



Where Education and Behavioral Science Meet

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Where Education and Behavioral Science Meet

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The Journal of Early and Intensive Behavioral Intervention Editorial Board

Editorial

Gary Novak

This issue amply demonstrates the intentionally broad scope of the *Journal of Early and Intensive Behavior Intervention*. One of the journal's aims is to bring to early interventionists information from areas that they might not otherwise venture into. To this end, the articles represented here cover a wide range: basic and applied, experimental and theoretical, behavioral and non-behavioral, and relate to a wide range of clinical and non-clinical populations.

The works employing a core behavioral viewpoint appear early in the issue. Tsiuouri and Greer examine the use of Skinner's Verbal Behavior in treating severe language delay in two children. From within the behavior analytic paradigm, they provide single-subject experimental data on how social reinforcement can increase echoic tacts. The second article, by St. Peter Pipkin, Winters, and Diller, also sticks closely to the behavioral paradigm, and again employs single-subject experimental designs with two children. The children in this study were lagging behind their typical kindergarten classmates in behavior and pre-academic skills. This time, edible reinforcers, goal setting, and instructions were shown to be effective in increasing letter naming by these children.

The third article, by Carbone, Morgenstern, Zecchin-Tirri, and Kolberg brings attention to the importance of motivating operations in applied research and practice. In particular, the authors elaborate on the importance of recognizing the use of the reflexive conditioned motivating operation (CMO-R), especially in discrete trial programs for children with autism by enhancing the effectiveness of reinforcers.

The article by Forgatch and De Garmo takes a broad systems approach to developmental problems by focusing on the parenting and economic skills of mothers experiencing divorce. Using a group design with mothers from the Oregon Divorce Study, the researchers looked at how parent training increased incomes and reduced financial stress in comparison with mothers who did not receive such training. Forgatch and De Garmo also report increased personal adjustment on the part of both the mothers and the children in their study through their parent training methods. In the next paper, Larmar and Gatfield describe the Early Impact (EI) program using both home and school components that are aimed at preventing the development of conduct problems for children at-risk.

The last three articles are concerned with treatments and techniques designed for children with a range of pervasive developmental disorders. Masse, McNeil, Wagner, and Chomey describe the use of Parent-Child Interaction Therapy (PCIT) in treating the externalizing behaviors of preschool children with High-Functioning Autism. The authors compare PCIT with other therapies, and suggest that PCIT's emphasis on teaching children and parents interactional skills may be appropriate for enhancing needed interactional and language skills for this population of children because of other abilities these high functioning children may have. Downs and Strand emphasize emotional recognition training as a more specific skill-based treatment that can be used with a wide-range of children with various developmental problems. Their results show some growth in emotional recognition skills in children receiving the training compared to those that did not. While the results varied widely across individuals, and might be examined with a further single-subject design, the results from the group design employed here are promising. The final paper, by Biederman and Freedman, gives an overview of the use of video modeling technology with children displaying a broad range of developmental problems that many readers will find relevant to their situations.

In short, there are a lot of ideas for practitioners and researchers alike to ponder in the ensuing pages. I hope you will find that the papers will bring you into contact with ideas that are outside the range you are accustomed to, and that they will provide you with new ideas and approaches.

The Role of Different Social Reinforcement Contingencies in Inducing Echoic Tacts through Motor Imitation Responding in Children with Severe Language Delays

Ioanna Tsiouri & R. D. Greer

Abstract

The study investigated the role of social reinforcement, when teaching two preschoolers with no functional vocal verbal behavior first instances of echoic responses, using rapid motor imitation responding. The dependent variables for the experiment were: (1) echoic tacts (echoics presented under the controlling variables of tacts) and (2) generalized motor imitation responses to the rapid motor imitation antecedent procedure (Ross & Greer, 2003; Tsiouri & Greer, 2003). Three single case reversal experimental designs were implemented, counterbalanced across two conditions: (1) delivery of praise and social reinforcement contingently upon only correct rapid motor imitation *and* echoic responses and (2) delivery of generalized social interaction on a fixed time schedule without extinction of correct echoic responses. Results showed that the number of echoics significantly increased during the contingent social reinforcement condition, when compared with the fixed time delivery condition, during which data consistently remained at a lower level, while motor imitation responding remained at high levels during both experimental conditions. These findings are discussed in terms of: a) whether motor imitation and vocal verbal imitation comprise two different response classes controlled by different setting events, yet may be joined as higher order operant by the procedure used and b) the importance of social reinforcement, when teaching first instances of echoic tacts, through rapid motor imitation responding. Keywords: Language delays, motor imitation, echoics, tacts, social reinforcement, noncontingent delivery of preferred item.

One of the major challenges that special educators are presented with when working with children with developmental disabilities is teaching vocal communication skills to nonvocal children. About 50% of children with autism do not display functional speech and they require intensive behavioral interventions to acquire an effective communication system (Whetherby & Prizant, 2000; Williams & Greer, 1993).

Skinner in his book *Verbal Behavior* (1957) identified several verbal functions distinguished by the occasions in which they occur and the consequences they produce. The three verbal operants directly or indirectly related to this study are the echoic, the mand and the tact. Echoic verbal behavior is defined as the verbal response under the control of verbal stimuli that generates a sound pattern similar to that of the stimulus (Skinner, 1957). For example, after an adult says “cat”, a child responds, “cat.” The critical characteristic of echoic verbal behavior is the point-to-point correspondence between the verbal stimulus and the response, as well as the temporal relation between the stimulus and the response (later reproduction of overheard speech is not echoic behavior). Another critical characteristic is that the reinforcer for the tact is a generalized reinforcer that is typically social in nature (Greer & Ross, 2008).

The mand is a verbal operant that specifies its reinforcer, under the functional control of relevant conditions of deprivation or aversive stimulation. For example, the response “I want water” is

evoked under conditions of deprivation from water and specifies to the listener that water will be an effective reinforcer. The tact is controlled by a nonverbal discriminative stimulus (an object, event or property of an object or event) and is reinforced by a non-specific generalized conditioned reinforcement, such as attention, praise or repetition of the response (Stafford, Sundberg & Braam, 1988). For example, a child says, “airplane” in the presence of an actual airplane. A listener consequences this response saying, “that’s right, it is an airplane.”

Skinner’s (1957) theory of verbal behavior gave rise to empirical research that investigated the verbal operants he identified and led to the development of applied instructional tactics and curricula. Whetherby and Prizant (2000) described a shift from highly structured “discrete trial” training curricula (Lovaas, 1977) to contemporary applied behavioral analysis approaches, which incorporate the environmental variables that control verbal behavior on a moment-to-moment basis (i.e., deprivation, satiation, aversive stimulation conditions, generalized social reinforcement, stimulus control, history of the organism, natural context in which communication occurs) (Greer & Ross, 2008; Hall & Sundberg, 1987; Hart & Risely, 1974; Partington & Sundberg, 1998). However, one need not wait for naturally occurring conditions to evoke verbal operants, since recent work has shown that the motivating conditions can be designed, thus ensuring many more opportunities to acquire the verbal operants (Fiorile & Greer, 2007; Greer & Ross, 2008; Pistoljevic & Greer, 2006; Schauffler & Greer, 2006)

Williams and Greer (1993) introduced the echoic to mand and the echoic to tact teaching operations for verbal behavior, where the student has to emit a certain number of echoic responses before being presented with opportunities for independent responses, mands or tacts. During the echoic to mand procedure, the therapist creates momentary deprivation states from preferred items, through a choice component (two preferred items are introduced at the same time). During the echoic to tact procedure, correct tacting of non-preferred items results in a generalized reinforcer (e.g., token or praise) and/or the opportunity to mand a preferred item.

Establishing operations or “motivative” variables, such as deprivation, satiation or aversive stimulation play a critical role in the acquisition of mands (Michael, 1982; Michael, 1983; Michael, 2000; Skinner, 1957). Deprivation often refers to restricted access to preferred items, while satiation or abolishing operations are considered equivalent with unrestricted access to preferred items. Michael (2000) gave an interesting example of how to produce a decrease in the reinforcing effectiveness of a preferred item through satiation. He suggested that attention given noncontingently by caregivers to infants (touching, eye contact, verbal praise) might function as an abolishing operation or satiation, while restricted access might function as an establishing or motivational operation for responses such as crying or other infant vocalization.

In accordance with Michael’s (2000) example, the noncontingent reinforcement (NCR) control procedure defined as the delivery of a reinforcer according to a schedule that is not response contingent or response dependent (Cooper, Heron and Heward, 1986; Thompson & Iwata, 2005), was utilized in order to investigate the role of contingent social reinforcement in inducing generalized motor and vocal imitation in infants (Bijou and Baer, 1967; Poulson and Kymissis, 1988; Poulson and Kymisses, 1996). They demonstrated that delivery of contingent parental interaction (smiles, taps, tickles) resulted in an increase of infant vocalization and of imitative responses (both motor and vocal), during training and generalized probe trials, when compared to a baseline condition, during which

social interaction was delivered non-contingently as a form of free interaction between the infant and the caregiver.

Two explanations have been proposed for the observed response suppression during the NCR procedure: a) satiation to the reinforcer being delivered (Marcus & Vollmer, 1996) and b) extinction, being defined as elimination of the reinforcement contingency following the target response (Hagopian, Crocket, Van Stone, Deleon, Bowman, 2000; Lalli, Casey, and Kates, 1997). There have been several clinical studies that investigated the role of the two mechanisms in the effectiveness of NCR in reducing the target response (Car, Bailey, Ecott, Lucker, Weil, 1998; Fisher, Iwata, Mazzaleski, 1997; Goh, Iwata, Deleon, 2000; Kahng, Iwata Deleon and Wallace, 2000; Lalli, Casey, and Kates, 1997). In most studies the NCR procedure has been implemented with an implicit extinction component. That is, the target behavior's reinforcer was delivered only on a time-based schedule and never contingently upon the target behavior. However, Lalli and colleagues (1997) tested the effects of a NCR without extinction procedure (delivery of a preferred item both contingently and non contingently with regard to the target behavior) and found that this procedure was effective in suppressing behavior although the original reinforcement contingency of the target behavior remained in place. Fisher, Iwata, Mazzaleski, (1997) demonstrated that even when arbitrary stimuli are delivered noncontingently, while reinforcers of the target behavior are delivered contingently upon it, still there is suppression of the target behavior. These studies provided evidence against the extinction hypothesis as a mechanism of response suppression during the NCR procedure. Goh, et al., (2000) alternatively suggested the need to discriminate between thick and thin NCR schedules. They demonstrated that during thick NCR schedules, response suppression results from satiation, while during thin NCR schedules; response suppression is a result of extinction.

The NCR procedure was reconsidered and refined by Poling and Normand (1999) and Vollmer (1999), who suggested that using the term "reinforcement" for the description of the response independent delivery of stimuli is not appropriate, since there is nothing in this procedure that bears the operational characteristic of reinforcement (measured increase in the rate of a response). Therefore, fixed time (FT) stimulus delivery would be a more precise term than noncontingent reinforcement or better yet fixed time (FT) delivery of preferred items.

Baer, Peterson, and Sherman, (1967); Poulson (1983); Reynolds, (1961) compared levels of infant vocalization under an experimental condition in which social stimulation was delivered contingent on vocalization according to an FR 1 schedule with those observed under a DRO control condition in which social stimulation was presented every 2 s in the absence of vocalization. Despite the higher densities of reinforcer delivery under the DRO schedule, the typically developing infants engaged in higher levels of responding under experimental (FR 1) conditions, suggesting that vocalization was sensitive to the social reinforcement delivered contingent on the response. In summary, both the NCR procedure, with its parametric variations (with or without extinction, with or without schedule thinning), and the DRO procedure seem to have interesting applications in the acquisition of verbal behavior and in strengthening first instances of vocal verbal behavior in infants.

Another thematic line of research in the acquisition of verbal behavior investigated the role of imitation (motor, vocal or object use imitation) as a predictor of language acquisition and retention (Gaines, Leaper, Monahan, & Wickgenant, 1988; Partington & Sundberg, 1998; Poulson & Kymissis, 1996; Yoder & Layton, 1988). Several research studies have investigated whether motor imitation generalized to vocal imitation when only motor imitation receives training. They found that there are

distinct topographical boundaries between imitative response classes (Garcia, Baer & Firestone, 1971; Young, Krantz, McClannahan & Poulson, 1994). In contrast to these findings, Sherman (1965) extended the class of motor imitation to include vocal responses, by fading in modeled responses that were closer approximations to vocalizations, such as mouth opening, blowing, emitting unvoiced sounds and finally voiced sounds. Peterson (1968) and Steinman & Boyce (1971) were successful in inducing non-imitative responses (one-step directions) that were never trained before, when these were interspersed among reinforced imitative responses.

Ross & Greer (2003); Tsiouri and Greer (2003) were successful in inducing first instances of echoic and independent mands and tacts in children with no functional vocal (echoic or independent) communication. They combined the rapid performance of large and small motor imitations with the echoic to mand teaching operations for verbal behavior (Williams & Greer, 1993; Greer, & Keohane, 2005; Greer & Ross, 2008). The Rapid Motor Imitation Antecedent (RMIA) procedure consisted of a sequence of six motor responses modeled by the instructor with the antecedent "do this". The instructor rapidly and randomly modeled six (three gross motor and six small motor) actions, which the participants imitated one by one, as they were presented. Large motor actions were defined as large muscle movements such as clap hands, touch head, tap knees, tap table, stomp feet, raise hand. The small motor actions were behaviors modeled on the instructor's face (touch nose, touch eye, touch teeth, open mouth).

The RMIA was combined with the echoic to mand and echoic to tact teaching operations for verbal behavior (Williams & Greer, 1993). According to this procedure the participant is required to emit a set number of echoic responses before instruction shifts to spontaneous functional verbal behavior, under the respective controlling variables of the mand or the tact. In Tsiouri and Greer (2003) the participant had to emit 2 consecutive correct echoics (mands or tacts) with the RMIA procedure and 8 consecutively correct echoics (mands or tacts) without the RMIA, before instruction switched to independent mand or tact responding. The RMIA procedure was successful in inducing echoic and independent mands and tacts. One interesting finding was that tacts (echoic and independent) required fewer opportunities than mands for mastery to criterion (Tsiouri and Greer, 2003). This finding contradicts previous research literature that suggests that mands are acquired faster than tacts and should be taught first (Caroll & Hesse, 1987; Stafford, et al., 1988; Sundberg, Milani, Partington, 1977). Moreover, research with typically developing children suggests that the tact response is predominant (Hart & Risely, 1995, 1999). Faster acquisition of echoic and independent tacts was attributed to the variability and quality of reinforcers available, during echoic and independent tact instruction, as well as the opportunity to choose a reinforcer as a consequence for correct responses. However, further research is needed to investigate the role of generalized social reinforcement as a controlling variable in the acquisition of echoic and independent tacts, when the RMIA procedure is in effect.

The purpose of the study reported here was to investigate the role that different contingencies of social reinforcement play in the effectiveness of the RMIA procedure to induce first instances of echoic tacts (echoics taught under the controlling variables of tacts) (Tsiouri & Greer, 2003). Thus, two experimental conditions were implemented: one of Fixed Time delivery of generalized social interaction without extinction (related to possible satiation effects) (Car, et al., 1998; Fisher, et al., 1997; Goh, et al., 2000; Kahng, et al., 2000; Lalli, et al., 1997), and one of contingent only upon correct motor imitation and echoic tact responses delivery of generalized social reinforcement. We posed two experimental questions: 1) Would different contingencies of delivery of social

reinforcement control the effectiveness of the RMIA procedure in inducing echoic tacts? 2) Would those different social reinforcement contingencies affect the RMIA responding?

Method

Participants

Participant A was a 5-year-old male, diagnosed with Pervasive Developmental Disorder, who according to the *Preschool Inventory of Repertoires for Kindergarten (PIRK)* (Greer & McCorkle, 1996), followed one-step and two-step directions, and demonstrated a generalized motor imitation repertoire (large and small motor actions). He could make eye contact with a person or an item for two seconds and could sit still in his chair for ten seconds upon request. He could echo, though not consistently, some vocalizations (ga, ah, ba), contingent upon the teacher's antecedent (a mean of two correct out of twenty responses).

