Journal of Autism and Developmental Disorders, Vol. 18, No. 4, 1988

Producing Speech Use in Nonverbal Autistic Children by Reinforcing Attempts[1]

Robert L. Koegel[2]
University of California at Santa Barbara

Mary O'Dell
Rio School District

Glen Dunlap[3]
Marshall University

It has been extremely difficult to teach speech to severely handicapped nonverbal autistic children. However, an overview of the literature suggests the possibility that selecting aspects of motivation as a central target behavior, rather than concentrating on motor speech production per se, may improve the effectiveness of teaching speech to these children. Therefore, the purpose of this experiment was to compare two different reinforcement conditions; one in which successive motor approximations of speech sounds were reinforced; and a "motivation" condition in which attempts to produce speech sounds were reinforced, without any motor shaping of speech. The results, replicated within a repeated reversal disign, showed that reinforcing speech attempts was more effective than reinforcing motor speech sounds with respect to (a) the children's interest, enthusiasm, happiness, and general behavior during treatment; and (b) improvements in the children's speech production. The results are discussed in terms of their relationship to the literature on normal parent–child speech interaction, success and failure, and learned helplessness.

[1]This research was supported by Public Health Research Grants No. MH28210 and MH39434 from the National Institute of Mental Health, U.S. Department of Education (Special Education Program) Research Contract No. 300-82-0362, and a grant from the California Community Foundation.
[2]Address all correspondence to Robert Koegel, Speech and Hearing Center, University of California, Santa Barbara, California 93106.
[3]Current affiliation: Florida Mental Health Institute, University of South Florida, Tampa, Florida.

0162-3257/88/1200-0525$06.00/0

Throughout the history of teaching autistic and other severely handicapped children, researchers, educators, and therapists have reported extreme difficulty in teaching speech to these children (Garcia & DeHaven, 1974; Lovaas, 1977; Sloane & Macaulay, 1968). The lowest functioning children typically present severe behavioral deficits in areas such as appropriate affect, social behavior, and verbal and nonverbal communication (Hollis & Carrier, 1978; Ritvo & Freeman, 1978; Rutter, 1978). Further, during treatment they frequently exhibit negligible orienting responses, excessive stereotypic and self-stimulatory behaviors, and excessive tantrums. Their disregard for external events and lack of curiosity (cf. Koegel & Schreibman, 1976; Rutter, 1966) have been extreme obstacles to the implementation of therapy techniques.

While early research has demonstrated that such children can be taught some speech (cf. Hewett, 1965; Lovaas, Berberich, Perloff, & Schaeffer, 1966), it has only been with extreme difficulty, frequently requiring tens of thousands of trials and years of effort (cf. Lovaas, 1977). Largely because of the effort required, it has been extremely difficult to encourage professionals to work with such children, and many have abandoned them from their case loads entirely (Koegel & Traphagen, 1982). As a result, researchers have been searching for key variables that might influence the way in which such children learn, so that the power of the treatment techniques might be enhanced.

One very promising avenue of research is focusing on the fact that virtually all successful attempts to teach speech to these children have included strong motivational components (R. L. Koegel & Koegel, 1988). Although the target behavior itself may have been motor speech, powerful reward systems typically were incorporated in the treatment programs. Further, researchers periodically have reported remarkable bursts of spontaneous speech from such children when the children unexpectably encountered extreme positive or negative motivational conditions. For example, a nonverbal autistic child encountering a large frightening dog might suddently yell "help"; or such a child, encountering an appealing display of lights, might produce whole words without any formal teaching (Fineman, 1968; Lovaas, personal communication; Schreibman, personal communication). Such observations, coupled with the fact that the area of motivation has been an extreme concern for treatment providers of severely handicapped children (Mittler, 1966), has led to a number of recent investigations into motivation as a possible key target behavior for such children (Churchill, 1971; Dunlap, 1984; Dunlap & Koegel, 1980; Egel, 1980, 1981; Koegel & Egel, 1979; Koegel, O'Dell, & Koegel, 1987; MacMillan, 1971). A large body of literature now suggests the likelihood that the treatment of motivation might be a central variable in the improvement of a variety of affective, social, and speech behaviors in

