their imitation sessions that many mothers did not imitate their children's vocalizations, perhaps because toy play was emphasized in the instructions.

Individual children's responses to imitative play

Gaze at mother's face. We also examined whether a significant number of children demonstrated immediate and cumulative changes in behavior as the result of the imitation procedure. It was found that a majority of children showed an increase in the average and total duration of gaze at mother's face for all possible comparisons between free play and imitation conditions and between the pre- and post-intervention imitation conditions. Based on a binomial test of proportions, the proportion of children showing an increase in the average duration of gaze at mother's face was statistically significant for the comparisons between Free Play 2 and Imitation 2—Familiar Toys ($p < .01$) and between Free Play 1 and Imitation 2—Novel Toys ($p < .05$). Based on a binomial test, the proportion of children showing an increase in total duration of gaze at mother's face was marginally significant for the comparison between Free Play 1 and Imitation 1 ($p < .06$) and significant for the comparison between Free Play 2 and Imitation 2—Familiar Toys ($p < .01$).

Gaze at mother's actions with toys. A majority of children also showed a decrease in average duration of gaze at mother's actions for all possible comparisons between free play and imitation conditions and between the pre- and post-intervention imitation conditions. Based on a binomial test, the proportion of children showing a decrease in average duration of gaze was sta-

the immediate effects of imitation (Free Play 1 vs. Imitation 1, Free Play 2 vs. Imitation 2—Novel and Familiar Toys; $p < .05$ for all comparisons). The proportion of children showing a decrease in total duration of gaze at mother's actions was statistically significant for the comparison between Imitation 1 and Imitation 2—Familiar Toys ($p < .05$).

Toy play. With regard to changes in toy play, a majority of children showed increases over the 2-week intervention period in both the number of toy changes and number of different schemes used. For toy changes, this proportion did not reach statistical significance based on the binomial test. However, for number of schemes, the proportion of children showing an increase was statistically significant for the comparison between Imitation 1 and Imitation 2—Novel Toys ($p < .05$); 12 out of 14 children showed increases in the number of different schemes used with the novel toys after the intervention.

Parent questionnaire

To investigate further the question of improvement after the intervention, the data from the parent questionnaire were examined, the results of which were encouraging. To the questions, "Have your child's imitation skills improved since the study?" and "Has your child's interpersonal behavior improved since the study?" the average response on a 4-point scale from *not at all* to *extremely improved* was halfway between (2) *slightly* and (3) *quite a bit*. One child was felt to be extremely improved on both measures, and no children were reported to have not improved at all. Of the 10 parents, 9 reported that they have continued to use the procedure either frequently or occasionally. No parent felt that there were any drawbacks or negative effects, except one parent who answered "Not sure" and explained that her son had come to insist on her imitating him much of the time. The average response to the question, "Overall,

dure was?" again on a 4-point scale, was (3) *quite a bit*. Two parents felt the procedure was extremely helpful, and all parents felt that it was at least slightly helpful.

Mediating variables

Finally, the possibility of identifying variables that predict which children will benefit most from the imitation procedure was explored. The variables examined were developmental levels of imitative ability and play, IQ, Vineland Social Quotient (SQ), Childhood Autism Rating Scale score (CARS), and chronological age. None of these variables was found to be a predictor of child's response to the 2-week intervention, as assessed by correlations between these variables and pre- and post-intervention change scores for gaze and toy play measures. IQ, alone, was found to be related to gaze and toy play; however, relationships between IQ and these behaviors were found across conditions and did not reflect the child's response to the intervention. Children with higher IQ scores were more likely to gaze at mother's face in all conditions (Pearson product-moment correlations ranged from .42 to .65; $p < .05$, for all correlations), were less likely to gaze at mother's actions with toys in both free play conditions ($r_s = -.52$ and $-.60$; $p < .02$, for both), and vocalized more during all conditions (correlations ranged from .40 ($p < .06$) to .59 ($p < .01$); four out of the five correlations were statistically significant; one was marginally significant).

Discussion

The results of this study support and extend previous findings of the positive effects of imitative play on autistic children's use of gaze and toy play (Dawson & Adams, 1984; Tiegerman & Primavera, 1981, 1984). Both immediate and cumulative increases in the duration of gaze at mother's face and certain aspects of creative toy play were found as a result of the imitative play procedure. The finding that increases in duration of gaze were directed at mother's face and not

simply at her actions with toys suggests that imitative play has a positive effect on autistic children's interest in people as social beings.