Participant B was a 4-year and 2 months old female, diagnosed with Pervasive Developmental Disorder. Based on the PIRK assessment (Greer & McCorkle, 1996), had no functional vocal verbal behavior, but textually responded independently to 20 letters of the alphabet. However, there was no echoic vocal verbal behavior in her repertoire. She could functionally use signs to mand-preferred items (5 signs). In terms of listener skills, she could follow one-step directions and she could also perform generalized motor imitation actions (both large and small motor actions), without receiving any prior explicit training. She could also make eye contact with the instructor for 2 seconds upon request and sit still in the chair for 8 seconds.

Both participants were chosen for this study because they satisfied four main criteria: they were under good instructional control (could sit still for 10 and 8 seconds respectively and attend to instructional material upon teacher's request) and they had generalized motor imitation in their repertoire. They both lacked functional communication skills, and they had very limited echoic behavior. Based on both participants' anecdotal instructional history, many forms of social interaction, such as the teacher's vocal praise, hugs, kisses, tickles and smiles functioned as educational reinforcement (Skinner, 1957).

Setting

The study was conducted in a special education school for preschoolers (2-5 years old) with disabilities. The school followed the Comprehensive Application of Behavior Analysis to Schooling (CABAS[®]) model (Greer, 2001; Greer & Keohane, 2004; Greer, Keohane & Healy, 2002; Greer, McCorkle, & Williams, 1989; Selinske, Greer, & Lodhi, 1991). The study was conducted in a full-day self-contained classroom (6 students, one teacher, two teacher assistants), where data collection was part of the daily instructional routine. The data collection lasted approximately two months.

Definition of Behaviors

Dependent Variables. Data were collected on: 1) the number of correct echoic tacts for the vocal verbal forms "cup" and "book" for participant A and "paper" for participant B. Correct responses had point to point correspondence with a vocal model, emitted in the presence of the corresponding non-verbal stimulus, and they were consequated by contingent generalized social reinforcement (Skinner, 1957; Tsiouri and Greer, 2003; Williams and Greer, 1993). The instructor

presented an actual cup, book or paper (non-verbal stimulus and at the same time he emitted the vocal model for the forms “cup”, “book” and “paper” respectively. The forms were chosen after it was determined, through a preference assessment test (choice assessment) (Piazza, Fischer, Hagopian, Bowman, Lisa, 1996), that cups, books, and papers were not preferred items for participants A and B respectively. This assessment was necessary in order to exclude any reinforcing or motivational effects that these items might have had on each participant’s echoic responding, which in this case would create confounding in terms of the role of generalized social reinforcement as the only reinforcer in effect.

2) Data were also collected on the rapid motor imitation antecedent (RMIA) (Ross & Greer, 2003; Tsiouri & Greer, 2003). It consisted of a sequence of six motor responses modeled by the instructor with the antecedent “do this”. The instructor rapidly and randomly modeled six (three large motor and three small motor) actions, which the participants imitated one by one, as they were presented. Large motor actions were defined as large muscle movements such as clap hands, touch head, tap knees, tap table, stomp feet, raise hand. The small motor actions were behaviors modeled on the instructor’s face (touch nose, touch eye, touch teeth, open mouth). The last motor action presented was always a small motor action around the mouth area (touch mouth, open mouth or show teeth). The RMIA always preceded the instructor’s vocal model for “cup”, “book” and “paper.”

Contingent Generalized Social Reinforcement Delivery and Fixed Time (FT) Delivery of Social Interaction without Extinction. The independent variables of the study were two different contingencies of reinforcement: a) delivery of generalized social reinforcement contingent upon only correct motor and echoic tact responses, and b) FT delivery of generalized social interaction without extinction, that is FT delivery of generalized social interaction upon incorrect motor or echoic tacts, combined with contingent upon correct motor and echoic tact responses delivery of generalized social reinforcement, (related to a possible satiation condition) (Fisher, et al., 1997; Goh, et al., 2000; Guerin, 1994; Kahng, et al., 2000; Lalli, et al., 1997; Vollmer and Hackenberg, 2001). Generalized social interaction was operationally defined as making eye contact, praising, smiling, hugging, kissing or tickling the participant.

Data Collection

Data were collected on both the RMIA responses and the echoic tact responses. A data form and a pencil were used to record the participants’ responses in blocks of 20 trial sessions. Each time the participants emitted six correct motor actions (RMIA) one plus (+) was recorded. If the participants emitted at least one incorrect motor imitation response, then a minus (-) was recorded for the whole RMIA sequence. Therefore, RMIA data were not response specific, but response class specific, since the participants had a generalized motor imitation repertoire. A second column on the data form was used to record correct (+) or incorrect (-) echoic tact responses.

Interobserver Agreement

Interobserver Agreement (IOA) was calculated on the number of correct RMIA responses and on the number of correct echoics emitted by the two participants, across baseline, and the two experimental conditions. IOA was calculated for each session by dividing the total number of point to point agreements by the total number of agreements plus disagreements and multiplying by 100%. Interobserver agreement data were collected during 30% -35% of sessions per each condition. The

mean IOA for Participant's A RMIA responses was 100%, and for the number of correct echoic tacts was 96% (range, 88%-100%). For Participant B the mean IOA was 98% (range, 90%-100%) for RMIA responses and 97% (range, 94%-100%) for echoic tacts.

Design

Two reversal experimental designs (ABAB), counterbalanced across two different reinforcement contingencies of reinforcement were implemented, in order to teach participant A two echoic tacts ("cup" and "book"). More specifically, the two conditions that were counterbalanced were: a) contingent on correct motor and echoic tact responses delivery of generalized social reinforcement and b) Fixed Time (FT) delivery of social interaction contingent upon incorrect responses, without extinction of correct responses (contingent delivery of social reinforcement upon correct responses). The two conditions had to be counterbalanced across two echoic tact forms in order to control for possible sequence effects. Participant B was introduced in the study to systematically replicate the second reversal design on Participant B, by teaching another echoic tact form ("paper").

Pre-baseline training. Before the onset of the study 8 probes were conducted with each participant, to determine the mean duration of performance of the RMIA sequence (six large and small motor actions, presented by the instructor, that each participant had to imitate within 2 sec.). The mean duration of the performance of the RMIA was 7.5 sec. for Participant A and 8.7 for Participant B. These data allowed the instructor to define the fixed time delivery of generalized social interaction by doubling the mean duration of performance of one RMIA sequence (15 seconds and 18 seconds respectively). Doubling of the mean performance time was used to prevent adventitious reinforcement of incorrect responses, as well as to control for interference of the fixed time response independent schedule with the performance of the RMIA and the echoic response (Goh, Iwata, DeLeon, 2000). Three probe sessions were also conducted to test whether the Participants had the target echoic responses ("cup" and "book" for Participant A, and "paper" for Participant B in their repertoire.

Contingent Reinforcement Delivery Condition. During the contingent reinforcement delivery condition generalized social reinforcement (hugs, smiles, kisses, pats on the shoulder, tickles, verbal praise, etc.) was delivered, contingent on correct motor and echoic tact responses. More specifically, the instructor obtained the Participant's attention, by calling his/her name, and rapidly presented three large and three small motor imitation actions, with the antecedent "do this", allowing the Participants 2 sec. to respond to each of the actions. No social reinforcement was delivered during motor imitation responding. A vocal model was presented together with the respective non-vocal stimulus (e.g. a plastic cup for the vocal model "cup"), immediately after the correct performance of the RMIA. If the Participant responded correctly to both the RMIA and the echoic tact, the instructor delivered generalized social reinforcement for 3 sec. If incorrect RMIA and/or echoic responses occurred, the instructor turned her head and ignored the Participant for 5 sec., before the presentation of the next instructional opportunity.

FT Delivery of Social Interaction without Extinction. During this condition, social interaction was delivered on a fixed time (FT) 15 seconds interval schedule for Participant A and on a fixed time (FT) 18 seconds interval schedule for Participant B, when incorrect RMIA and/or echoic responses occurred (Car, et al., 1998; Goh, et al., 2000; Guerin, 1994; Fisher, et al., 1997; Kahng, et al., 2000; Lalli, et al., 1997; Poling & Normand, 1999; Thompson & Iwata, 2005; Vollmer & Hackenberg, 2001). The researcher used a stopwatch that started at the same time with the presentation of the RMIA. If an incorrect response (motor or echoic) occurred, the researcher waited until 15 sec (Participant A) or 18 sec. (Participant B) had elapsed, and then delivered generalized social interaction.

In the case of correct echoic responses, however, contingent generalized social reinforcement was delivered in order to control for possible extinction of correct echoic responses (Car, et al., 1998; Fisher, et al, 1997; Lalli, et al., 1997).

The instructor conducted the experiment in 20 trial sessions. The total number of sessions across all four experimental conditions, within each experimental design, was kept constant (8 sessions per condition for both experimental designs implemented on Participant A, and 5 sessions per condition, for the experimental design implemented on Participant B). Keeping the number of 20-trial sessions constant across experimental conditions was necessary in order to control for the number of instructional opportunities as a possible confounding variable for the number of correct echoic responses.

The duration of each delivery of generalized social interaction across both experimental conditions was held constant (3 seconds), so that it would provide a way to measure the total amount of generalized social interaction delivered. Table 1 summarizes the total amount (duration) of generalized social reinforcement delivered across the two experimental conditions for Participant A and Participant B. In order to establish an initial deprivation state, there was no social interaction between the Participants and the instructor before the onset of each session, throughout the experiment.

Table 1. Total amount of generalized social reinforcement (in sec) delivered during the two experimental conditions for Participant A and Participant B.

<i>Participant A</i>		
	<i>Fixed Time Delivery</i>	<i>Contingent Delivery</i>
<i>“Cup”</i>	<i>960 sec</i>	<i>465 sec</i>
<i>“Book”</i>	<i>960 sec</i>	<i>552 sec</i>
<i>Participant B</i>		
	<i>Fixed Time Delivery</i>	<i>Contingent Delivery</i>
<i>“Paper”</i>	<i>600</i>	<i>435 sec</i>

Results

Figure 1 shows the number of correct RMIA responses and correct echoic tacts (“cup”) that Participant A emitted across the two different reinforcement contingencies conditions in the first reversal experimental design. Initially, three probe sessions (20 trials each) were conducted, in order to determine whether Participant A could emit the echoic tact “cup”, without the performance of the RMIA. Figure 1 shows that Participant A emitted 0 echoic tacts when the instructor presented the actual cup together with the vocal model “cup”. In the FT delivery without extinction condition, the instructor conducted 8 sessions (20 trials each), during which the participant emitted a mean of 19

correct RMIA responses and a mean of 2 correct echoic responses. Data were overall stable with a zero trend.

During the first contingent delivery condition, data on the number of correct RMIA responses emitted were overall stable with a zero trend and a mean of 19.7. Data on the correct echoic tacts emitted were variable, but with an overall ascending trend and a mean of 8.25. When returning to the FT delivery condition, data on the RMIA performance showed a zero trend. The mean number of correct responses was 19. Data on the number of correct echoic tacts were stable, with a zero trend and a mean of 3.75. During the last contingent delivery condition, data on the correct RMIA responses were overall stable, with a zero trend and a mean of 19. Data collected on the number of correct echoic tacts were overall stable, with a zero trend and a mean of 11.

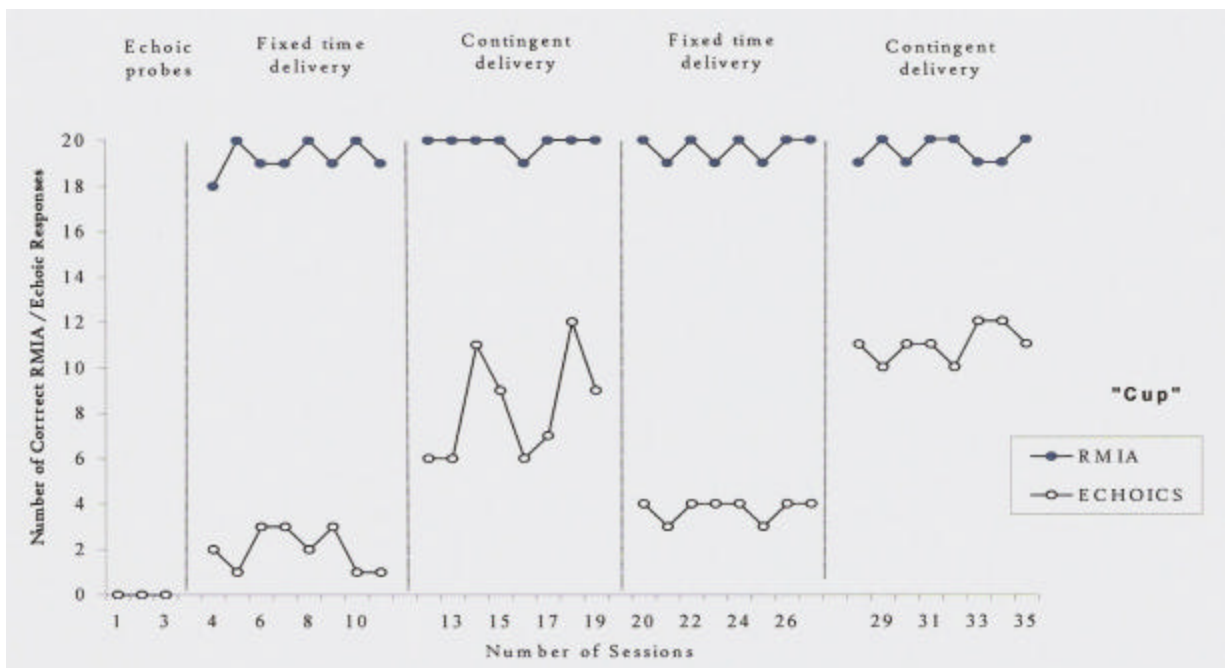


Figure 1. Number of Correct RMIA responses and correct echoic tacts emitted by participant A during fixed time delivery (satiation), and Contingent delivery (deprivation) conditions for the form “cup”.

Figure 2 shows the second reversal experimental design implemented on Participant A, during which, FT delivery without extinction and contingent delivery conditions were introduced in reversed order, to control for possible sequence effects. Data were collected on the echoic tact “book”. Probe sessions data showed that Participant A did not have the echoic tact “book” in his repertoire. In the first experimental condition (contingent delivery), correct RMIA responses data were variable, with a zero trend and a mean of 19.1. Data on correct echoic tacts were variable, with a steep ascending trend and a mean of 8. During the first FT delivery condition, data on the number of correct RMIA were stable, with a zero trend and a mean of 19.5. Correct echoic tacts data were variable, with an overall descending trend and a mean of 6.4. During the second contingent delivery condition, data on the RMIA correct responses were stable, with a zero trend and a mean of 19.8. Data on the number of correct echoic tacts were variable, with an overall ascending trend and a mean of 15.1. During the last FT delivery condition, data on correct RMIA responses were overall stable, with a zero trend and a

mean of 19.4. Data on correct echoic responses were variable, with an overall descending trend and a mean of 4.3.

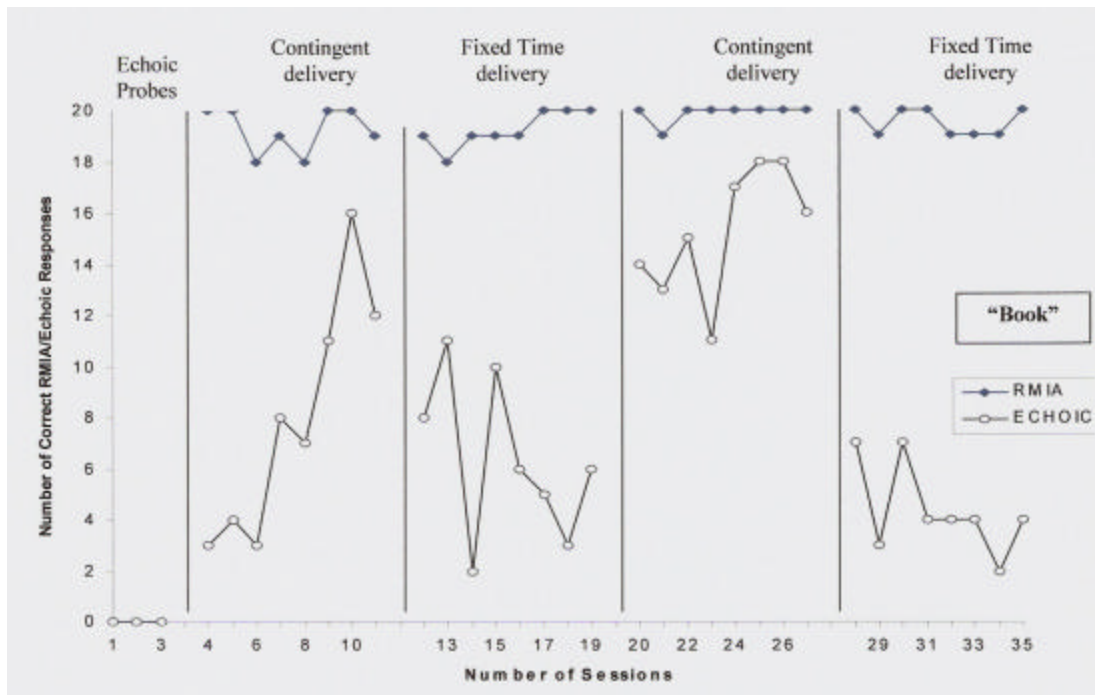


Figure 2. Number of Correct RMIA responses and correct echoic tacts emitted by participant A during fixed time delivery (satiation), and Contingent delivery (deprivation) conditions for the form “book”.