such severely handicapped children, raising the question of whether it might be more effective to treat motivation itself, rather than to treat motor speech as the central target behavior (see Goetz, Schuler, & Sailor, 1983; Koegel & Johnson, in press; R. L. Koegel & Koegel, 1988; Koegel & Mentis, 1985, for reviews). This hypothessis, which is similar conceptually to the competence model proposed by White (1959), focuses on the notion of increasing a child's motivation to respond by increasing the number of successes a child has when attempting to respond (also see Dunlap, 1984; L. K. Koegel & Koegel, 1986). Therefore, we reasoned in an analogous manner that by directly reinforcing all attempts at speech use, we might increase the children's motivation to speak, and thereby enhance speech treatment results. Thus, the specific purpose of the present investigation was to compare two conditions: one condition in which successive motor approximations of speech sounds were reinforced; and another condition in which attempts to produce speech sounds were reinforced, without any shaping of motor speech.

METHOD

Subjects

Four children with exceptionally severe communication delays participated in this investigation. Children 1, 2, and 4 were male, aged 3-3, 8-4, and 11-9, respectively. Child 3 was a female aged 9-0. Prior to the study the three older children had received formal diagnoses of autism by two independent agencies according to the U.S. National Society for Children and Adults with Autism criteria (Ritvo & Freeman, 1978), and Child 1 had been diagnosed as developmentally delayed with autistic characteristics. All of the children were functioning at a nonverbal level, and all exhibited severe disturbances in development in areas of cognition, play, social relatedness, and stereotypic responding. Although none of the children were formally testable on standardized tests, teachers and psychologists estimated their functioning to be at approximately the 1-year level. In summary, the children were selected because they were functioning at an exceptionally severe level of handicap.

Setting

All sessions took place in a small clinic room at the University of California at Santa Barbara. The room contained a table, several chairs, and a variety of toys and materials. A one-way window was in the door which led

to an observation hallway. An inconspicuous video camera was mounted in a corner and was controlled by equipment located in an adjacent room.

All sessions were approximately 20 minutes in length and were conducted in a one-to-one clinician–child format. The clinician and child sat next to each other, with a table beside them, and a variety of toys within easy reach of the clinician who would present the toys and model speech sounds for the child. The clinicians for all sessions were advanced graduate students in Speech and Hearing.

Experimental Design

In order to compare and replicate the effects of the two conditions (i.e., reinforcement of motor speech vs. reinforcement of speech attempts) a within-subject repeated reversal design was employed (Barlow & Hersen, 1984). A child began in one condition (e.g., the motor speech condition) for 2 to 6 treatment sessions, and then entered the other condition (e.g., reinforcement of verbal attempts) for 2 to 6 additional sessions before conditions would again be reversed to the original condition. In this manner, each child participated in from 3 to 6 alternations of treatment conditions, for a total of 14 to 24 treatment sessions per child. To control for order effects, the initial treatment condition for one of the children was the opposite of the initial treatment condition for the other children. The number of sessions per condition was varied (from 2 to 6) in order to ensure that neither the length of the conditions nor any periodicity in responding could influence the results. The exact order of conditions and number of sessions for each child are depicted in the graphs shown in Results.

Independent Variable

All treatment procedures were held constant (see fidelity of implementation measures below) except for the systematic manipulation of the type of response-reinforcer contingency used during treatment. That is, in one condition successive approximations of *motor speech* sounds were reinforced. In the other condition, any *verbal attempts* to speak were reinforced, independently of whether or not they were correct motor productions. Descriptions of each of these contingencies are provided below.

