Teaching the Imitation and Spontaneous Use of Gestures Using a Naturalistic Behavioral Intervention in Young Children with Autism

Final Report: March 31, 2006
Dr. Brooke Ingersoll

Organization, Design, Methodology, and Outcomes
Members of Research Team: This project was conducted by the Principal Investigator (P.I.), Brooke Ingersoll, PhD, with the assistance of five undergraduate research assistants from Lewis & Clark College. The undergraduate research assistants were Liz Lewis, '05, Meredith Maxon, '05, Samantha Gergans, '06, Johnny Askew, '06 and Emily Kroman, '07. This project was conducted at Lewis & Clark College in Portland, OR. The P.I. was responsible for oversight of all aspects of the study, from recruitment of participants, design of the experimental intervention, training assistants in implementation of the intervention and scoring techniques, and administration of the standardized assessments. The undergraduate research assistants were responsible for implementing the experimental intervention and coding behavioral data from videotape.

Primary Research Question, Summary of Methodology, and Outcomes: This study was designed to determine whether an experimental naturalistic imitation intervention could be used to teach the imitation of descriptive gestures to young children with autism during play. It also examined whether the intervention resulted in increases in the children’s spontaneous use of descriptive gestures. Further, it examined whether the intervention led to socially valid changes in the children’s use of social-communication skills that could be identified by naïve observers.

This study used a multiple-baseline design across five boys with autism ranging in age from 34 to 49 months. Baseline ranged from 2 to 6 weeks, followed by 10 weeks of treatment. Once a week towards the end of treatment, generalization probes, which were identical to baseline and included novel toys, therapist, and setting, were conducted. Participants returned for a one-month follow-up and received three generalization sessions. The first 10 minutes of each day of baseline, treatment, and follow-up as well as all generalization probes were videotaped and scored for total gesture imitation, combined gesture imitation, total spontaneous gesture use, and combined spontaneous gesture use. In addition, the Motor Imitation Scale (Stone et al., 1997) and (2) Structured Laboratory Observation (SLO) with the parent were administered at pre and post. Lastly, the social validity of the intervention was assessed through subjective ratings by naïve viewers of the children’s behavior before and during treatment (Schreibman, Koegel, Mills & Burke, 1981). Two groups of 18 college students viewed one of two tapes containing a videotaped sample of all the participants during a randomly selected baseline session and randomly selected generalization session taken during treatment. One tape consisted of three of the children at during baseline and two children during treatment and the other tape consisted of the same children in opposite points of treatment. The participants completed a brief questionnaire about the children’s imitation, language, play, and social behavior using a 5-point rating scale after viewing each 2-minute segment.

All participants increased their imitation of total descriptive gestures and combined descriptive gestures in the treatment setting and on a structured imitation assessment. Gains generalized to
novel materials, a therapist, and a setting. One-month follow-up data indicated that all children maintained their gains in gesture imitation and combined imitations. In addition, all participants exhibited increases in their spontaneous use of total descriptive gestures which generalized to some untrained contexts. For two children the gains were small, while for three children the gains were robust and included combined spontaneous gesture use. All children increased their gesture imitation from pre to post on the structured imitation assessment. Gains in gesture imitation and spontaneous use did not, however, generalize to use with the parents during the SLO. Finally, naïve observers rated the children significantly better during treatment than baseline in all categories (imitates gestures, uses gestures appropriately, shows interest in adult, imitates actions with objects, plays with toys appropriately, and uses language appropriately). These results provide support for the effectiveness of a naturalistic intervention for teaching gesture imitation and offer a new and potentially important treatment option for young children who are not yet imitating or using descriptive gestures.

How project varied from initial plan: We were able to carry out this project almost exactly as proposed. One small change was that we did not specifically score coordinated joint attention, verbal imitation, and spontaneous speech from the session data due to lack of time. However, the changes we saw in combined imitations and gesture use suggested that the children increased their verbal imitation and spontaneous speech since both of the combined measures included language use. Also, our social validity data suggested that the children exhibited global changes in social responsiveness, supporting changes in coordinated joint attention. We did not include a measure of parent satisfaction or ratings by early childhood special education teachers because it was determined that the measure of social validity that we included was the most conservative approach.

Comparison of predicted and actual outcomes: Our actual outcomes were very consistent with our predicted outcomes with one exception. Our data suggest that the participating children learned to both imitate gestures and use gestures spontaneously during play. These skills generalized to a novel setting, therapist, and play materials. We predicted that the children would also generalize their gesture imitation to interactions with their primary caregivers. However, Structured Laboratory Observations in this study indicate that some of the children did not increase their gesture use with their parents. This is most likely due to the fact that the parents were not trained in the intervention and thus did not provide clear models of appropriate descriptive gesture for the children to imitate. However, it also suggests that it may be necessary to train parents to use Reciprocal Imitation Training with their child in order to produce meaningful changes in gesture use during parent-child interactions. The research in this study suggests that an important next step will be to evaluate the effectiveness of training parents to implement the procedure, which we have done.