Figure 3 shows the reversal experimental design implemented on Participant B, in order to replicate the last reversal design implemented on Participant A. The echoic tact for this design was the vocal form “paper”. Three probe sessions showed that Participant B did not have this echoic form in her repertoire (3 sessions at 0). During the first contingent delivery condition, data on correct RMIA responses had an overall ascending trend and a mean of 19. Data on the number of correct echoic responses had a steep ascending trend and a mean of 11.2. During the first FT delivery condition, data on the number of correct RMIA responses were variable, with a mean of 18, while data on correct echoic tact response were variable, with an overall descending trend and a mean of 7. During the second contingent delivery condition, data on the RMIA were stable, with a zero trend and a mean of 19.6, while data on correct echoic tacts were variable, with a zero trend and a mean of 17.8. During the last FT delivery condition, data on correct RMIA responses were variable, with a zero trend and a mean of 18.6. Data on correct echoic tacts were stable with a descending trend and a mean of 12.

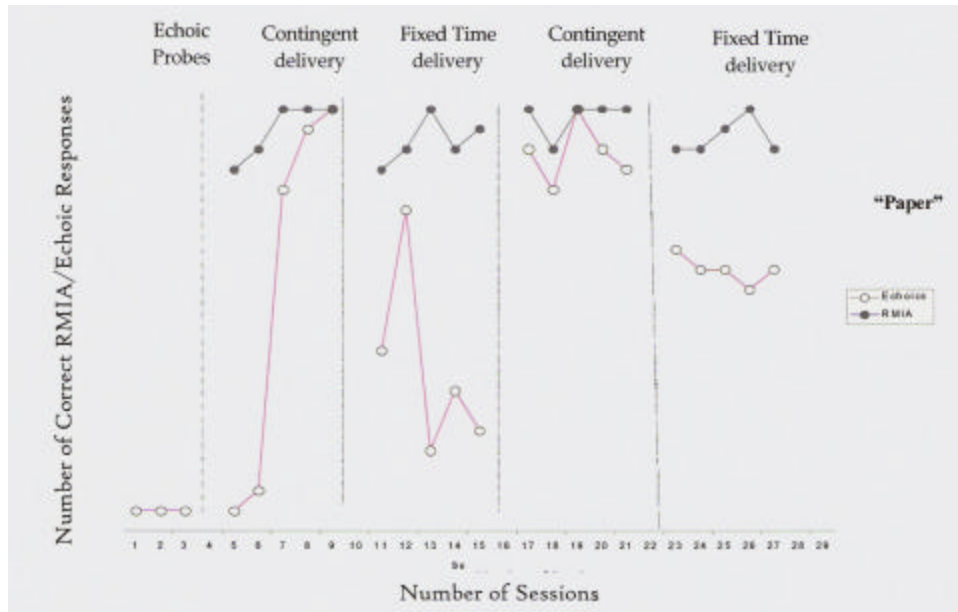


Figure 3. Number of Correct RMIA responses and correct echoic tacts emitted by participant B during fixed time delivery (satiation), and Contingent delivery (deprivation) conditions for the form “paper.”

Table 2. Total number of opportunities, total number of correct echoic tacts, mean number and range of correct echoic tact responses for the forms “cup”, “book” for participant A, and “paper” for participant B.

Participant A		
	Fixed Time Delivery	Contingent Delivery
“Cup”		
Total Number of Sessions	16	16
Total Number of Opportunities	320	320
Total Correct Responses	44	155
Mean	2.8	9.7
Range	(1-4)	(6-12)
“Book”		
Total Number of Sessions	16	16
Total Number of Opportunities	320	320
Total Correct Responses	88	184
Mean	5.35	11.55
Range	(2-11)	(3-18)
Participant B		
	Fixed Time Delivery	Contingent Delivery
“Paper”		
Total Number of Sessions	10	10
Total Number of Opportunities	200	200
Total Correct Responses	96	145
Mean	9.6	14.5
Range	(3-15)	(0-20)

Table 2 summarizes the number of echoic tact opportunities, the number of correct echoic tact responses, the mean number, and the range of correct echoic tacts, across the two experimental conditions of FT delivery and contingent delivery for the forms “cup” and “book” for participant A and “paper” for Participant B.

Discussion

The purpose of the study reported here was to investigate the role of different contingencies of social reinforcement in the acquisition of first instances of echoic tacts (echoics taught under the controlling variables of tacts) (Tsiouri & Greer, 2003). Thus, social interaction (praise, attention, physical interaction), which is considered the natural consequence for the echoic and the tact (Skinner, 1957; Stafford, Sundberg, Braam, 1988), was delivered on different reinforcement contingencies, during two experimental conditions: a) Fixed Time delivery of generalized social interaction without extinction (related to possible satiation effects) (Car, et al., 1998; Fisher, et al., 1997; Goh, et al., 2000; Kahng, et al., 2000; Lalli, et al., 1997; Poling and Normand, 1999; Vollmer, 1999), and b) contingent only upon correct motor imitation and echoic tact responses delivery of generalized social reinforcement. We posed two experimental questions: 1) Would different contingencies of delivery of social reinforcement, control the effectiveness of the rapid motor imitation sequence in inducing echoic tacts? 2) Would these different social reinforcement contingencies affect RMIA responses?

Data showed that across all three reversal experimental designs, counterbalanced across satiation and deprivation condition, there was a functional relationship between the number of correct echoics and contingent only upon correct responses delivery of social reinforcement. The level of correct echoic tacts was significantly higher during this experimental condition, while data dropped to a low level during the FT delivery of social interaction without extinction condition.

Across all three reversal experimental designs, there was no effect of the FT delivery without extinction condition or the contingent reinforcement delivery condition on the correct performance of the RMIA. Data remained at a high level across both conditions, which showed that generalized social reinforcement was not functioning as a controlling variable for the performance of the RMIA.

This finding is consistent with similar experimental results derived from Peterson and Whitehurst (1971) and Steinman and Boyce (1971), who implemented a DRO procedure in order to test whether imitative behavior was maintained by contingent reinforcement operations. They found that imitative responding remained at high levels and was not affected by the noncontingent delivery of reinforcement. Whitehurst, 1971; Whitehurst, 1977 suggested that setting events such as the child’s history of compliance or non-compliance with adult’s instructions, the presence or the absence of the adult in the room (Peterson and Whitehurst, 1971) and the presence or absence of explicit instructions, as to which stimuli the child should respond to (Steinman, 1970), could be the controlling variables in effect for the performance of generalized motor imitation (responding to previously reinforced and not reinforced imitations).

In our study, the high levels of correct RMIA responding, regardless of the reinforcement contingencies in effect, were probably a function of similar controlling variables or setting events. Participants were under good instructional control, and had a previous history of educational reinforcement (Skinner, 1957), when performing large and small motor imitation actions with the

instructor (who was their classroom teacher). Participants demonstrated a generalized motor imitation repertoire before the onset of the study and had received explicit training to increase the rate of their RMIA performance during pre-baseline training. Therefore, one can assume that the performance of random large and small motor actions, that the instructor modeled, was reinforcing per se, regardless of the social reinforcement contingencies in effect during each experimental condition.

Echoic tact responses, on the other hand, were a function of the amount of generalized social interaction, delivered under two different contingencies. Contingent delivery of social reinforcement increased correct echoic tact responding, when the RMIA procedure was implemented to induce first instances of correct echoic tact responses (Ross and Greer, 2003; Tsiouri and Greer, 2003). When the amount of social interaction increased, (during the FT delivery without extinction condition), the level of correct echoic tact responses dropped, despite the fact that contingent social reinforcement of correct echoics was still in effect.

How can we explain the differences, however, between RMIA responding and echoic tact responding, under different contingencies of reinforcement. We can better answer this question by posing another type of question: are motor imitation responses and echoics two different response classes?

Earlier and current literature on generalized imitation, provided evidence towards viewing imitation in general as one functional response class, with no distinct topographical boundaries. Sherman (1965) extended the class of motor imitation to include vocal imitation by shaping responses that were closer approximations to vocalizations such as oral motor imitation. Peterson (1968) was successful in inducing non-imitative responses (one-step directions) without prior training, when they were interspersed among reinforced imitative responses. Poulson and Kymissis (1988); Poulson and Kymissis (1996); Steinman (1970); Steinman and Boyce (1971); suggested that both motor and vocal generalized imitation follow the same operant acquisition paradigm, which involves not only contingent social reinforcement but also the learning of the rule “do as the model says”. Thus, complying with the model is the controlling variable for the emergence of the generalized imitation response class

Another body of research on generalized imitation, however, suggests that there are distinct topographical boundaries between generalized imitation classes and that the boundaries are related to the previous training histories (Garcia, Baer and Firestone, 1971; Young; Krantz, McCannahan & Poulson, 1994; Whitehurst, 1971). According to the results of these studies, data showed that generalized imitation (from reinforced to non-reinforced responses) occurred more often within the same response class (e.g. from large motor imitation actions to small motor imitation actions), than across different response classes (e.g., from motor imitation to vocal imitation).

Skinner (1957) suggested that imitation is not inherent, but is acquired quickly at the early stages of life and evidence has accrued that this is the case for observational learning at later stages (Greer, Singer-Dudeck, & Gautreaux, 2006). Reinforcing contingencies evoke imitative responses, and not the behavior of the model. At most, what one can argue is that behaving similar to a model becomes a reinforcer for the observer, because of a previous history of observation of the outcomes or the effects of this particular behavior. Even if we accept, however, that generalized imitation comprises one response class that follows the operant behavior paradigm, this does not suggest that we deny the existence of distinct contingencies that are characteristic of only echoic behavior. Echoics form their

own separate, functionally independent operant class. This response class is under the control of specific variables, such as generalized social reinforcement and a vocal stimulus that involves a combination of muscular movement and a specific sound pattern (Skinner, 1957).

This study provides evidence towards the functional independence of echoic tacts and generalized motor imitation responding. Echoics under the controlling variables of tacts were sensitive to contingent reinforcement delivery conditions, while RMIA responding seemed to be under the controlling variables of the “do as the model says” paradigm, and at the same time insensitive to the reinforcement contingencies under the different experimental conditions.

More recently, the research on the formation of higher order operants, as a function of rapidly alternating exemplar experiences, suggest that the procedure of inducing echoic to tacts or echoics to mands following imitative responses may act to join the two initially independent response classes of see and do to hear and say as a new duplic higher order operant. That is just as the rapid alternation of listener and speaker responses to a single stimulus has acted to induce the higher order operants involved in Naming (Fiorile & Greer, 2007; Greer, Stolfi, Chavez-Brown, & Rivera-Valdes, 2005) and the higher order operants involved in joining saying and writing (Greer, Yuan, & Gautreaux, 2005) it is possible that rapidly alternating see do with hear say opportunities results in the joining of the imitative class with the echoic class resulting in a higher order duplic operant (Greer & Ross, 2008).

We also have to point out the possible importance of the FT delivery of social interaction without extinction procedure, on the acquisition of first instances of echoic tact behavior. There is a possible satiation effect that this procedure creates, when compared to the contingent reinforcement delivery condition (Car, et al., 1998; Fisher, et al., 1997; Goh, et al., 2000; Kahng, et al., 2000; Lalli, et al., 1997). The amount of generalized social interaction during the FT condition was significantly higher than during the contingent delivery condition (Table 1). Further experimental manipulation of the total amount of generalized social reinforcement though is needed, in order to investigate the possible motivational variables in effect, when teaching echoic tact responses. Establishing operations, such as satiation vs. deprivation from generalized social reinforcement (attention, social praise and other forms of educational reinforcement), should be thoroughly utilized, not only when teaching the mand function but also when teaching echoic and independent tacts. This line of research can contribute to the development of motivational instructional procedures that would achieve rapid increase in the echoic and independent tacting repertoire of children with severe language delays in the Autistic Spectrum Disorders.

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Effects of Instruction, Goals, and Reinforcement on Academic Behavior: Assessing Skill versus Reinforcement Deficits

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Abstract

We attempted to determine the effects of instructions, goal setting, and reinforcement, in isolation and combination, on the letter naming proficiency of 2 underperforming Kindergarten students. During a no-intervention baseline, both students' accuracy was low or declining. Instructions alone produced increases over baseline responding, but the effects were not maintained; goal setting and reinforcement alone did not produce any initial effects. When reinforcement was combined with instructions and goal setting, the performance of both participants improved in all conditions, with greatest initial improvements in the instruction plus reinforcement condition. Data from this phase showed some evidence of carryover between conditions. These findings suggest that single interventions were not sufficient for performance improvement, but that combined interventions were effective.

Keywords: academic performance, goal setting, instruction, Kindergarten students, letter naming, literacy, motivational deficits, skill deficits, reinforcement

There are several possible causes when students underperform or otherwise fail to meet academic standards. Gilbert (1978) proposed six variables that may be involved in underperformance: information, instruments, incentives, knowledge, capacity, and motives. Of these domains, information, incentives, knowledge, and motivation may be of particular interest in educational settings. Informational deficits (and deficits in the related knowledge domain) involve individuals not knowing how to perform the skill, not knowing what performance standards are in place, or not receiving feedback about their behavior relative to the expectations. According to Gilbert, failures of incentives involve weak or poorly scheduled reinforcers for performing well or competing reinforcers for poor performance. When students underperform, the question of whether the deficits are due to a lack of instruction or to mismanaged contingencies is important to consider; does the performer know how to do what they are being asked to do? Is there sufficient reinforcement available for performing the expected task? When these questions are answered correctly, an intervention aimed at improving performance may be developed.

Several studies have examined assessments and interventions based on differences between skill and performance deficits (e.g., Daly, Martens, Hamler, Dool, & Eckert, 1999; Duhon et al., 2004; Eckert et al., 2000; Lerman, Vorndran, Addison, & Kuhn, 2004; Noell et al., 1998). The efficacy of these interventions has been demonstrated across different populations (including children with autism, developmental disabilities, and typical development), responses (including math and reading at a variety of levels), and settings (including homes, schools, and clinics). Interventions typically involve some combination of instructional strategies, goal setting, performance feedback, and reinforcement, in isolation or combination. For example, Duhon et al. (2004) examined the utility of a brief assessment (similar to the one described by Northup et al., 1991) for predicting performance in extended interventions targeting math and writing skills. Brief assessments were conducted to establish baseline levels of performance. Instructions were provided but no explicit reinforcement contingency was in place. Following the assessment, the experimenters conducted out-of-class sessions to examine effects of goal setting and rewards. Two participants performed more accurately during the goal/reward sessions than during the initial assessment, suggesting a performance deficit, while the other 2 participants showed no change between instructional and goal/reward sessions, suggesting a skill deficit. During the extended intervention component of the study, the experimenters employed an alternating-treatment design (e.g., Barlow & Hersen, 1984) to evaluate the relative effectiveness of performance- or skill-based treatments.

The performance-based treatment involved stating a goal and allowing access to a small reward if the goal was met. The skill-based treatment involved pre-session practice or the use of an instructional aid. Students with hypothesized performance deficits improved in the performance-based treatment and students with hypothesized skills deficits improved in the skill-based treatment.