Motor Speech Condition. In this condition successive improvements in motor speech were reinforced, such that only a child's motor speech productions that met or exceeded a phonetic criterion were reinforced. The initial phonetic criterion at the start of any given session was based upon the child's most frequent phonetic response during a five-trial sampling of the child's

utterances for each target word. This criterion was then advanced systematically in a shaping paradigm every time the child produced 6 out of 10 responses that met or exceeded the already established criterion (Martin & Pear, 1978). Each such advancement in successive approximations was based upon the requirement that the child produce at least one more correct distinctive feature (Ingram, 1976; Schane, 1973) of the target word, in a stepwise progression, with (as noted above) advancements made every time the child met a given phonetic criterion.

Verbal Attempts Condition. In this condition any (non-self-stimulatory) voco-verbal response that included an observable attempt to speak was reinforced, independent of whether or not it was correct from a phonetic perspective. Observable attempts were defined as including the following three components: (a) the use of at least normal vocal loudness; (b) body and facial orientation towards the clinician and/or relevant stimulus materials; and (c) the response appeared task-directed and purposeful. The response did not need to resemble the target word in any way in order to be reinforced.

Stimulus Presentation

Stimulus words were selected for each child individually prior to the start of the experiment, and (since the children served as their own controls) the same words received treatment in all conditions for any given child, within the context of the repeated reversal design. The syllable length and phonemic composition of the target words was based upon each child's stimulability prior to the start of the experiment. The words were also selected based upon the ease with which they could be associated with a variety of natural reinforcers. Accordingly, Child I and Child 3, who were severely impaired, worked primarily on one- and two-syllable words, such as "hit," "up," "dog," and "music." Child 2 and Child 4, who were easier to stimulate, worked on multiple word utterances such as "I want it," "put away," "play wtih toy," "want toy," "more blow," and "brush hair."

The presentation of the target utterances was varied to provide stimulus variation and novelty during the task. A specific verbal model (e.g., the word "blow") was presented for an average of three trials, then a different target word (e.g., "up") would be presented, with the restriction that each target word would receive a total of 20 treatment trials per session.

Stimulus materials included a variety of toys, games, and activities on the table between the child and clinician. On each trial the child would be encouraged to select a stimulus object from the table, and the clinician would demonstrate the use of the object while modeling a relevant target word. For example, if the child chose a set of cymbals, the clinician might hit the cym-

Table I. Percentage of Appropriate Use of Clinical Techniques for the Two Experimental Conditions

Behavioral category	Motor shaping condition	Attempt condition
Controlled		
1. Discriminative stimuli	99	100
2. Consequences	86	87
3. Discrete trials	100	100
4. Shared control	100	100
5. Turn-taking	100	100
6. Variation of task	100	100
Manipulated		
7. Shaping	97	46
8. Reinforcement of attempts	20	99

bals together while saying the word "hit." If the child made a verbal attempt to say the word (in the verbal attempts condition) or a correct phonetic approximation of the word (in the motor shaping condition) the clinician would reward the child by allowing the child to play with this preferred toy (see Koegel, O'Dell, & Koegel, 1987; Koegel, Dyer, & Bell, 1987, for further description of these procedures).

Fidelity of Implementation of Treatment Conditions

In order to insure that both treatment conditions were implemented faithfully, 38 videotaped sessions (19 in each condition) were scored to assess the clinician's percent correct use of eight major therapy categories. The first six categories represented general clinical procedures common to both conditions and the last two categories represented the manipulation of the independent variable in this experiment. The specific categories were as follows: (1) clear speech models for the child to imitate; (2) clear and appropriate consequences for correct versus incorrect child responses; (3) clearly discriminable treatment trials; (4) appropriate shared control of stimulus materials by the clinician and child; (5) appropriate turn-taking between the clinician and child; (6) appropriate task variations; (7) correct shaping of motor speech production; and (8) reinforcement of verbal attempts to speak. Two trained judges, naive to the experimental condition they were observing, independently scored the videotapes in a random order, for each therapy category following each 10-second segment. Table I shows the percentage correct use of each therapy category. As can be seen, all the categories were scored as being used correctly at very high levels in both experimental conditions (range: 86 to 100% of the intervals), except for categories (7), shaping of motor speech productions, and (8) reinforcement of verbal attempts to