Unexpected outcomes: We had one interesting, but unexpected outcome in this study. First, given the close association between gesture use and language ability, we predicted that the children with higher language ages at intake would make more gains in spontaneous gesture use. However, our results suggest that the children with lower language ages at intake made more gains in their use of spontaneous descriptive gestures. In addition, the two children who did not increase their spontaneous use of combined gestures had the highest expressive language age at intake. This finding is consistent with literature on typical development that suggests as children
age, they rely less on gestures and more on spoken words (Namy & Waxman, 2003). Perhaps the use of descriptive gestures improves communicative competency in children with lower language ages; however, as children become more verbally fluent, they rely significantly less on gestures to clarify their communication. Interestingly, even those children with less developed language skills did not augment their communication with gesture until they had received specific training in gesture imitation. This finding is consistent with research that indicates, unlike typically developing children and children with language delay, children with autism do not tend to use gestures to compensate for language difficulties (Wetherby & Prutting, 1984). These observations might suggest gesture imitation would be most beneficial as a treatment target for children with limited language.

**Extent to which research advances the state of knowledge regarding autism intervention:** This study advances the state of knowledge regarding autism intervention in that it demonstrates that imitation of descriptive gestures can be targeted using a naturalistic approach. Previous research has used a structured behavioral approach; thus our findings suggest that imitation can be taught within ongoing interactions. In addition, our findings suggest that teaching children with autism to imitate gestures within natural interactions results in increases in spontaneous gesture use. Further, our findings suggest that this intervention also leads to more global gains in social-communication skills including language and thus increasing gesture imitation in young children with autism may improve communicative competence.

**Future modifications:** Despite the promising results, evidence for generalization to interactions with the parents has been much more limited, particularly for gesture imitation. One potential explanation for this failure to generalize is that parents may not be aware of their own gesture use. Further their gestures may be too subtle for initial acquisition by the child, a possibility that we observed during our parent-child interaction observation, in which the parents did not model many gestures and those they modeled were very subtle. We believe that an important modification would be to include a brief parent training component on the importance of gesture use, appropriate gestures to model, how to encourage children to imitate, and how to reinforce gesture use. Therefore, an important next step in this research is to assess the effect of teaching parents to implement the intervention with their children with autism. We conducted a small study examining the effectiveness of teaching parents to use the experimental intervention to teach their children to imitate with objects. We included one parent-child dyad in which the mother was taught to target object and gesture imitation. Our findings suggested that this is an effective intervention and that teaching parents to target gesture imitation resulted in generalization to the family’s home. This study has been accepted for publication in *Research in Developmental Disabilities*.

**Practical Findings**
The results of this study are relevant for individuals with autism to the extent that they provide support for a novel intervention that is successful for teaching the imitation and spontaneous use of descriptive gestures, an important skill that has received little attention in intervention literature. The intervention resulted both in improvements in the targeted behavior (gesture imitation) but also resulted in spontaneous use of gesture, which generalized to a novel setting, therapist, and materials. In addition, the children were rated as exhibiting more appropriate gesture, social, play, and language skills during treatment, suggesting that the intervention resulted in global changes in social-communication skills that were evident to naïve observers in
a brief observation. These findings suggest that the experimental intervention offers a simple, yet highly effective approach for targeting needed skills in young children with autism. For parents, the results are relevant because they provide support for an effective intervention that targets skills that parents consider to be very important: social-communication. Our findings showed that the gains were limited with parents motivated us to conduct a follow-up study using parent training. These results suggest that parents can learn to use the intervention and that it results in positive gains in imitation skills in their children with autism. Parents in the follow-up study rated the intervention as easy and enjoyable to use as well as effective for increasing a variety of social-communication skills in their children. This finding suggests that the intervention would be highly appropriate for parent training. For teachers, the findings are relevant because they offer a new and potentially promising intervention option for targeting gesture imitation skills in young children with autism. Based on these and previous findings, it is recommended that early intervention programs use RIT to target both gesture and object imitation skills in their young students with autism. This recommendation would provide a better treatment option for early intervention programs for children with autism.

**Implications for Future Research**

Submission to Professional Journals: We submitted a report on this study to the *Journal of Autism and Developmental Disorders* on February 4th. A copy of our submission is included with this report. A review paper including data from this project has been accepted for publication in *Infants & Young Children* and an article on the modification of the experimental intervention for use by parents has been accepted for publication in *Research in Developmental Disabilities*. Copies of the preprint of these articles are also included with this report. Data from these studies have also been presented at conferences of the Western Psychological Association, California Association for Behavior Analysis (CalABA), and the Society for Research in Child Development (SRCD).

Future Research: The findings of our study suggest two future directions. First, we are interested in conducting a larger study of the experimental intervention targeting both object and gesture imitation using standardized assessments and randomized control trials. Along these lines, we are interested in determining whether certain behavioral characteristics can predict which children respond best to the intervention and whether changes in imitation as a result of the intervention lead to gains in other social-communication skills, including language, play, and social interaction. Second, we are interested in comparing the effectiveness of this intervention to Discrete Trial Training (DTT), a traditional structured imitation training procedure that is commonly used in early intervention programs to determine whether one intervention leads to greater gains in imitation skills and/or more improvement overall in social communication than the other.

Level of Funding for Future Research: We have just received a $137,264 grant from Cure Autism Now (CAN) to fund the first study. We also plan to approach Organization for Autism Research to conduct a study comparing this intervention to discrete trial training.

Comments/Suggestions:

It has been a wonderful experience working with the Organization for Autism Research on this research project. Thank you very much for your support.
Financials (attachments):  
The following is an itemized accounting of grant monies provided by the Organization for Autism Research. There have been no additional funding sources for this project. Attached is the official financial report.

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