Like Duhon et al. (2004), most research assessing reinforcement- or skill-deficits has used combinations of treatment components. For example, Duhon et al. incorporated both goals and reinforcement in their performance-based intervention. Eckert, Adroin, Daisey, and Scarola (2000) assessed various combinations of six components commonly used in performance- or skill-based interventions for reading: previewing the reading passage, practicing the passage, performance feedback (on the amount of time only or amount of time plus number of errors), goal setting (with goals set by the student or the experimenter), performance charting, and reinforcement. Reading fluency was improved in conditions combining skill-based interventions (preview plus practice) with performance-based interventions (feedback, goal setting, charting, or reinforcement), as compared to baseline. However, results were largely undifferentiated between the various combined skill- and performance-based interventions. Additionally, each condition included at least two components, precluding determination of the effect of any individual component on responding.

Prior literature has suggested that both skill and performance deficits may contribute to poor academic outcomes, and that interventions can be developed to address these deficits (e.g., Bonfiglio, Daly, Marten, Lin, & Corsaut, 2004; Eckert et al., 2000; Eckert et al., 2002; Lerman et al., 2004; Noell et al., 1998). Authors have acknowledged that the interactions between the antecedent-based and consequence-based interventions may be difficult to separate (cf., Bonfiglio et al., 2004). Unfortunately, most research exploring performance or skills deficits combined several individual components into a larger treatment package (e.g., Eckert et al., 2000). In particular, goal setting was frequently combined with reinforcement or performance feedback, making the isolated effects of these components difficult to discern (e.g., Bonfiglio et al., 2004; Duhon et al., 2004; Eckert et al., 2000; 2002). Goal setting in isolation may be an easy and inexpensive method of improving students' academic behavior. However, if goals alone are not sufficient to promote appropriate behavior, additional intervention components may be required.

The present study examined effects of instruction, goal setting, and reinforcement, in isolation and combination, on letter naming with typically developing Kindergarten students. Two interventions were used to determine whether participant noncompliance was due to skill deficits, performance deficits, or some combination of the two. During the first intervention, three conditions were compared in an alternating-treatments design: (1) pre-session instruction was provided but no consequences were programmed, (2) goals were stated but no consequences were programmed for meeting those goals, or (3) no pre-session antecedents (i.e., goals or instructions) were used but access to reinforcers was provided contingent on improved performance. The purpose of this comparison was to determine the effects of instruction, goals, and reinforcement in isolation. During the second intervention, access to small edibles was included in all conditions to determine if combined skill and performance deficits contributed to noncompliance with academic tasks.

Method

Participants, Setting, and Materials

Two 5-year-old children were referred by teachers and caregivers for skill deficits in alphabet letter recognition and disruptive behavior during class instruction. Jake and Theresa were both Kindergarten students in regular-education classrooms. Both were of at least average intelligence, but their disruptive behavior in the classroom resulted in below-average grades and put them at risk for retention in Kindergarten for the next academic year.

Sessions were conducted in small testing rooms located near the participants' classrooms. Testing rooms contained tables, child- and adult-sized chairs, storage cabinets, and a variety of educational items, such as books and games. Small (1 in. by 1 in.) letter tiles were used throughout the experiment.

Response Measurement and Reliability

Observers were undergraduate and graduate students, who were trained using a real-time data collection program (InstantData v1.1 for PC) on laptop computers. All observers had previously attained interobserver agreement scores (calculated as described below) of at least 90% for three consecutive sessions. Observers recorded the duration of each session, the number of letters identified correctly, the number of letters identified incorrectly, and the number of times the participant said "I don't know." Correct responding was operationally defined as naming the letter that was presented. Incorrect responding was operationally defined as naming a different letter than the one presented. Percentage of correct responses was calculated by dividing the number of correct responses by the sum of incorrect and "I don't know" responses, and multiplying by 100.

For Jake, data were collected using a real-time data collection program (InstantData v1.1 for PC) installed on laptop computers. Because computers were not available for sessions with Theresa, data were collected by tallying the number of correct, incorrect, and "I don't know" responses using a paper-and-pencil data sheet.

Two observers independently observed and scored responses for 25% of sessions across both participants. Interobserver agreement (IOA) was calculated by dividing the lesser number of responses scored by an observer by the greater number (scored by the other observer) and multiplying the quotient by 100. Interobserver agreement for correct letter identification averaged 94.2% (range 81.8% to 100%), incorrect letter identification averaged 93.2% (range 66.7% to 100%), and "I don't know" responses averaged 96.0% (range 50.0% to 100%).

Procedure

Experimental Design. This experiment consisted of a nonconcurrent multiple-baseline-across-participants design with an embedded reversal for Jake. Multiple sessions, each 2 min in duration, were conducted two to three days per week. Prior to the start of each session, the child was led into the room and asked to choose where he or she would like to sit. An experimenter and an observer sat at the same table, approximately 0.5 m away from the child. All experimenters were doctoral students. Sessions were conducted until participants attained 80% accuracy on at least one letter set, with no evidence of a downward trend.

Pre-experimental Letter-Naming Assessment. We first conducted a pre-experimental assessment to determine which letters the child was able to correctly identify. Participants were told that if they did not know the name of a letter, they could say "I don't know." Letter tiles were presented in random order. Upon presentation of each letter tile, the experimenter prompted the child to identify the name of the letter by asking "what letter." If the child did not identify the letter within 10 s, the experimenter prompted the child again. The experimenter continued to prompt every 10 s until the child responded. When the child responded (correctly or incorrectly), the letter was removed, and the experimenter immediately presented

another letter. Each session lasted until all 26 letters were presented 10 times. Following the session, the experimenter provided the child with noncontingent access to leisure items for approximately 2 min before starting the next session. Three sessions were conducted for each participant during the pre-experimental assessment. The letters that were incorrectly identified on each presentation for all three sessions were randomly assigned to one of three sets that would be used in subsequent analyses. Letter sets contained four and six letters for Jake and Theresa, respectively.

Baseline. Baseline sessions were conducted for each participant to ensure that each of the sets contained letters that were all unknown to the participants. The child was asked to name as many letters as possible in 2-min sessions by using the same verbal prompt as in the pre-experimental assessment. As in the pre-experimental assessment, the child was re-prompted every 10 s if he or she not respond within that period. If the child responded (correctly or incorrectly), the letter was removed, and the experimenter immediately presented another letter. The letter tiles were presented randomly without replacement and were cycled through until 2 min elapsed. There were no programmed consequences for responses, either correct or incorrect, during the baseline phase.

Intervention 1. During Intervention 1, antecedents and consequences differed across the three sets of letters. In one set (hereafter, the “instruction set”), the experimenter provided pre-session instruction on the names of the letters in that set. If underperformance was due to skill deficits alone, accuracy should improve in this condition. Instruction consisted of the experimenter showing the child a letter and saying the name of the letter. The experimenter then prompted the child to repeat the letter name. If the child did not repeat the name of the letter within 10 s, the experimenter repeated the name of the letter and prompted the child to repeat the letter name. Pre-session instruction continued until all letters in the set had been shown four times. An instructional period was conducted immediately before each session with the instruction set.

The experimental session began immediately after the instructional period. The experimenter presented a letter and prompted the child to name the letter. A prompt occurred every 10 s until the child responded. Following a response, either correct or incorrect, the letter was removed, and a new letter was presented. The letter tiles were presented without replacement and were cycled through until 2 min elapsed. No pre-session goals were stated, and no reinforcers were available.

For another set of letters (hereafter, the “goal set”), the experimenter provided a goal before the start of the session by stating “Try to get [goal value] right.” The goal was determined by adding one letter to the number of letters identified correctly in the previous session with the goal set. For example, if the child identified 17 letters correctly in the previous session with the goal set, the goal would be to identify 18 letters correctly. The purpose of this manipulation was to determine the effect of goals without instruction or reinforcement on letter naming; if underperformance was due to performance deficits alone, accuracy might improve in this condition. The experimental session began immediately after the goal was stated. The experimenter presented a letter and prompted the child to name the letter. A prompt occurred every 10 s until the child responded. Following a response, either correct or incorrect, the letter was removed, and a new letter was presented. The letter tiles were presented randomly without replacement and were cycled through until 2 min elapsed. No instructions, feedback, or reinforcement were available.

The final set of letters (hereafter, the “reinforcement set”) was not preceded with any instruction or goal. However, if the child reached the reinforcement criterion described below, he or she was provided with access to edible items without explanation of how those items were earned. The reinforcement criterion was determined by adding one letter to the number of letters identified correctly in the previous session with the reinforcement set (the same calculation used to determine the goal, only based on performance in a different set). If the child reached the reinforcement criterion, he or she was provided with five small edible items that had been identified as preferred through both parental and child nomination. Reinforcers for attaining the criteria for Jake and Theresa were Superman® gummy fruit snack and Goldfish® crackers, respectively. The purpose of this manipulation was to determine the effects of reinforcement alone on letter naming; if underperformance was due to reinforcement deficits alone, accuracy should improve in this condition. A prompt occurred every 10 s until the child responded. Following a response, either correct or incorrect, the letter was removed, and a new letter was presented.

The letter tiles were presented randomly without replacement and were cycled through until 2 min elapsed.

Intervention 2. During Intervention 2, the antecedents for each of the sets were identical to those described in Intervention 1. However, the consequence for each letter set was identical to that of the reinforcement set described in Intervention 1. Therefore, if the child correctly identified in one session the same amount as the previous session with that set plus one, the experimenter provided the child with five edible items. The antecedents and consequences associated with the reinforcement set were identical to Intervention 1; no antecedents were used and reinforcers were available for improved performance.

Reinforcement Only. Jake was exposed to a final phase, to determine the effect of reinforcement only on letter naming with the sets previously associated with instructions, goals, and reinforcement. During this phase, there were no programmed antecedents (instruction or goals), but reinforcers were available for all sets contingent on improved performance (as in Intervention 2). During all sessions, a prompt occurred every 10 s until the child responded. Following a response, either correct or incorrect, the letter was removed, and a new letter was presented. The letter tiles were presented randomly without replacement and were cycled through until 2 min elapsed. Attainment of the reinforcement criterion (as previously described) resulted in the presentation of edible items to the child.

Results

Results from the pre-experimental assessment (not shown in Figure) identified 12 letters incorrectly named by Jake and 19 letters incorrectly named by Theresa. To create equal numbers of letters across the three sets, one eligible letter was excluded from Theresa’s analysis. Thus, each letter set for Jake and Theresa contained four and six letters, respectively, depicted in both upper and lower case. For Jake, the instruction set contained the letters E, G, U, and Y; the goal set contained H, P, Q, and W; the reinforcement set contained F, M, T, and R. For Theresa, the instruction set contained the letters B, E, H, N, U and X. The goal set contained A, D, G, R, L, and W, and the reinforcement set contained C, F, I, Q, V, and Y. These letter sets remained constant through all baseline and intervention phases.

Results for the baseline and intervention phases for Jake and Theresa are shown in Figure 1.

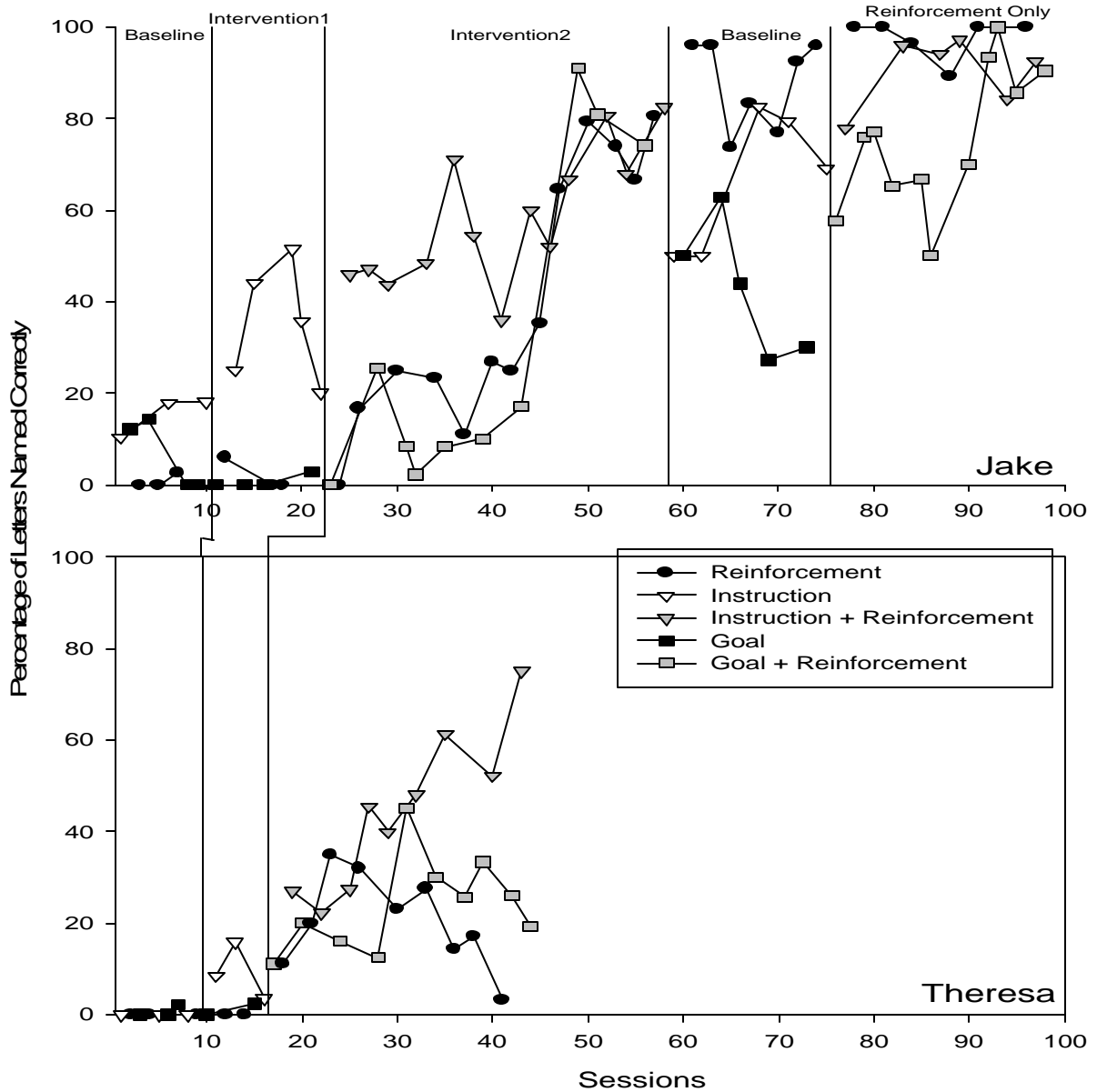


Figure 1. Baseline and intervention results for Jake (upper panel) and Theresa (lower panel). Triangles denote responding in the instruction set. Squares denote responding in the goal set. Circles denote responding in the reinforcement set. Shaded symbols show sessions in which reinforcement contingencies were added to the antecedent manipulations.

The accuracy of responding, shown as percentage of letters named correctly, is along the y-axis, with consecutive sessions along the x-axis. Each data path shows results for a different set of letters: the instruction set by triangles, the goal set by squares, and the reinforcement set by circles.

The results for Jake are shown in the upper panel. During baseline, Jake correctly responded to more letters in the instruction set than any other set. This is surprising given that Jake was not able to correctly identify any of the letters (in any set) during the pre-experimental assessment and that we provided no instruction on any of the letters during the baseline phase. Nonetheless, Jake's performance on all sets was stable or decreasing by the end of the phase.

Intervention 1 involved manipulations of antecedents for the instruction and goal sets and a manipulation of consequences for the reinforcement set. Jake's performance initially improved in the instruction set, but declined over the course of the phase. Jake's performance in the goal and reinforcement sets did not improve, despite contacting the reinforcer following session 12. These results suggest that, for Jake, instruction may be necessary but insufficient for performance increases.