speak. These other two categories, reflecting the manipulation of the independent variable, were used differently in the two conditions. That is, motor shaping was scored as being performed 97% of the time in the motor-shaping condition, but only 46% of the time in the reinforcement of verbal-attempts condition, where there was (appropriately) no motor shaping contingency. Conversely, reinforcement of verbal attempts was scored as being performed 99% of the time in the verbal-attempts condition but only 20% of the time in the motor-shaping condition, where (appropriately) a motor production needed to be performed at a specific phonetic criterion, regardless of whether it was a clear speech attempt, in order to be reinforced.

Dependent Variables

The dependent measures, including ratings of affect and measures of improvement in speech production, were recorded in all conditions in the experiment.

The first set of measures concerned the children's affect and general conduct during the treatment conditions. The observers used a 6-point rating scale (Dunlap, 1984; Dunlap & Koegel, 1980; L. K. Koegel & Koegel, 1986; Koegel & Egel, 1979) to rate the children's interest, enthusiasm, happiness, and general behavior. Scores could range from 0 to 5 points, with average scores for a session from 0 to 1.6 representing degrees of extremely poor general behavior for that session. Scores of 1.7 to 3.3 represented neutral affect (i.e., neither high nor low interest, enthusiasm, nor happiness, and neither exceptionally good nor poor general behavior). Scores of 3.4 to 5.0 represented degrees of extremely high interest, enthusiasm, and happiness, and extremely good general behavior. For every session in the experiment, raters, trained in using the scales, recorded data in continuous 1-minute windows throughout every session, from videotapes presented in a random order.

The second set of dependent variables concerned the children's improvements in speech production from session to session, in each condition. In both conditions the improvements in correct speech productions per session were defined according to the same phonemic criteria described above. That is, the children's average improvement in speech production in each condition was determined from phonetic transcriptions of the children's responses, with each target word assigned 12 levels based upon a distinctive features analysis (cf. Ingram, 1976; Schane, 1973). Thus, the more distinctive features of the target word that were included in the child's verbal response, the higher the speech production score for the response, ranging from 0 to 12. Then the average score for each word was determined for each session,

so that it could be subtracted from the average score for the following session to yield a numerical gain (or loss) score.

Supplementary Follow-Up Measures

As of the writing of this article, three of the four children were available for follow-up measures. All three children had received 4 years of speech therapy. Two of the children (Child 1 and Child 2) had been discharged to two different treatment programs staffed by clinicians who had been trained in the use of the procedures used in the *attempts* condition. Child 3 had been discharged to a different treatment program that utilized *motor speech* shaping procedures.

At follow-up, each of the children participated in a videotaped interaction with adults who were unknown to the children (they were introduced as friends of the therapist), and who were naive to our experimental arrangements. Each of these sessions continued for 10 consecutive minutes of conversational interaction. Two observers then independently recorded the total number of intelligible words spoken by each child and the length of utterance for every verbal interaction for each child.

Reliability

Two observers, blind to the experimental conditions, independently recorded each dependent variable, and the fidelity of implementation of treatment measures from videotapes (presented in a random order) for 40% of the sessions in the experiment. Percentage agreement between observers was calculated by the formula, number of agreements divided by number of agreements plus disagreements times 100. An agreement for the percentage of correct responding measures and for the follow-up measures was defined as the two observers recording a response in the identical manner on a trial-by-trial basis. An agreement for the four affect scales was defined as the two observers' scores for a session being within 0.5 points of each other (on the 6-point scale) on a session-by-session basis.

The resulting reliability calculations yielded an average percentage agreement score of 78% (range: 75–84% across the four children) for the improvement in speech production measure, an average percentage agreement of 95% (range: 92–100%) for the follow-up measures, an average percentage agreement of 100% for the affect scales, and an average percentage agreement of 83% (range: 79–100%) for the fidelity of implementation measures.