The beneficial effects of imitative play found in the present study are especially encouraging in light of the fact that the intervention was only carried out for a 2-week period and for 20 minutes per day. Mothers who participated in the study generally found the intervention to be relatively easy to implement, enjoyable, and helpful for their children. Moreover, contrary to our predictions, children of a fairly wide range of cognitive and social ability responded positively to imitative play. Children's responses to the intervention were not found to be a function of developmental levels of imitative ability and toy play, IQ, social age, or severity of autistic symptoms. Instead, the majority of children showed increases in the duration of gaze at mother's face and creative toy play, regardless of these individual characteristics.

Several limitations of the present study need to be noted. Given the fact that a control group of autistic children who did not receive the intervention was not included, it is impossible to know whether the cumulative changes observed are directly attributable to the imitation procedure. However, the finding that the cumulative increases in gaze and creative toy play were observed only in the post-intervention imitation conditions (and not in the free play condition) suggests that the changes were specific to the imitative play context and are not simply general increases in social behavior related to time or attention bestowed by the mother during the intervention. Furthermore, the finding that the positive effects on children's behavior generalized to the imitation condition with novel toys indicates that the changes in the children's behavior were not simply related to the children's increased familiarity with the toys. On the other hand, the fact that increases in gaze at mother's face and creative toy play were not observed in the post-intervention free play condition suggests that the benefits of the procedure are limited to the imi-

tation interactive context and raises the question of whether this procedure has positive effects on autistic children's social behavior in other contexts. Finally, given that many of the children who participated in this study were enrolled in the TEACCH educational program, it is possible that some of the skills they had learned in this program before entering the study contributed to their positive response to the imitation intervention. In future research, it will be important to assess whether the effects of imitative play generalize to other environmental contexts and subject populations.

Of clinical and theoretical interest is the fact that autistic children's attention to others can be increased, and repetitive toy play can be decreased by a simple interactive strategy that provides simplified, predictable, and highly contingent responses and allows the children to control and regulate the amount of stimulation they receive. Imitative play exaggerates and distills many important features of early social interaction and may thereby assist in the development of the basic building blocks of reciprocal interaction, including a sense of social effectiveness and contingency, social initiation, and the experience of shared communication and mutuality.

Identifying which, if any, of the features of imitative play are responsible for promoting social responsiveness and creative toy play in autistic children is a worthy goal of future research. Part of the explanation for the effectiveness of imitative play may be that this interactive strategy is sensitive to the child's narrow range of optimal stimulation (Dawson & Galpert, 1986; Dawson & Lewy, 1989). Several studies of autonomic and cortical activity in autistic children (Cohen & Johnson, 1977; Hutt, Forrest, & Richer, 1975; Hutt, Hutt, Lee, & Ounsted, 1964; Kootz & Cohen, 1981; Kootz, Mari-

nelli, & Cohen, 1982) have indicated that these children may be chronically overaroused. In imitative play, the child can easily regulate the amount of stimulation received by varying the frequency and intensity of his or her own actions, a feature that may be helpful for children who are easily overstimulated. This explanation for why imitative play may be facilitative of social attention in children with autism is supported by a study carried out by Field (1977, 1979) with preterm infants, who often exhibit high levels of gaze aversion and negative affect. Field found that preterm infants became more attentive when their mothers systematically imitated their infants' behavior than when mothers spontaneously interacted with their infants. Moreover, corresponding decreases were noted in infant tonic heart rate during imitative play. It would be informative to examine physiological measures of arousal in autistic children during imitation and other forms of interaction.

Since parental imitation is a very early form of interaction, it is perhaps most socially appropriate for children who are functioning at early developmental levels. We suggest that imitative play may be used to provide a foundation for establishing social interest and interactive play. This foundation then can be built upon by using other, more sophisticated, interactive strategies and games. We presently are designing and evaluating a series of such strategies for facilitating early social development. While requiring increasing sophistication on the part of the child, these strategies attempt to capture and make assimilable key features of natural social interactions. Whether such an approach will result in positive changes in social behavior that generalize beyond the immediate therapeutic interactive context remains to be seen.