Intervention 2 involved manipulations of antecedents and consequences for the instruction and goal sets (opportunity to earn a reinforcer was added to the previously used antecedents). To highlight the difference in consequences, we shaded the triangles (instruction set) and squares (goal set). The antecedents and consequences in the reinforcement set remained identical to Intervention 1. Jake's performance improved on all three sets during Intervention 2. The greatest immediate gain occurred in the set in which Jake received instruction before the session and a reinforcer for meeting the performance criterion. However, immediate gains were also observed in the goal set and the reinforcement set. By the middle of Intervention 2, Jake was performing with high accuracy on all three sets, with no differentiation in responding between the sets.

Because of this finding, we reversed to baseline to determine the role of reinforcement in Jake's performance. Jake's accuracy continued to improve on the reinforcement set, but declined somewhat on the other two sets. Finally, we instituted a reinforcement-only phase, in which no antecedent interventions were used. During the reinforcement-only phase, Jake's performance improved from the previous baseline phase for all three sets. However, improvements were slower in the set previously associated with goals than in the other two sets. This difference seemed to be related to the particular letters that were assigned to that set. Specifically, the goal set contained the letters P and Q. Jake consistently answered "P" when shown a lower case Q. Therefore, we conducted a brief instructional period immediately before session 93. During the instruction period, the experimenter reviewed upper and lower case P and Q with Jake, using the strategy previously used with the instruction set, and then asked Jake to independently name the letters. Feedback was provided for correct and incorrect naming during the instructional period. The instructional period continued until Jake was able to accurately name both upper and lower case letters correctly two consecutive times. Following this instructional period, Jake's accuracy on the set previously associated with goals increased to above 80% correct.

Theresa's results are shown in the lower panel of Figure 1. During baseline, Theresa correctly named a letter on only one opportunity. There were no clear differences between the three sets. During Intervention 1, Theresa's performance on the instruction set increased initially, but decreased by the end of the phase. This result suggests that instruction alone was insufficient to promote and maintain accurate responding, but may have been a necessary component of an intervention, as it was for Jake. Theresa's performance did not improve in the goal and reinforcement sets during Intervention 1. However, Theresa never contacted the reinforcement contingency during this phase, so the effects of reinforcement alone cannot be determined from these data. During Intervention 2, Theresa's performance in the instruction set exceeded her performance in the other two sets. However, accuracy increased above baseline and Intervention 1 levels for all sets. Unlike Jake's performance, Theresa's letter naming in the goal set and reinforcement set declined through the course of the phase.

Discussion

We evaluated the effects of instructions, goal setting, and reinforcement, in isolation and combination, on the letter naming performance of 2 typically developing Kindergarten students. Instruction, goal setting, and reinforcement were not effective in isolation, suggesting that the student's poor classroom performance was due to both instructional and reinforcement deficits. When reinforcement was combined with instruction and with goal setting, performance in all conditions improved. For Jake, exposure to the combined interventions seemed initially necessary, but reinforcement alone was sufficient by the end of the experiment. For Theresa, a combination of instruction and reinforcement was necessary to maintain performance.

Both participants demonstrated improved accuracy on all sets when a reinforcement contingency was added to instructions and goal setting. In other words, performance improved even on the letter set that remained unchanged from the previous phase (the reinforcement set). This suggests that our initial conclusion from Intervention 1—that instruction was necessary but not sufficient to maintain performance—was incorrect. Had instruction been necessary but not sufficient, the students' performances would have increased on the instruction set, but not the goal or reinforcement sets, during Intervention 2. The increase in accuracy on the goal and reinforcement sets suggests that the students "knew" more than they were demonstrating during the previous phase. This change in behavior may be due to changes in discriminative stimuli, in that the edible reinforcers were placed on the table within the participant's line of sight, during Intervention 2. Perhaps the presence of the edibles signaled the availability of reinforcers across conditions and was sufficient to increase responding. It is also possible that some other feature of Intervention 2, such as an increased overall reinforcement rate or generalization between conditions, led to improved performance.

Theresa's performance in the goal and reinforcement sets did not maintain during Intervention 2. Her performance in both sets declined steady after initial improvements. It is possible that the edible item (Goldfish® crackers) lost its reinforcing efficacy over time. Although no formal reinforcer assessment was conducted, Theresa frequently requested Goldfish® after the sessions during Interventions 1 and 2. However, a formal reinforcer assessment may have clarified these results. It is also possible that Theresa forgot some of the letters across time (as it seems that Jake "forgot" the difference between lower case P and Q between Intervention 2 and the reinforcement-only phases). This "forgetting" could have been attenuated in the instruction set, in which we told Theresa the names of the letters before the start of each session.

The persistence of accurate responding during the reversal to baseline for Jake warrants further investigation. Jake's behavior in the set previously associated with reinforcement showed more resistance to extinction during the reversal to baseline than did behavior in the other two sets. It is possible that the change from Intervention 2 to baseline was less discriminable for the reinforcement set than for the other two sets. For both the instruction and goal sets, the return to baseline involved two changes: the removal of the antecedents (instruction or goals, respectively) and the removal of the reinforcement contingencies. The change in antecedents may have made the transition to baseline more discriminable than with the reinforcement set, which involved the removal of the reinforcement contingency, but no change in the antecedent verbal behavior of the experimenter. It is also possible that the distribution of letters across the sets influenced this outcome. The reinforcement set contained letters appearing more commonly in English words; the average frequency of letters in the reinforcement set was 256.8 per 1000, in contrast to 220.3 per 1000 for the instruction set and 99.8 per 1000 for the goal set (calculated using data from Pratt, 1996). Given that declines in Jake's performance across sets matched the average frequency of the letters in that set, it seems plausible that the frequency with which Jake was likely to encounter these letters outside of the experiment may have influenced his performance during baseline conditions.

It is also possible that some of the initial improvements in performance were due to events occurring outside the experimental situation. For example, both participants were exposed to a regular-education Kindergarten curriculum outside of the experimental sessions. Therefore, although we did not provide instruction on the letters in the goal and reinforcement sets, both participants were undoubtedly exposed to some instruction on these letters in their classrooms. The influence of this extra-experimental history cannot be eliminated as a contributing factor to the results of this study. We chose to target letter naming in this experiment because of its social significance to the children and their parents; future research could use arbitrary stimuli, for which participants would receive no extra-experimental exposure.

For Jake, interaction between the sets during Intervention 2 seems likely. Jake's performance in the goal and reinforcement sets did not improve until he received a reinforcer in the instruction set. In addition, his performance on the goal and reinforcer sets improved dramatically between sessions 46 and 48. These sessions were conducted on the same day; there is little chance that this improvement was due to events occurring outside the experiment (such as extra instruction at home or in the classroom, or a change in the reinforcing efficacy of the Gummies®). It is difficult to determine what factors led to the dramatic improvement in performance over the course of the day's sessions. Recall that Jake was never given instructions on how to earn reinforcers; it is possible that Jake "figured out" (developed some self-generated rules) that reinforcers were reliably available for improved performance. It is also possible that Jake's behavior in the instruction set generalized across the other two sets. Future research could examine the effects of instructions, goals, and reinforcement using a reversal design to reduce the possibility of carryover or interaction between the conditions.

One limitation of this study is that Theresa was not exposed to a reversal to baseline. Jake's behavior during the reversal to baseline may be atypical for performance under these conditions, and it would have been helpful to observe changes in Theresa's performance. However, Theresa's data showed clear differentiation between the sets, and she met the study termination criterion, during Intervention 2. It also would have been interesting to determine if Theresa's behavior in the instruction set would maintain during a reinforcement-only phase. If this was the case, it would suggest that continuing instruction was not necessary to maintain performance.

A second limitation of the study is the experimental design. We used a nonconcurrent multiple-baseline-across-participants design because of the timing of the referrals. When we began collecting Theresa's data, there were no other Kindergarten students available who were seemingly capable, but underperforming. Theresa's teacher requested that we begin working with her immediately because of an escalation of her noncompliance in the classroom. However, use of a concurrent multiple-baseline-across-participants design would have permitted stronger demonstration of experimental control. Nonetheless, we were able to demonstrate differentiation in responding between the experimental conditions, with results that replicated (at least to some extent) across participants.

The results of this study suggest that a single intervention strategy, including goal setting alone, may be ineffective at improving the academic performance of Kindergarten students. This study replicates prior work suggesting that multiple-component interventions may be necessary to improve performance (cf. Eckert et al., 2000), and extends the current literature by demonstrating that goal setting was not effective in isolation. We hope that these results underscore the importance of implementing effective instructional strategies combined with reinforcement contingencies to support academic behavior. We also hope that this study will provide a foundation for future research examining the interaction between rapidly alternating instructional conditions (such as instruction plus reinforcement and reinforcement only). If future research determines that these interactions improve performance, teachers could use that information to determine effective instructional designs. For example, a teacher could intersperse periods of instruction plus reinforcement with periods of reinforcement alone. This strategy may be particularly useful when a teacher can only provide instruction to select students (i.e., during small-group instruction).

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The Role of the Reflexive Conditioned Motivating Operation (CMO-R) During Discrete Trial Instruction of Children with Autism

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Abstract

The principle of motivation has resurfaced as an independent variable in the field of behavior analysis over the past 20 years. The increased interest is the result of the refinements of the concept of the motivating operation and its application to the learning needs of persons with developmental disabilities. Notwithstanding the increased emphasis upon modification of motivating operations to reduce problem behavior, the autism treatment literature currently reflects limited recognition of this important behavioral variable. This paper provides an overview of antecedent based instructional modifications that lead to a reduction of escape and avoidance behavior of children with autism during instruction. An analysis of these instructional methods as motivating operations is proposed. A conceptually systematic analysis of the influence of instructional methods is offered as a tool for improving the selection and implementation of effective teaching procedures.

Keywords: motivating operations, establishing operations, autism, escape and avoidance behavior, discrete trial instruction.

Comprehensive intensive treatment based upon the application of behavior analytic principles has proven to be an effective form of intervention for children with autism (Green, 1996). Several comparative studies have demonstrated the superiority of behavior analytic programs over other approaches to autism treatment or differing levels of intensities of services (Birnbauer & Leach, 1993; Cohen, Amerine-Dickens, & Smith, 2006; Eikseth, Smith, Jahr, & Eldevik, 2002, 2007; Howard, Sparkman, Cohen, Green, & Stanislaw, 2005; Lovaas, 1987; Sallows & Graupner, 2005; Remington et al., in press; Smith, Groen, & Wynne, 2000). This research has provided clear evidence that intensive intervention guided by behavior analytic principles can produce substantial benefits for children with a disorder that was once thought to be resistant to all forms of treatment. There are reports of children with autism entering regular education classrooms, achieving substantial cognitive gains and developing age appropriate social skills after many years of intensive behavioral intervention (Lovaas, 1987). Recently, evidence has been gathered that suggests that school, community, and home applications of intensive behavioral intervention can be equally successful (Eikseth et al., 2002; Howard et al., 2005). At least five published manuals (Leaf & McEachin, 1999; Lovaas, 1981, 2003; Maurice, Green, & Foxx, 2001; Maurice, Green, & Luce, 1996) for parents and practitioners are available to provide a summary of the effective teaching methods discovered through controlled studies. These manuals have provided a user-friendly method of disseminating effective behavior analytic methods for teaching children with autism. The result may be greater acceptance and widespread application of behavior analytic methods with children with autism.

Much of the research and all of the manualized treatment packages have emphasized the importance of motivating children to respond to teacher directed instructional tasks. Koegel, Carter, and Koegel (1998) and Koegel, Koegel, Shoshan & McNerney (1999) suggested that motivation is pivotal to the teaching of children with autism because its creation is critical to the development of a wide range of

skills. Moreover, given the tendency of these children to engage in high rates of escape and avoidance behaviors (Koegel, Koegel, Frea, & Smith, 1995) within instructional demand settings, methods that increase the motivation to respond may be essential to positive long-term outcomes. The ultimate outcome for many children with autism may depend at least partially upon their learning to attend to teacher-directed activities and respond correctly and quickly for reasonable periods of time each day (Drash & Tudor, 1993). This is especially important for children with autism because they frequently fail to learn through exposure to typical social environments (Smith, 2001). As an alternative to mere exposure to everyday experiences, the method of discrete trial instruction (Lovaas, 1981, 1987; Smith, 2001) has been demonstrated to be one of the most effective instructional tools for teaching important language, social, and cognitive skills to children with autism as a component of a comprehensive program of intervention. The method is modeled after Skinner's (1968) three-term contingency arrangement whereby a stimulus is presented by a teacher, a response occurs, and a consequence follows the response in order to strengthen or weaken the likelihood that it will occur again under similar conditions.

When discrete trial instruction has been used as a component of a comprehensive program of intensive intervention for children with autism, long-term benefits have been achieved with many children (Lovaas, 1987; McEachin, Smith, & Lovaas, 1993; Smith, 1999). Notwithstanding the benefits of this method, its proper implementation presents substantial challenges to practitioners. The implementation of discrete trial instruction may conflict with the learning history of children with autism related to escape and avoidance behavior. In other words, the high demand requirements of discrete trial instruction are the same conditions that typically evoke problem behavior in the form of tantrums, flopping, high rates of stereotypies, aggression, and self-injury. Smith (2001) explains "...children with autism may attempt to escape or avoid almost all teaching situations, as well as any requests that adults make of them" (p. 89). Consequently, a thorough conceptual understanding and practical repertoire related to the modification of instructional variables that reduce escape and avoidance maintained problem behavior of children with autism appears essential. The purpose of this paper is to provide an overview of the behavioral analysis of motivation during discrete trial instruction and a re-interpretation of the effects of antecedent variables as motivating operations (MO), and more specifically, the CMO-R. No new methods are presented. Instead, this interpretation is offered to help practitioners and teachers understand why a variety of procedures that have been reported in the literature are effective. Baer, Wolf, and Risley (1968) stated that practitioners within a scientific discipline require more than a "bag of tricks" as the source of their procedures. Extension to new areas is only accomplished through the understanding of how procedures work in terms of basic principles. In the case of discrete trial instruction of children with autism, practitioners may benefit from a conceptually systematic analysis of motivation when conducting training, applying the principles to new problems, generally reducing the aversiveness of teaching environments, and decreasing reliance on escape extinction. Moreover, improved selection of appropriate instructional methods may be facilitated.

The Establishing Operation

Michael (1993) stated the establishing operation (EO) "is an environmental event, operation, or stimulus condition that affects an organism by momentarily altering (a) the reinforcing effectiveness of other events and (b) the frequency of occurrence of that part of the organism's repertoire relevant to those events as consequences" (p.192). To paraphrase Michael (2004), EOs make someone "want something" and lead to the actions that have produced what is now "wanted." Food deprivation makes you "want" food and therefore leads to actions that have produced food ingestion in the past, such as making a sandwich. A headache makes you "want" pain relief and therefore leads to actions that reduce pain, such as swallowing an aspirin. A significant portion of tantrums and generally disruptive behavior in children with autism during instruction may result from strong motivation for something (EO), such as task removal, a toy, or attention.

The term EO had been considered awkward since it implies only an increase in reinforcing or punishing effectiveness. Therefore, Laraway, Syncerski, Michael and Poling (2003) recommended replacing the term with motivating operation (MO). Within the remainder of this paper the term MO will be used.

Michael (1993, 2004, 2007) has provided descriptions of several unconditioned and conditioned MOs. A full description of each is beyond the scope of this paper. Our purpose here is to provide an analysis of problem behavior during discrete trial instruction utilizing the relevant concept of the conditioned reflexive motivation operation (CMO-R). And then, to suggest methods that appear to abolish the CMO-R leading to reductions in problem behavior within the context of demand related instructional activities with persons with developmental disabilities and autism. Despite the fact that several studies have demonstrated a reduction in escape motivated behavior without acknowledging the role of the CMO-R the increasing number of studies (Iwata, et al. 2000) implicating this important motivational variable seems to suggest a previously unrecognized role. The CMO-R has been implicated directly as an independent variable that affects the occurrence of problem behavior in several studies in the past few years (Crockett & Hagopian, 2006; DeLeon, Neidert, Anders, & Rodriguez-Catter, 2001; Ebanks & Fischer, 2003; Lalli et al., 1999; McComas, Hoch, Paone, & El-Roy, 2000). The presentation of instructional demands in all these studies implicated the CMO-R as the potential mechanism that accounted for the reported behavioral effects.