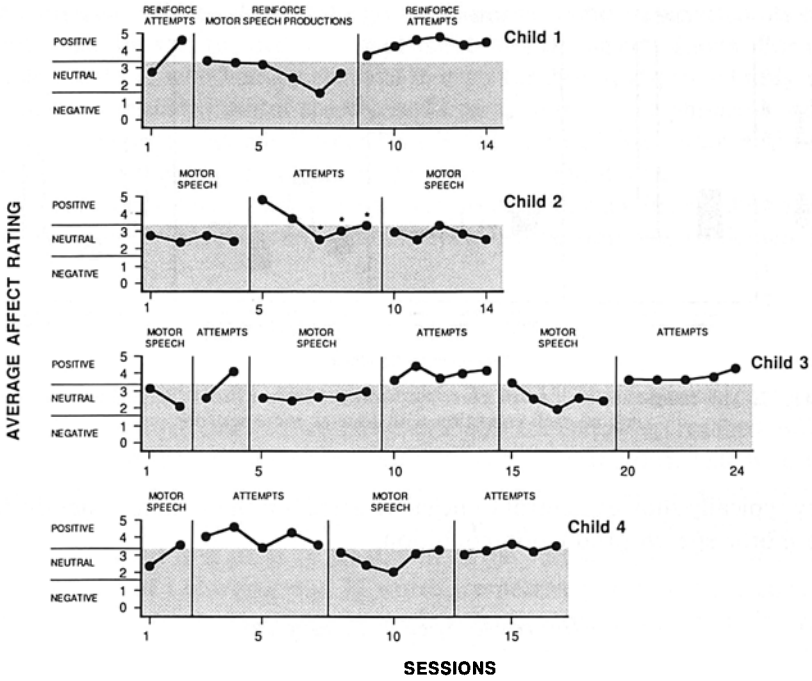

Fig. 1. Average affect ratings for each child in each session. Data points represent the average of four rating scales (enthusiasm, happiness, interest, and general behavior). The asterisks in the attempts condition for Child 2 reflect days when this child had a poison oak reaction.

RESULTS

Affect and General Behavior

Figure 1 presents the composite affect scores for the children's average affect levels in each session of the experiment. Since the ratings were consistent across each subscale (happiness, interest, enthusiasm, and general behavior), the composite scores (cf. Dunlap & Koegel, 1980) are presented in the figure. The results show that the affect levels were always higher in the verbal attempts condition than they were in the motor speech condition, and only in the verbal attempts condition were the affect ratings in the positive range. That is, while the children typically were judged to show varying degrees of positive to high positive affect scores for happiness, interest, enthusiasm, and general behavior in the verbal attempts condition, in contrast

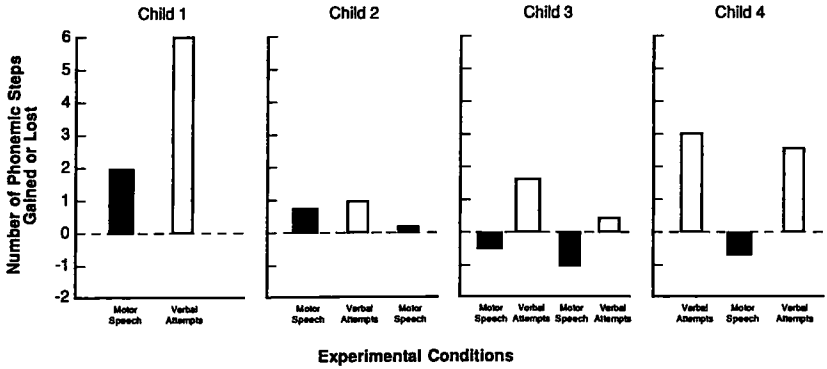

Fig. 2. The change in the level of correct speech production from the beginning to the end of each condition with four or more sessions.

they typically showed neutral to negative affect on these same scales during the motor speech production condition.