References

- Cohen, D. J., & Johnson, W. T. (1977). Cardiovascular correlates of attention in normal and psychiatrically disturbed children. *Archives of General Psychiatry*, 34, 561-567.
- Dawson, G., & Adams, A. (1984). Imitation and social responsiveness in autistic children. *Journal of Abnormal Child Psychology*, 12, 209-224.
- Dawson, G., & Galbert, I. (1986). A developmental

- model for facilitating the social behavior of autistic children. In E. Schopler & G. Mesibov (Eds.), *Social behavior in autism*. New York: Plenum.
- Dawson, G., Hill, D., Spencer, A., Galpert, L., & Watson, L. (1990). Affective exchanges between young autistic children and their mothers. *Journal of Abnormal Child Psychology*.
- Dawson, G., & Lewy, A. (1989). Arousal, attention, and the socioemotional impairments of individuals with autism. In G. Dawson (Ed.), *Autism: Nature, diagnosis and treatment*. New York: Guilford.
- Field, T. (1977). Effects of early separation, interactive deficits and experimental manipulation of infant-mother face-to-face interaction. *Child Development*, 48, 731-771.
- Field, T. (1979). Interaction patterns of high-risk and normal infants. In T. Field, A. Sostek, S. Goldberg, & H. H. Schuman (Eds.), *Infants born at risk*. New York: Spectrum.
- Hutt, S. J., Forrest, S. J., Richer, J. (1975). Cardiac arrhythmia and behavior in autistic children. *Acta Psychiatrica Scandinavica*, 51, 361-372.
- Hutt, S. J., Hutt, C., Lee, D., & Ounsted, C. (1964). Arousal and childhood autism. *Nature*, 204, 908-909.
- Kootz, J. P., & Cohen, D. J. (1981). Modulation of sensory intake in autistic children: Cardiovascular and behavioral indices. *Journal of the American Academy of Child Psychiatry*, 20, 692-701.
- Kootz, J. P., Marinelli, B., & Cohen, D. J. (1982). Modulation of response to environmental stimulation in autistic children. *Journal of Autism and Developmental Disorders*, 12, 185-193.
- Malatesta, C. Z., & Izard, C. E. (1984). The ontogenesis of human social signals: From biological imperative to symbol utilization. In N. Fox & R. Davidson (Eds.), *The psychobiology of affective development*. Hillsdale, NJ: Erlbaum.
- Olley, J. G., & Stevenson, S. E. (1989). Preschool curriculum for children with autism: Addressing early social skills. In G. Dawson (Ed.), *Autism: Nature, diagnosis, and treatment*. New York: Guilford.
- Papousek, H., & Papousek, J. (1977). Mothering and cognitive headstart: Psychobiological considerations. In H. R. Schaffer (Ed.), *Studies of mother-infant interaction*. New York: Academic.
- Prizant, B. M., & Wetherby, A. M. (1987). Communicative intent: A framework for understanding social-communicative behavior in autism. *Journal of the Academy of Child Psychiatry and Psychology*, 26, 472-479.
- Rutter, M. (1983). Cognitive deficits in the pathogenesis of autism. *Journal of Child Psychology and Psychiatry*, 24, 513-531.
- Schopler, E., Reichler, G., Devellis, G., & Daly, K. (1978). Toward objective classification of childhood autism: Childhood Autism Rating Scale (CARS). *Journal of Autism and Developmental Disorders*, 10, 91-103.
- Tiegerman, E., & Primavera, L. (1981). Object manipulation: An interactional strategy with autistic children. *Journal of Autism and Developmental Disorders*, 14, 27-38.
- Tiegerman, E., & Primavera, L. (1984). Imitating the autistic child: Facilitating communicative gaze behavior. *Journal of Autism and Developmental Disorders*, 11, 427-438.
- Uzgiris, I. (1981). Experience in the social context: Imitation and play. In R. L. Schiefelbusch & D. D. Bricker (Eds.), *Early language: Acquisition and intervention*. Baltimore: University Park Press.
- Uzgiris, I., & Hunt, J. M. (1975). *Assessment in infancy*. Urbana: University of Illinois Press.