Michael (1993) defined the CMO-R as:

Any stimulus condition whose presence or absence has been positively correlated with the presence or absence of any form of worsening will function as a CMO in establishing its own termination as effective reinforcement and in evoking any behavior that has been so reinforced. (p.203)

The CMO-R is an environmental event that ultimately increases the value of conditioned negative reinforcement and therefore evokes any behavior that has led to a reduction in the current aversive condition. In the case of the CMO-R specifically, the conditioned aversive stimulus is the onset of the very stimulus whose offset would function as a form of conditioned reinforcement. For example, when teaching children with autism, the mere delivery of an instructional demand may establish its removal as a reinforcer. Therefore the offset of the stimulus will act as a reinforcer for any response that removes the instructional demand. In other words, if instructional demands and the setting in which they are presented “signals” or warns of any type of worsening situation (i.e., reduced reinforcement, difficult instructional demands, many instructional demands, high rate of errors, etc.), responses which remove the warning signal will be evoked. Within this context, instructional demands act as aversive stimuli and therefore evoke problem behavior that has in the past led to the removal of the demands.

The CMO-R and Teaching Children with Autism

Responding maintained by escape and avoidance of instructional and other types of demands accounts for between 33% and 48% of self-injurious and aggressive behaviors of persons with developmental disabilities (Derby et al., 1992; Iwata et al., 1994). The behavior analytic research literature is replete with interventions for escape-motivated behavior including but not limited to functional communication training (FCT) plus extinction (Hanley, Iwata & McCord, 2003) and non-contingent escape (Carr & Le Blanc, 2006). Lovaas (1981) suggested that children with developmental disabilities and autism frequently engage in problem behavior that interferes with learning. “Developmentally disabled children often throw tantrums when demands are placed on them. Their tantrums may interfere seriously with their learning of more appropriate behaviors” (Lovaas, 1981, p.29). Other researchers have also documented the negative role that escape and avoidance behavior plays in the

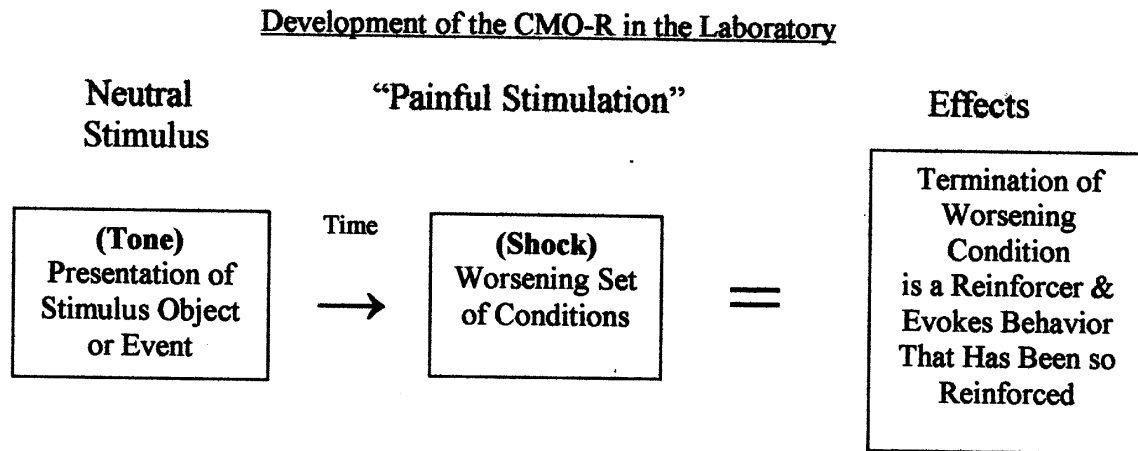
teaching and acquisition of important skills of children with autism (Koegel et al., 1998). These investigators claim that:

It is well documented that children with autism fail to respond to and avoid many types of language and academic interactions....failure to respond to everyday environmental stimuli, which appears as a widespread motivation problem, may not only have an impact on a child's communicative and scholastic activities but also can be profoundly detrimental to a child's social development. (Koegel et al., 1998, pp.167-168).

Sundberg (1993) suggested that the teaching of language and other skills is often complicated when instructional stimuli act as a CMO-R. This conclusion is particularly problematic since one of the most frequently implemented behavior analytic methods, discrete trial instruction, includes the presentation of frequent teacher initiated academic demands. For example, discrete trial instruction begins with a teacher's instructional demand. Smith (2001) suggests "As a result, these children are likely to experience frustration in teaching situations.... They may react to such frustrations with tantrums and other efforts to escape or avoid future failures". (p.86) Smith suggests that providers of these services must be equipped with the skills necessary to reduce these problem behaviors during teaching sessions. Some investigators have concluded that the best outcome for children with autism may be related to the skill of the teacher or parent in reducing disruptive behavior and developing learner cooperation during instruction (Lovaas, 2003). Given the fact that there is evidence that instructional and other types of demands delivered to children with autism during teaching sessions and at other times might well function as CMO-Rs (Smith & Iwata, 1997), for some children a comprehensive understanding of how this independent variable affects learning and information on how to weaken its control over problem behavior appears essential for teachers and others who guide programs for children with autism.

To facilitate an understanding of CMO-R an example from the laboratory setting is offered. Figure 1 illustrates the development of the CMO-R and the development of the escape and avoidance behavior it evokes in a laboratory environment. Following the laboratory example an applied example will be presented. The figure illustrates how the presentation of a neutral stimulus, through repeated correlation with a worsening set of conditions, becomes a CMO-R. This effect has been demonstrated within the laboratory with animal subjects. The operant experimental preparation that has yielded high rates of escape and avoidance behavior is referred to as the discriminated avoidance paradigm (Hoffman, 1966). In the laboratory example, rats subjected to painful shock that was preceded by and positively correlated with the sound of a neutral tone learned to terminate the tone and avoid the shock by pressing a metal bar. In this experiment, after repeated exposures to the tone-shock pairings, the mere presentation of the tone established its removal as a reinforcer and evoked behavior that in the past had resulted in its termination, such as bar pressing. Notice how the tone presentation met the two-part definition of the MO in terms of value-altering and behavior-altering effects. Also note the termination of the tone acted as a conditioned reinforcer for the bar pressing. Within the behavioral literature, the onset of a stimulus like the tone has been identified as a discriminative stimulus (S^D) for the behavior of bar pressing. Michael's (1982, 2007) reinterpretation of the difference between discriminative stimuli and MOs leads to the conclusion that the tone onset acts as a CMO-R. In addition, the reinforcer for the bar press has typically been identified as avoidance of the shock, not the termination of the tone. Michael (2004) suggested from a molecular perspective this does not seem reasonable since, "Something not happening does not easily qualify as the kind of event that can function as an immediate response consequence" (p. 71). Michael's (1982, 1988, 1993, 2000, 2004, 2007) refinements of the concept of the CMO has greatly added to our understanding of this behavioral variable. Failure to properly identify these events in terms of their functional relations to behavior may lead to imprecise and ineffective control of behavior in the laboratory and worse, poorly designed and implemented treatment programs for children with autism in classrooms and other settings.

Now consider the same arrangement as it relates to the instruction of children with autism within a discrete trial instruction format. Figure 2 illustrates the same arrangement of behavior analytic variables described in the laboratory example provided in Figure 1.



After repeated correlations of the events in the above sequence.....

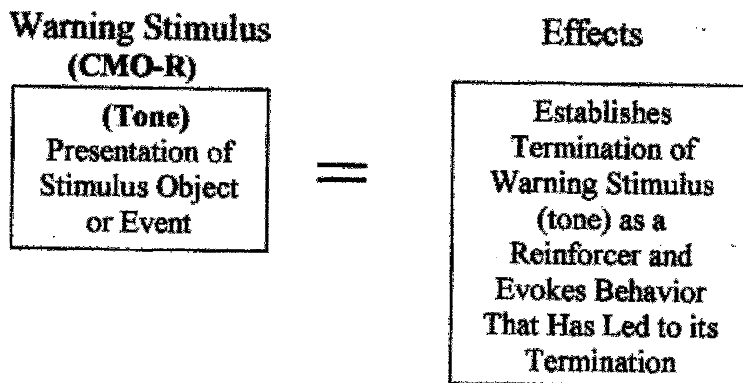
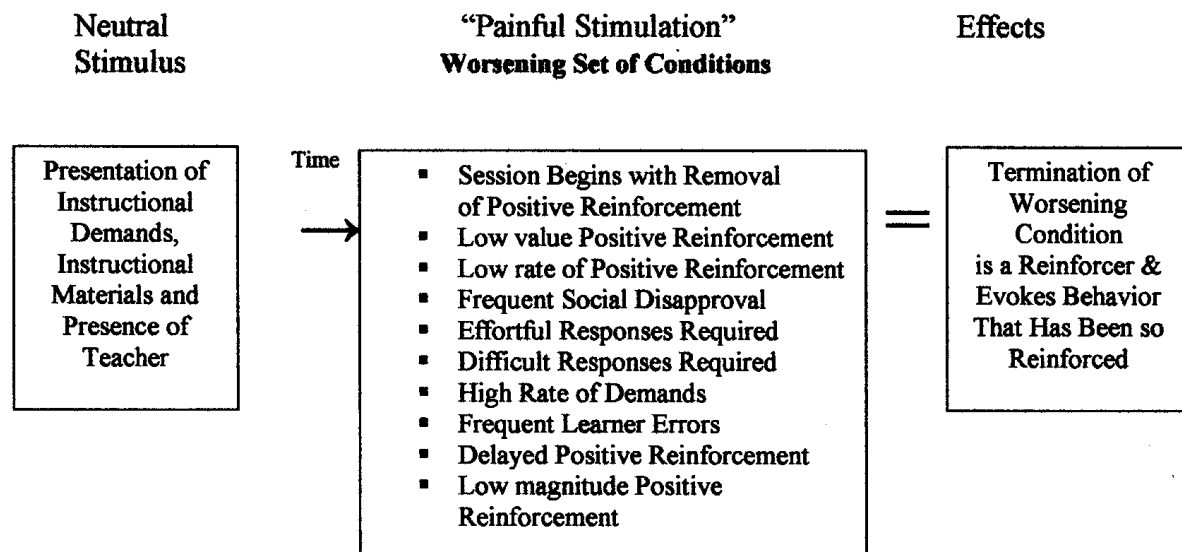


Figure 1. Illustrative diagram of the development of the reflexive conditioned motivating operation (CMO-R) in the laboratory.

Development of the CMO-R in the Classroom



After repeated correlations of the events in the above sequence.....

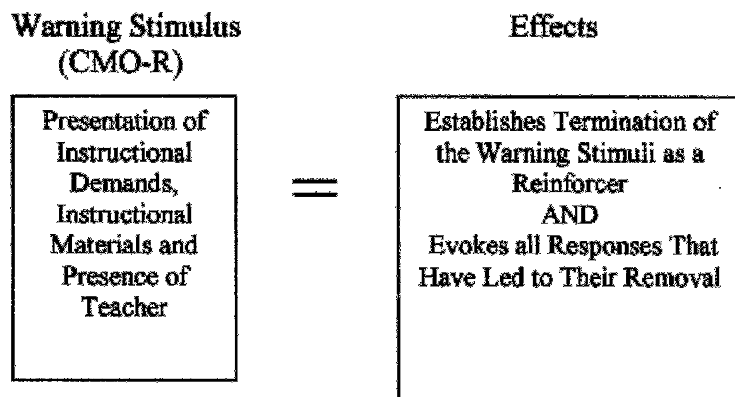


Figure 2. Illustrative diagram of the development of the reflexive conditioned motivating operation (CMO-R) in the classroom.

It is generally recommended that many children with autism receive as much as 25 to 40 hours per week of intensive behavioral intervention (Leaf & McEachin, 1999; Lord & McGee, 2001; Green, 1996). An important component of the intensive treatment model is the use of discrete trial instruction. Within this approach, behavioral tasks are divided into component activities. While the instructor is sitting at a child-sized table, he or she usually presents an instructional demand, waits for or prompts the correct response, provides a consequence for the child's response, and then pauses for a few seconds before presenting the next instructional demand (Anderson, Taras, & O'Malley-Cannon, 1996). The daily activities may be alternately structured and unstructured, with opportunities for incidental teaching (Leaf & McEachin, 1999). Many programs combine discrete trial instruction sessions with natural environment teaching (Sundberg & Partington, 1998). Whatever format is chosen, all behavioral treatment programs for children with autism emphasize active learner responding to high rates of teacher-presented instructional demands with the degree of learner cooperation affecting the benefit achieved.

As Figure 2 suggests, the presence of the teacher, display of the materials, and requests to move to the instructional environment may all have been correlated with later stages of the instructional setting when the "worsening set of conditions" became increasingly potent. All of the instructional activities listed in the worsening conditions column in Figure 2 have been identified in the behavioral literature as potentially aversive conditions that may occur during the instruction of children with autism (McGill, 1999; Smith & Iwata, 1997; Wilder & Carr, 1998). In this way, the activities at the beginning of the session serve as a warning signal that movement towards the later stages of the instructional session is progressing and therefore establishes removal of any and all signs of instruction as a reinforcer and evokes problem behavior, such as aggression, self-injury, tantrumming, etc. that have historically produced task removal (Michael, 2000). In this case, the teacher, the materials, the teacher's voice, and the actual demands may all begin to function as a CMO-R due to their correlation with instructional activities that represent a worsening set of conditions. The worsening set of conditions in the instructional example is only metaphorically referred to as "painful stimulation." Conditions or stimuli that warn of a decrease in the rate of reinforcement, decrease in the amount of reinforcement, less immediate reinforcement, greater response requirement, greater response effort, etc. are all worsening conditions that can act as reinforcers for behavior that terminates them (Michael, 2004). Failure to recognize the contribution of the CMO-R to the development of escape and avoidance behavior during the instruction of children with autism may reduce the likelihood that the instructional methods necessary to weaken its effects will be implemented.

Differentiating S^Ds from MOs

An issue central to this topic is the difference between the S^D and the MO. The fact is these two antecedent stimuli share several structural and functional characteristics which include the fact that they are both antecedent variables, they are learned, and they both evoke and abate behavior. S^D control is frequently identified as the source of behavior change that is more properly ascribed to the effects of CMO-R. "Whereas the discriminative stimulus derives control over responding through a special historical relationship with behavioral consequences, Skinner's account of other antecedents suggests a different source of influence between some antecedent stimuli and behavior" (Smith & Iwata, 1997, p.346). In this quote, Smith and Iwata are referring to the MO as the "different source of influence." Notwithstanding this distinction, behavior analysts have typically been trained to classify all antecedent evocative stimuli as discriminative stimuli (Schlinger, 1993). This set of circumstances "...leaves a gap in our understanding of operant functional relations" (Michael, 1993, p.191). Moreover, Michael (1996) suggests that being able to talk about these different variables is essential to being able to analyze them effectively during instructional sessions. Therefore, when analyzing the evocative effects of demands on problem behavior with children with autism, reliance on the concept of the MO may lead to more effective practice. Since instructional demands do not "signal" the availability of reinforcement for problem behavior but instead make negative reinforcement in the form of task removal valuable as

reinforcement they are best identified as an MO. This is the critical property that differentiates an S^D from a CMO-R. “In short, EOs change how much people want something; S^Ds change their chances of getting it” (McGill, 1999, p.395). Michael (2000) has highlighted the importance of this distinction by claiming “...to say that thinking of two evocative variables with such different histories and implications for prediction and control as though they were the same would surely result in theoretical and practical ineffectiveness” (p. 402).

Differentiating the CMO-R From Other MOs

Different MOs acquire their control over behavior through different mechanisms and histories. Unconditioned MOs have unique histories related to the species phylogeny. Conditioned MOs have unique histories related to an individual's ontogeny. In other words, the histories that have led to the development of the many unconditioned and conditioned MOs are all remarkably different. Moreover, the mechanisms that account for their effects are all different. Consequently, practitioner efforts to abolish the effects and abate behavior related to any of the unconditioned or conditioned MOs would require substantially different environmental manipulations specific to each type of motivating operation. As a result, Michael, (1993, 2007) has provided specific labels for each MO as a way of acknowledging the different histories that have led to their control over behavior. Moreover, he has identified the different forms of unpairing that can be used to decrease behavior evoked by conditioned MOs. Practitioners who are aware of these differences will certainly be more effective in controlling behavior than those who are not.