Improved Speech Production

While the above data show that the children were happier, interested, enthused, and well behaved when their verbal attempts were reinforced, it is also important to consider the children's speech production during the two experimental conditions. In order to examine changes (improvements or deterioration) in speech production when several successive sessions were implemented within any given experimental condition, all conditions with four or more sessions were examined, and the resulting gains (or losses) were determined for each condition (see Figure 2). The figure shows the change in the level of correct speech production according to the phonemic criteria described above (Ingram, 1976; Schane, 1973) within the reversal design, with number of sessions per condition held constant for each child. As can be

Table II. Supplementary Follow-Up Data

	Pretreatment		Follow-up	
	No. of words	MLU	No. of words	MLU
	Verbal attempts treatment			
Child I	0	0	122	2.0 (1-4)
Child 2	0	0	75	1.6 (1-3)
	Motor shaping treatment			
Child 3	0	0	0	0

seen, all four children showed the greatest improvements in the attempts sessions, regardless of the order of implementation of the conditions. For example, Child 1, who had six sessions in each condition, improved only 1.8 phonemic steps in the motor speech condition in contrast to 6 phonemic steps in the verbal attempts condition. That is, while all of the children always showed phonemic improvements in the verbal attempts condition, they either showed smaller improvements, no change, or deterioration in speech production in every instance when the motor speech condition was implemented.

Supplementary Follow-up Measures

Follow-up measures are presented in Table II. The follow-up data obtained for the three children who were available for follow-up reached differences between the two treatment conditions that were consistent with the above reversal analyses. However, the differences between the two conditions at this 4-year follow-up were very dramatic. Child 1 and Child 2 (who had participated in 4 years of treatment in the verbal attempts condition), spoke a total of 122 words and 75 words, respectively, during their conversational interactions. The range in the length of utterance across all interactions for Child 1 was one to four words and the range in the length of utterance for Child 2 was one to three words.

In marked contrast, but also consistent with both the literature and with our reversal analyses, the child who had received the 4 years of motor speech treatment did not speak any words at all during the follow-up sessions. Correspondingly, his mean length of utterance was also zero.

In summary, all of the dependent measures, including the affect scales and the measures of improvement in speech production, indicated more favorable responding in the verbal attempts condition. The children were happier, more enthused, more interested, better behaved, and responded more correctly in speech production when their verbal attempts to speak were reinforced, without any reinforcement contingency on the accuracy of their speech production.

DISCUSSION

The results of this investigation show that these very severely communicatively delayed children achieved higher percentages of correct speech production and were judged to have more positive affect when they were reinforced for their speech attempts. While each condition produced some improvement in the children's speech, the data indicate that considerably more rapid and consistent progress occurred when the children were reinforced

within the framework of a speech attempts contingency rather than when they were reinforced solely on the basis of their correct speech production. Although the follow-up results should be viewed cautiously because of the possibility that the lengthy follow-up interval could have permitted other variables to also influence the results, it was very encouraging to see very large improvements in the children's speech functioning after extended exposure to treatment.

The results may be interpreted in a number of ways. First, it should be noted that a higher density of reinforcement occurred in the attempts condition. While the children's responses determined what was reinforced in each condition, the attempt contingency resulted in a higher frequency of reinforcement than the contingency that reinforced only correct motor approximations. Although the total number of verbal responses per session was the same in each condition (because of the experimental design), the number of correct responses was always greater in the verbal attempts condition. Therefore, a denser ratio of reinforcement in the attempts condition may have influenced the children's motivation to respond which in turn may have facilitated production of more accurate responses.