In the case of the CMO-R, it is the only MO which is engendered with evocative control over behavior through a history of correlation with a worsening setting of conditions. As a result of this unique history the mere presentation of this type of stimulus event immediately establishes its removal as a form of reinforcement. Methods to reduce the effects of the CMO-R are procedurally distinct from unconditioned as well as other conditioned MOs, e.g. surrogate, transitive. Consequently, failure to differentiate the CMO-R from other MOs or other behavioral variables in clinical practice would “surely result in theoretical and practical ineffectiveness” (Michael, 2000).

Re-Interpreting Existing Treatments from a CMO-R Perspective

Iwata et al. (2000) suggested that research has recently demonstrated the value of modifying MOs to increase or decrease problem behavior. The authors of all three major reviews of the topic (McGill, 1999; Smith & Iwata, 1997; Wilder & Carr, 1998) devoted sections of their papers to the modification of MOs as independent variables. They all subdivided this section into the MO modifications that were effective in reducing problem behavior maintained by positive, negative, and automatic reinforcement. The sections of these papers on modification of antecedent motivation variables to reduce problem behavior maintained by negative reinforcement analyzed their effects in terms of the CMO-R. They all cited studies in which investigators have implemented procedures to reduce the value of task removal as reinforcers. As pointed out by Smith and Iwata (1997), however, few of the earlier studies have relied on the concept of the MO. Instead they attributed the results to the structural variables of setting events and contextual variables or improperly to the effects of stimulus control. Recognition of the role of the MO has been obscured by the fact that a conceptually systematic approach that focuses on the functional relations among environmental stimuli and behavior has not been the general practice in the field. “In fact, a criticism of applied behavior analysis is a perceived failure to relate the many procedures generated for changing socially significant behavior to basic behavioral principles” (Smith & Iwata, 1997, p. 343).

Michael (2000, 2007) provided a conceptual analysis of the modification of the CMO-R as a guide to practitioners serving persons with autism and developmental disabilities. He adopted the notion of “increasing the effectiveness of instruction” as a unifying concept under which motivational antecedent

variables previously identified as setting events or contextual variables could be classified as motivating operations. Within his analysis, Michael rejected the idea of merely removing the CMO-R (e.g., instructional demands), to reduce problem behavior because presentation of frequent instructional demands is a necessary condition for learning to occur within discrete trial instruction methodology. Additionally, he agreed that the function-altering effects of extinction could reduce problem behavior but would leave the CMO-R in place and therefore would only be a practical solution if the aversive nature of the demands as CMO-Rs could not be reduced. He concluded that in most cases the CMO-R could be abolished by altering the instructional practices so that “instruction results in less failure, more frequent social and other forms of reinforcement, and other general improvements in the demand situation to the point at which it may not function as a demand but rather as an opportunity” (Michael, 2000, p. 409). Michael’s analysis identifies a very important independent variable or class of motivational variables to be considered during discrete trial instruction of children with autism which heretofore have been largely overlooked.

McGill (1999) provided additional support for Michael’s recommendation related to instructional modification. He stated that merely reducing the problem behavior while leaving the aversive nature of the demand situation unresolved is an unsatisfactory solution. He suggested that not only are practitioners obligated to reduce problem behavior but also to alter the challenging environment encountered by most persons with autism and developmental disabilities. McGill agrees with Durand (1990) that problem behaviors are at least partially the result of poorly arranged environments and that the CMO-R “...is a reflection of aberrant environmental characteristics (such as inappropriate demands)” (McGill, 1999, p.406). McGill (1999) goes on to say that failure to manipulate the CMO-R may raise ethical concerns “... because it leaves a counterhabilitative environment in place and may be limited in its effectiveness because the circumstances evoking problem behavior still exist” (p. 406). Moreover, he states that FCT without extinction, punishment, and/or use of antecedent modifications is generally ineffective in reducing behavior maintained by negative reinforcement. This contention is supported empirically by Fisher, Piazza, Cataldo, Harrell, Jefferson & Conner, R. 1993; and Hagopian, Fisher., Sullivan., Acquisto & LeBlanc, 1998. Finally, McGill (1999) concluded that merely teaching a functionally equivalent response may not be sufficient to reduce problem behavior without modification of the value of the reinforcer that has led to the acquisition and maintenance of the response.

Treatments Designed to Abolish the CMO-R

Many effective antecedent modifications to reduce problem behavior have been demonstrated in research studies, often under the heading of curricular revisions (Dunlap, Foster-Johnson, Clarke, Kern, & Childs, 1995; Dunlap & Kern, 1993, 1996; Dunlap et al., 1993; Dunlap, Kern-Dunlap, Clarke, & Robbins, 1991; Kern, Childs, Dunlap, Clarke, & Falk, 1994; Kern & Dunlap, 1998) or antecedent interventions (Miltenberger, 2006). Many of these studies have tested the effectiveness of treatment packages. Typically, variables related to choice of task, task variation, pace of instruction, interspersions of high-probability tasks, partial versus whole-task instruction, task difficulty, reducing learner errors, and so on have been included in the treatment packages to reduce escape-motivated problem behavior (Munk & Repp, 1994). Although these reports have provided useful descriptions of behavior change methods they have failed to analyze them in terms of basic behavioral principles. Failure to provide a behavioral analysis of the effects of antecedent manipulations leaves the practitioner without the information necessary to analyze complex and novel cases. Notwithstanding this issue, many of the antecedent behavior reduction procedures recommended to reduce escape-motivated behavior can be re-interpreted in terms of modification of the CMO-R. Such an analysis suggests that the antecedent variables identified in the curricular revision literature acted as abolishing operations to the extent that they decrease the value of the reinforcer that is maintaining the problem behavior and therefore abated the responses that they previously controlled. A re-interpretation of the curricular revision research findings will reduce their explanatory mechanisms to a handful of behavioral principles and provide a conceptually systematic

approach to the treatment of escape-motivated problem behaviors of children with autism during discrete trial instruction. This type of behavioral analysis may have important practical implications for persons who instruct children with autism.

Many behavior analytic practitioners have made use of the evidenced-based procedures described in the following section. No new procedures are offered. What follows is a discussion of some of the evidenced-based instructional practices that have been demonstrated to reduce problem behavior during instruction along with a re-interpretation of the effects and benefits of these methods in terms of altering the function of CMO-Rs.

Methods to Reduce the Effects of the CMO-R During Discrete Trial Instruction

Programming Competing Reinforcers

Several studies with persons with disabilities demonstrated that problem behavior evoked by a CMO-R and reinforced through termination of the demand situation can be reduced without controlling the negative reinforcing consequence that has maintained the behavior (Call, Wacker, Ringdahl, Cooper-Brown, & Boeltrich, 2004; Lalli & Casey, 1996; Lalli et al., 1999; Parrish, Cataldo, Kolko, Neef, & Egel, 1986; Piazza, Fisher, Hanley, Remick, Contrucci, & Aitken 1997; Russo, Cataldo, & Cushing, 1981). In other words, behavior maintained by negative reinforcement can be weakened by programming positive reinforcement for an alternative compliant response or by delivering it non-contingently during high demand situations. This can be accomplished without eliminating the response-reinforcer relation in some cases (Lalli et al., 1999). The effects of positive and negative reinforcement were studied in a series of investigations with participants whose problem behavior had been acquired and maintained through task removal (Lalli & Casey, 1996; Lalli et al., 1999; Piazza et al., 1997). By programming concurrent schedules of reinforcement in which compliance with task demands were positively reinforced (e.g., with food, praise) and problem behavior resulted in task termination, the competing effects of positive and negative reinforcement could be assessed. These studies demonstrated that introduction of positive reinforcement for responses that were alternatives to the negatively reinforced problem behavior reduced the problem behavior without modification of the maintaining contingency, and in some cases without the use of extinction for problem behavior. In the Lalli et al. (1999) study, the results were achieved when the programmed schedule of reinforcement actually favored responses that produced task removal (i.e., negative reinforcement). The authors concluded that the presentation of the positive reinforcer abolished the CMO-R or value of task removal as a reinforcer and abated the class of responses that had produced that reinforcer in the past. In a follow up study by DeLeon et al. (2001) the competing effects of positive and negative reinforcement on problem behavior maintained by task removal were investigated with a chained schedule. A child with autism was provided the opportunity to choose a positive reinforcer (i.e., potato chip) or negative reinforcer (i.e., break) after completing a scheduled number of responses. When the number of demands was relatively low, the participant reliably chose the positive reinforcer. It appeared that the presence of the positive reinforcer decreased the value of task termination as a reinforcer. However, her preference switched to the break when the number of tasks required for reinforcement increased to more than 10. The authors concluded that the switch to the preference for a break when demands were increased indicated the demands had returned to their initial status as a CMO-R and therefore increased the value of task removal and evoked the participant's choice behavior of a break.

As demonstrated by Kennedy (1994) and then again in a recent study by Call et al. (2004), the addition of a positive reinforcer delivered during instruction reduced the escape-motivated non-compliant behavior of some participants. Call et al. (2004) concluded "...the addition of an arbitrary positive reinforcer can sometimes be sufficient to reduce problem behavior that is maintained, partially or solely, by negative reinforcement" (p.155). These authors and others have suggested that this effect is the result

of lessening the aversive context of the instructional setting by the delivery of a competing positive reinforcer. These results appear consistent with Michael's (2000) analysis of how the function of demands may be altered from an aversive stimulus to an opportunity for the delivery of reinforcement.

Pairing and Embedding the Instructional Environment with Positive Reinforcement

McGill (1999) recommends several methods for weakening the value of the CMO-R to reduce escape-motivated problem behavior during instructional sessions with persons with developmental disabilities and autism. He suggests both consequence and antecedent modifications that may be effective. In any case, presentation of the stimuli that have evoked negatively reinforced problem behavior without presentation of the worsening condition that has typically accompanied them will reduce the value of the CMO-R and abate problem behavior. One method of accomplishing this outcome is to pair and embed the teaching context, personnel, materials, etc. with an "improving set of conditions" through the delivery of positive reinforcers. In this way, the aversiveness of the teaching environment is reduced and therefore less likely to evoke escape and avoidance responses (Kemp & Carr, 1995). Embedding reinforcing activities in a context of instructional demands has been shown to reduce behavior evoked by instructional demands. Studies by Carr and Carlson (1993) and Kemp and Carr (1995) demonstrated that demand related problem behavior could be reduced by embedding reinforcing activities during community activities and in employment settings, respectively. Carr, Newsom, and Binkoff (1980) found that activities such as storytelling during demand situations reduced escape-motivated responses and increased compliance with demands. Kennedy, Itkonen and Lindquist (1995) demonstrated that merely embedding social comments prior to low probability demands decreased non-compliance in students with severe disabilities.

Errorless Instruction

Several studies have demonstrated that when students make frequent errors during instructional sessions, levels of problem behavior are high (Carr & Durand, 1985; Ebanks & Fisher, 2003; Heckaman, Alber, Hooper, & Heward, 1998; Weeks & Gaylord-Ross, 1981). Instructional methods that reduce the frequency of errors have been demonstrated to reduce the level of problem behavior. An analysis of these results in terms of motivational variables suggests that errors may function as an MO and increase the reinforcing value of task removal or termination. If the instructor prevents or at least minimizes errors during instruction (i.e., errorless learning) the CMO-R is abolished and students engage in fewer problem behaviors. For example, Heckaman, et al. (1998) demonstrated that when instructors used response prompts with a progressive time delay and students made very few errors, levels of disruptive behavior were dramatically reduced. By comparison when a least-to-most prompting strategy was used the student made many more errors and had higher levels of disruptive behavior. In a similar manner, Ebanks and Fisher (2003) reduced escape-motivated destructive behavior by providing antecedent prompting to reduce errors and by interspersing easy tasks with the more difficult demands. This intervention resulted in zero-levels of destructive behaviors. Weeks and Gaylord-Ross (1981) found that students had higher levels of problem behavior during difficult as opposed to easy tasks. Almost no problem behavior occurred when students were making correct responses. Errorless instruction dramatically reduced problem behavior and increased learning.

These findings suggest the importance of minimizing learner errors through antecedent prompting methods. The reduction in errors probably functioned as an abolishing operation that reduced the effectiveness of escape as a reinforcing consequence and as a result reduced escape-motivated problem behavior.

Stimulus Demand Fading

Instructional demands have been implicated as a CMO-R in several studies (DeLeon et al., 2001; Ebanks & Fisher, 2003; Lalli et al., 1999; McComas, Hoch, Paone, & El-Roy, 2000). Research studies have shown that escape-motivated problem behavior can be virtually eliminated by removing demands (Carr & Durand, 1985; Carr et al., 1980). However, this approach is impractical for teaching children with autism because failure to present instructional demands virtually eliminates learning opportunities. As a result, several studies have shown that it is possible to alter the demands and then re-introduce them along a variety of dimensions including task difficulty (Cameron, Ainsleigh, & Bird, 1992; Weeks & Gaylord-Ross, 1981), number of low probability requests (Ducharme & Worling, 1994), response effort (Horner & Day, 1991; Richman, Wacker, & Winborn, 2001; Wacker et al., 1990; Weld & Evans, 1990) and number or rate of instructional trials (Kennedy, 1994; Pace, Iwata, Cowdery, Andree, & McIntyre, 1993; Zarcone, Iwata, Smith, Mazaleski, & Lerman, 1994; Zarcone, Iwata, Vollmer, Jagtiani, Smith, & Mazaleski, 1993). For example, Pace et al. (1993) used a combination of extinction and fading instructional demands to reduce escape-motivated problem behaviors. Initially the instructor simply sat with the child until they completed a session with no problem behavior. Then, the instructor delivered one instructional demand at about the midpoint of the session. Over successive sessions, more demands were faded into the session. The results suggested that the fading procedures accelerated the behavior reduction effects of extinction. These results were probably obtained because the original task demands functioned as a CMO-R that increased the value of escape-motivated problem behavior. Removal of demands weakened the MO and decreased escape-motivated problem behaviors. Their gradual re-introduction in some cases did not create enough of a CMO-R to increase escape-motivated problem behaviors.

Modifying the rate, difficulty, and effort of responses during discrete trial instruction appears to reduce escape- and avoidance-motivated problem behaviors. Over time, instructors may be able to fade in the rate, difficulty, and effort of demands until high levels of instructional participation are reached without problem behavior.

Task Variation

Some investigators have found that mass trialing (i.e., constantly presenting the same stimulus on consecutive trials) may increase problematic behavior during instructional sessions for persons with autism (Dunlap, 1984; Dunlap & Dunlap, 1987; Dunlap, Dyer, & Koegel, 1980; McComas et al., 2000; Winterling, Dunlap, & O'Neill, 1987). For example, Winterling et al. (1987) demonstrated that task variation dramatically reduced the levels of problem behavior for children and an adult with autism. They compared a condition in which the same task was presented on every trial to a condition in which tasks were varied frequently. The task variation condition produced less problem behavior. In addition, they demonstrated that increased skill acquisition occurred with the task variation approach in a second study with an adult with autism. These results were obtained because task variation functioned as an abolishing operation that reduced the value of escape from tasks. To use everyday language, doing the same task over and over again is boring. These findings suggest that mixing and varying instructional tasks during discrete trial instruction may function as an abolishing operation and decrease the effectiveness of escape as a reinforcer.

Pace of Instruction

Studies have evaluated the effects of pace of instruction on acquisition and problematic behavior in different types of learners (Carnine, 1976; Dunlap, Dyer, & Koegel, 1983; Koegel, Dunlap, & Dyer, 1980; Tincani, Ernsbarger, Harrison, & Heward, 2005). For example, Koegel et al. (1980) and Dunlap, et al. (1983), both demonstrated that short inter-trial intervals (ITI) reduced stereotypic behavior in children

with autism when compared to long ITIs. In addition, children achieved higher rates of correct responding during the short ITI condition. In general, children exhibited less off-task behaviors and acquired more skills during brisk-paced instruction. Pace of instruction probably functions as an abolishing operation, reducing the value of escape and avoidance as reinforcers. Specifically, during the ITI, reinforcement is not available and with longer, as compared to shorter intervals, the child receives a lower rate of reinforcement for instructional sessions of equal duration. A recent study by Roxburgh and Carbone (2007) investigated this issue directly and found that during instruction of children with autism, shorter ITIs produced a higher rate of reinforcement and therefore less problem behavior. During long ITIs, the learner likely receives automatic reinforcement for stereotypic behavior. In contrast, instructional demands delivered at a brisk pace reduce the rate of reinforcement available through automatic reinforcement and increases the rate of socially mediated positive reinforcement available. Children who do not engage in off-task behaviors and are impulsive (i.e., respond too quickly) are unlikely to benefit from fast-paced instruction (Dyer, Christian & Luce, 1982). However, it appears that these children are less likely to engage in escape-motivated problem behavior as well.