Other related factors that may have influenced the positive results in the attempts condition may be the notions of competence (White, 1959), of success and failure (MacMillan, 1971, 1975) and of learned helplessness (Seligman, 1972). Specifically, reinforcing attempts may have forced a frequent exposure to a favorable response-reinforcer contingency and, therefore, helped to eliminate a state of learned helplessness. The suggestion that success may heighten motivation (Churchill, 1971; Goetz et al., 1983; L. K. Koegel & Koegel, 1986; Koegel & Egel, 1979; Koegel & Mentis, 1985; MacMillan, 1971; White, 1959) and facilitate better achievement may be especially pertinent for severely communicatively delayed children, who often experience failure when they respond. These factors may have influenced the higher correct responding and motivation that occurred in the attempts condition. That is, it is possible that the children have more responses in their repertoire than they typically exhibit (Dunlap & Koegel, 1980), and that their improved motivation may have influenced their performance of already learned behavior.

Reinforcing the children's attempts may also have influenced responding through improved generalized imitation. For example, Schumaker and Sherman (1978) have pointed out that parents of normal children frequently reinforce their children's attempts to imitate parent models of speech, and that the resulting high rate of imitative behavior may facilitate speech acquisition (cf. Moerk, 1972).

From a treatment perspective, the results of this study suggest that severely speech-delayed children may derive special benefit from contingen-

cies of reinforcement that focus on manifestations of motivated responding, rather than addressing the motor utterances alone. More broadly, the findings may indicate that, at least for some (very severely handicapped) children, motivation may have to be increased before efficient speech learning can follow. By focusing on verbal attempts, whether or not they are successive motor approximations, a therapist may influence the children's motivation to maintain interest and attention during the speech task (cf. Dunlap, 1984; Skinner, 1962). The present investigation suggests that such antecedent variables may be extremely important for this severely handicapped population of children.

REFERENCES

Barlow, D. H., & Hersen, M. (1984). *Single case experimental designs: Strategies for studying behavior change* (2nd ed.). Elmsford, NY: Pergamon.

Churchill, D. W. (1971). Effects of success and failure in psychotic children. *Archives of General Psychiatry, 25,* 208-214.

Dunlap, G. (1984). The influence of task variation and maintenance tasks on the learning and affect of autistic children. *Journal of Experimental Child Psychology, 37,* 41-64.

Dunlap, G., & Koegel, R. L. (1980). Motivating autistic children through stimulus variation. *Journal of Applied Behavior Analysis, 13,* 619-627.

Egel, A. L. (1980). The effects of constant versus varied reinforcer presentation on responding by autistic children. *Journal of Experimental Child Psychology, 30,* 455-463.

Egel, A. L. (1981). Reinforcer variation: Implications for motivating developmentally disabled children. *Journal of Applied Behavior Analysis, 14,* 345-350.

Fineman, K. R. (1968). Shaping and increasing verbalizations in an autistic child in response to visual color stimulation. *Perceptual and Motor Skills, 27,* 1071-1074.

Garcia, E. E., & DeHaven, E. D. (1974). Use of operant techniques in the establishment and generalization of language: A review and analysis. *American Journal of Mental Deficiency, 79,* 169-178.

Goetz, L., Schuler, A., & Sailor, W. (1983). Motivational considerations in teaching language to severely handicapped studlents. In M. Hersen, V. Van Hassett, & J. Matson (Eds.), *Behavior therapy for the developmentally and physically disabled* (pp. 57-77). New York: Academic Press.

Hewett, F. M. (1965). Teaching speech to an autistic child through operant conditioning. *American Journal of Orthopsychiatry, 35,* 927-936.

Hollis, J. H., & Carrier, Q. K. (1978). Intervention strategies for nonspeech children. In R. L. Schiefelbusch (Ed.), *Language intervention strategies.* Baltimore: University Park Press.

Ingram, D. (1976). *Phonological disability in children.* New York: Elsevier.

Koegel, L. K., & Koegel, R. L. (1986). The effects of interspersed maintenance tasks on academic performance in a severe childhood stroke victim. *Journal of Applied Behavior Analysis, 19,* 425-430.

Koegel, R. L., Dyer, K., & Bell, L. K. (1987). The influence of child-preferred activities on autistic children's social behavior. *Journal of Applied Behavior Analysis, 20,* 243-252.

Koegel, R. L., & Egel, A. L. (1979). Motivating autistic children. *Journal of Abnormal Psychology, 88,* 418-426.

Koegel, R. L., & Johnson, J. (in press). Motivating language use in autistic children. In G. Dawson (Ed.), *Autism: New perspectives on diagnosis.* New York: Guilford.

Koegel, R. L., & Koegel, L. K. (1988). Generalized responsivity and pivotal behaviors. In R. H. Horner, G. Dunlap, & R. L. Koegel (Eds.), *Generalization and maintenance: Lifestyle changes in applied settings* (pp.41-66). Baltimore: Paul H. Brookes.

Koegel, R. L., & Mentis, M. (1985). Motivation in childhood autism: Can they or won't they? *Journal of Child Psychology and Psychiatry, 26,* 185-191.

Koegel, R. L., O'Dell, M. C., & Koegel, L. K. (1987). A natural language teaching paradigm for nonverbal autistic children. *Journal of Autism and Development Disorders, 17,* 187-200.

Koegel, R. L., & Schreibman, L. (1976). Identification of consistent responding to auditory stimuli by a functionally "deaf" autistic child. *Journal of Autism and Childhood Schizophrenia, 6,* 147-155.

Koegel, R. L., & Traphagen, J. (1982). Selection of initial words of speech training with nonverbal children. In R. L. Koegel, A. Rincover, & A. L. Egel (Eds.), *Educating and Understanding Autistic Children* (pp. 65-77). San Diego: College-Hill Press.

Lovaas, O. I. (1977). *The autistic child.* New York: Irvington.

Lovaas, O. I., Berberich, J. P., Perooff, B. F., & Schaeffer, B. (1966). Acquisition of imitative speech by schizophrenic children. *Science, 151,* 705-707.

MacMillan, D. L. (1971). The problem of motivation in the education of the mentally retarded. *Exceptional Children, 37,* 579-586.

MacMillan, D. L. (1975). Effect of experimental success and failure on the situational expectancy of EMR and nonretarded children. *American Journal of Mental Deficiency, 80,* 90-95.

Martin, G., & Pear, J. (1978). *Behavior modification: What it is and how to do it.* Englewood Cliffs, NJ: Prentice Hall.

Mittler, P. (1966).The psychological assessment of autistic children, In J. K. Wing (Ed.), *Early childhood autism: Clinical, educational, and social aspects* (pp. 145-158). London: Pergamon Press.

Moerk, E. (1972). Principles of interaction in language learning. *Merrill-Palmer Quarterly, 18,* 229-257.

Rutter, M. (1966). Prognosis: Psychotic children in adolescence and early adult life. In J. K. Wing (Ed.), *Early childhood autism: Clinical, educational, and social aspects.* London: Pergamon.

Rutter, M. (1978). Diagnosis and definition of childhood autism. *Journal of Autism and Childhood Schizophrenia, 8,* 139-161.

Ritvo, E. R., & Freeman, B. J. (1978). National Society for Autistic Children definition of the syndrome of autism. *Journal of Autism and Childhood Schizophrenia, 34,* 235-255.

Schane, S. A. (1973). *Generative phonology.* Englewood Cliffs, NJ: Prentice Hall.

Schumaker, J. B., & Sherman, J. A. (1978). Parent as intervention agent. In R. L. Schiefelbusch (Ed.), *Language intervention strategies.* Baltimore: University Park Press.

Skinner, B. F. (1962). Two "synthetic social relations." *Journal of the Experimental Analysis of Behavior, 5,* 531-533.

Sloane, H. N., & Macaulay, B. D. (1968). *Operant procedures in remedial speech and language training.* New York: Houghton Mifflin.

White, R. W. (1959). Motivation reconsidered: The concept of competence. *Psychological Review, 66,* 297-333.