In contrast, a few studies seem to suggest that a faster pace of instruction is related to increases in escape-motivated problem behavior (Smith, Iwata, Goh, & Shore, 1995; Zarcone et al., 1994; Zarcone et al., 1993). In these studies, when the pace of the instruction was increased, the number of tasks the individuals were required to complete was also increased. For example, in Smith et al. (1995) the two conditions were a high-rate condition in which 30 trials were presented during the 15-minute session and a low-rate condition in which 10 trials were presented during the 15-minute session. The low-rate condition always produced lower rates of self-injurious behaviors. Since the number of instructional demands delivered is confounded with pace in this experiment, it is not possible to separate out the effects of pace with the effects of the number of instructional demands. The authors of this study discussed the difficulty of attempting to study pace of instruction without confounding variables of differences in reinforcement amount, rate, and ITIs.

Overall it has been found that pace of instruction is an important variable that might serve as an abolishing operation that reduces the effectiveness of escape as a reinforcer. But, as mentioned above, there are some exceptions to this finding. First, pace of instruction is not likely to be an effective abolishing operation if the number of demands or the duration of the session is also increased. Second, if a child does not engage in escape-motivated problem behavior or engages in quick responding, they are less likely to benefit from a fast-pace of instruction. For a comprehensive discussion of variables related to pace of instruction see Tincani et al. (2005).

Neutralizing Routines

Several studies have demonstrated that variables beyond the control of the instructor may establish CMO-R during planned instructional sessions. Several studies have demonstrated that occurrences such as sleep deprivation (Kennedy & Meyer, 1996; O'Reilly, 1995), otitis media (O'Reilly, 1997), and cancellation of preferred activities (Horner, Day, & Day, 1997) have increased problem behavior during instructional sessions that have followed them. Horner et al. (1997) demonstrated that it may be possible to create an abolishing operation or "neutralizing routine" that reduces the effectiveness the value of instructional demands as CMO-R following unplanned daily occurrences. In this study, two students engaged in problem behavior contingent on error corrections and when the additional CMO-R of having a planned activity was cancelled or delayed. The implementation of a neutralizing routine substantially reduced problem behavior. The neutralizing routines used in this study consisted of the students engaging in highly preferred activities 30-40 minutes prior to the instructional session. Students emitted zero-levels of problematic behavior during the neutralizing routine condition.

Some individuals will benefit from high periods of dense reinforcement and low demand activities prior to instructional sessions especially after the denial of other reinforcers. This study demonstrates the importance of behavior analysts understanding the concept of the CMO-R to reducing problem behavior.

Choice Making

Choice making may function as an abolishing operation and reduce the value of escape from tasks (Dyer, Dunlap, & Winterling, 1990; McComas et al., 2000; Vaughn & Horner, 1997). For example, Dyer et al. (1990) found problem behavior was dramatically reduced when students were offered choices of activities and reinforcers during instructional sessions. The choice condition dramatically reduced problem behavior in all participants. Choice likely functions as an abolishing operation for escape-motivated problem behavior because the child has the opportunity to specify the current motivation. Because the child could stop an activity at any time and choose a new activity there is limited possibility of creating a CMO-R for escape maintained problem behavior. Many children will benefit from the opportunity to make choices regarding activities within discrete trial instruction sessions.

Interspersal Instruction

Several studies have demonstrated that problem behavior can be reduced when easy tasks are interspersed with difficult tasks (Carr et al., 1980; Harchik & Putzier, 1990; Horner, Day, Sprague, O'Brien, & Healthfield, 1991; Mace & Belfiore, 1990; Mace et al., 1988; Neef, Iwata, & Page, 1980; Singer, Singer, & Horner, 1987). Two studies found similar effects when interspersing social comments with instructional demands (Kennedy, 1994; Kennedy et al., 1995). Problem behavior may have been reduced with the use of these procedures because the interspersal of easy tasks functions as an abolishing operation reducing the value of escape as a reinforcer. Difficult tasks probably function as a CMO-R because they are correlated with a worsening set of conditions related to low rates of reinforcement, high rates of errors, and higher rates of social disapproval. By interspersing easy tasks with more difficult tasks the value of the CMO-R is reduced. It is recommended to combine extinction with interspersal instruction to ensure its effectiveness (Zarcone, Iwata, Hughes, & Vollmer, 1993). It is also important to avoid presenting easy tasks immediately following problem behavior. If this were to occur, problem behavior would likely be strengthened by negative reinforcement (Sailor, Guess, Rutherford, & Baer, 1968). Despite the data suggesting the negative effects of this practice (Sailor et al., 1968) many educators remove difficult tasks contingent upon problem behavior and present alternative maintenance or easier mastered tasks. In any case, children with autism may benefit from interspersal of easy and target skills during discrete trial instruction.

Task Novelty

The simple presentation of a novel task may serve as CMO-R for some students and increase the value of task removal as a reinforcer. One study demonstrated this effect by introducing new tasks each time self-injurious behavior (SIB) reached low levels (Smith et al., 1995). Following introduction of the novel task, SIB increased leading to the identification of the novel tasks as MOs. Simple exposure to the task may reduce the value of this CMO-R over several sessions for some individuals. It is probably important to introduce novel tasks gradually, because introducing high rates of novel stimuli will likely serve as an MO, increasing the effectiveness of escape as a reinforcer. Gradual introduction may be effective in keeping the value of task removal as a reinforcer low. Simple exposure to novel stimuli may benefit some children and reduce escape-motivated problem behavior.

Session Duration

The length of the treatment session may serve as a CMO-R that increases the value of escape. Smith et al. (1995) found idiosyncratic differences among participants in how session duration may serve as an MO. The authors clearly considered the passage of time as a behavioral variable. Some participants had little or no problematic behavior early in the session, but high rates later in the session suggested that the passage of time in the demand condition may have functioned as a CMO-R. Other participants engaged in a relatively high rate of problem behavior early in the session, but the rate decreased over the length of the session. This implies that the actual presentation of the demand condition may have served as the MO. The authors make treatment recommendations based on this analysis. Specifically for learners who engage in problematic behavior late in the session it may be best to arrange several sessions of short durations. For students who engage in the most problem behavior at the start of the session, it may be advantageous to have relatively long instructional sessions, but fewer per day. These treatment recommendations are directly related to an analysis of the behavior based on session duration functioning as an MO that may either establish or abolishing the reinforcing value of escape from tasks (Smith et al., 1995).

Conclusions

A thorough understanding of the principle of motivation and an analysis of instructional methods as MOs can provide behavior analysts with a powerful technology for reducing problem behavior during discrete trial instruction. With knowledge of the concept of the CMO-R, behavior analysts may be better equipped to evaluate, select, and implement instructional methods that reduce escape and avoidance behavior exhibited by a large percentage of children with autism and related disabilities. A conceptually systematic approach to determining the influence of antecedent motivational variables will equip instructional decision-makers with a wider range of choices of teaching methods and maybe more importantly, will provide a natural science approach to analyzing and modifying instructional methods when the performance of learners with autism does not result in expected outcomes.

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Accelerating Recovery from Poverty: Prevention Effects for Recently Separated Mothers

Marion S. Forgatch & David S. DeGarmo

Abstract

This study evaluated benefits of a preventive intervention to the living standards of recently separated mothers. In the Oregon Divorce Study's randomized experimental design, data were collected 5 times over 30 months and evaluated with Hierarchical Linear Growth Models. Relative to their no-intervention control counterparts, experimental mothers had greater improvements in gross annual income, discretionary annual income, poverty threshold, income-to-needs ratios, and financial stress. Comparisons showed the intervention to produce a greater increase in income-to-needs and a greater rise-above-poverty threshold. Benefits to income-to-needs were statistically independent of maternal depressed mood, divorce status, child support, and repartnering. Financial stress reductions were explained by the intervention effect on income-to-needs. The importance of helping disadvantaged families with evidence-based programs is discussed.

Keywords: Prevention, income, PMTO, parenting, intervention.

In the last decade, approximately 16% of children in the United States under the age of 18 lived in poverty, although about 40% of children in households headed by single women lived below poverty levels (U. S. Census Bureau, 2002). Longitudinal studies have consistently found strong associations between poverty and adjustment problems for children and their parents (Duncan, Brooks-Gunn, & Klebanov, 1994; Hernandez, 1997; McLoyd, 1998). The adverse outcomes for children include a high prevalence of emotional and behavior problems, and deficits in cognitive functioning, academic performance, and physical health. For their parents, poverty is associated with low levels of education, unemployment or low-wage employment, stress, mental health problems, and ineffective parenting practices – all conditions that are particularly common in single-mother families. This complex network of poverty concomitants makes it difficult to identify mechanisms that entrap parents in poverty and to understand how poverty transmits its negative effects to children.

Intervention programs have been successful in populations disadvantaged because of poverty (Huston et al., 2001; Salkind & Haskins, 1982), and in populations at risk because of factors that accompany poverty, including low birth weight (Brooks-Gunn, McCormick, Shapiro, Benasich, & Black, 1994), teen or unmarried pregnancy (Olds et al., 1997), living in high-crime neighborhoods (Reid, Eddy, Fetrow, & Stoolmiller, 1999), and marital disruption (Forgatch & DeGarmo, 1999, 2002). Effective intervention strategies included providing financial aid to families (Huston et al., 2001), enriching children's early educational experiences (Ramey, Bryant, & Suarez, 1983), educating parents through home visits (Olds et al., 1997), providing parent education in groups (Forgatch & DeGarmo, 1999; Martinez & Forgatch, 2001), and offering combinations of these methods (Brooks-Gunn et al., 1994; Reid et al., 1999; Wolchik et al., 2000). Demonstrating intervention efficacy, however, does not necessarily clarify pathways that may mediate environmental factors and pathology (Rutter, Pickles, Murray, & Eaves, 2001). The problem is that most interventions have multiple actions, many of which are not the mechanisms themselves. To demonstrate causal status, a theory-based intervention must produce changes in specified mechanisms, and those changes must produce the hypothesized changes in outcomes when evaluated with appropriate statistical procedures (Coie et al., 1993). The Oregon Divorce Study (ODS) is

one of the few programs to have achieved this level of theory evaluation in family research for child outcomes (Rutter et al., 2001). In the present study, we attempt similar theory testing for maternal outcomes related to poverty.

The ODS consisted of two longitudinal investigations, each with independent samples of approximately 200 recently separated single mothers with elementary-school-aged sons (Forgatch & DeGarmo, 2002; Patterson & Forgatch, 1990). The samples were restricted to mothers with young sons because boys are more likely than girls to exhibit adverse effects of divorce as preadolescents (Shaw, Emery, & Tuer, 1993). The social interaction learning (SIL) model on which the ODS program was based specifies that the effect of adverse contexts on children's outcomes is mediated by disruption of parenting practices (Reid, Patterson, & Snyder, 2002). Recent marital separation was selected as a risk factor for testing the SIL model because of its well-known association with adverse environmental contexts, ineffective parenting practices, and adjustment problems for parents and children (Anderson, Hetherington, & Clingempeel, 1989). Families in the midst of the separation process make an ideal population in which to test the SIL model because there are disruptions in all three domains of the model (i.e., environment, family process, and adjustment).

The first ODS study (ODS I) carried out a 4-year passive longitudinal investigation with multiple-method, multiple-agent measurement during the first and last of four assessments. The data were applied to test correlational mediation models postulating that environmental disruptions associated with marital separation affected children's adjustment through their negative impact on parenting practices (Forgatch, Patterson, & Ray, 1996; Patterson & Forgatch, 1990). The adverse environmental contexts consisted of diminished resources (e.g., low income, unemployment or low-wage employment, low socioeconomic status), increased stress (e.g., financial difficulties, negative life and family events), disrupted social support, and increased emotional problems (e.g., depression, irritability). The need to better understand how this set of contexts may interfere with parenting led us to specify a divorce model with two maternal role systems as influential to child adjustment: "mother as parent" and "mother as person" (Forgatch & DeGarmo, 2002). Within this divorce adjustment model, the two maternal domains are related to each other bidirectionally and both impact child adjustment. Child adjustment, in turn, has bidirectional relationships with the two maternal domains. The SIL model postulates two types of parenting that contribute to child outcomes: effective parenting promotes healthy child adjustment, and coercive discipline produces negative child outcomes (Reid et al., 2002). Effective and coercive parenting, therefore, are encompassed within the "mother as parent" domain of the divorce model and targeted in the intervention.

The "mother as person" subsystem describes expected associations among the family environment variables. The relations among factors in this subsystem reflect bidirectional interconnections among limited resources, extensive stress, disrupted support, and maternal depressed mood. Each of these factors, individually and in concert with the others, is presumed to disrupt parenting practices and contribute further to child adjustment problems, which, in turn, make it more stressful and more difficult to parent (DeGarmo, Patterson, & Forgatch, 2004; Patterson & Forgatch, 1990).

Separating mothers can anticipate drops of 13% to 35% of pre-separation income, with many families sinking into poverty (Duncan & Hoffman, 1985; Smock, 1993). Such a decline in resources is stressful for the mothers heading these families (Lorenz et al., 1997). Financial loss and the many thorny sequelae of divorce contribute to psychological distress; added stress with declines in social support can exacerbate adjustment problems such as depression and irritability (Coyne, Kessler, Tal, Turnbull, & Wortman, 1987). Dysfunctional behavior tends to interfere with healthy adult relationships which further limits resources, disrupts support, and adds to future stress (Patterson & Forgatch, 1990). Over time, the model specifies that further perturbations (e.g., repartnering, an intervention program) to the system can alter trajectories, for better or for worse (Forgatch & DeGarmo, 2002). Our expansion of the theoretical

model to study maternal adjustment was accompanied by an attendant expansion of the intervention for parent management training, the Oregon model (PMTO). The program, *Parenting through Change* (Forgatch, 1994), combined training in parenting practices with skills training for personal improvement.

Findings from Study 2 of the ODS intervention (ODS II) supported the SIL model, yielding positive outcomes for child and maternal adjustment (DeGarmo & Forgatch, 2005; DeGarmo et al., 2004; Forgatch & DeGarmo, 1999, 2002; Martinez & Forgatch, 2001). Benefits to positive and coercive parenting practices revealed classic prevention effects: Mothers in the control group showed a steady deterioration in both types of parenting over 30 months while mothers in the experimental group maintained baseline levels. The intervention's impact on parenting practices produced positive outcomes for boys in several areas of functioning: teacher ratings of aggression, delinquency, externalizing and internalizing behavior, adaptive functioning, and prosocial behavior; laboratory tests for reading achievement; observations of noncompliance and aggressive behavior; and boys' self-report of depression, peer relations, and association with deviant peers. Thus, the ODS findings provided strong support for the SIL model, with parenting practices functioning as causal mechanisms for the child outcomes.

Two dimensions showed hypothesized positive effects in the "mother as person" domain. Relative to their control counterparts, experimental mothers reported significant reductions in depressed mood and financial stress (Forgatch & DeGarmo, 2002). Mothers in both groups reported gradual recovery from depression with time after the separation; by 30 months the trajectories between the groups had significantly diverged, favoring the experimental mothers. In a subsequent analysis, DeGarmo et al. (2004) tested a theoretically based model that evaluated the pathways to reduced maternal depression. The intervention effect on maternal depression was mediated by the intervention effect on boys' externalizing behavior. The series of longitudinal latent growth models showed that benefits to parenting practices produced reductions in boys' internalizing and externalizing behaviors, and the reduction in externalizing behaviors mediated the intervention effect on maternal depression. Thus, as boys' behavior improved, mothers' depression lifted. This finding was in keeping with the SIL model and longitudinal analyses in ODS I.

We added a personal development module to the parent-training program to address common problems confronting single mothers, and we presumed that this module would produce an array of intervention effects on maternal adjustment. Other parent training programs have demonstrated that adding components to enhance parental personal adjustment broadens treatment gains (Dadds, Schwartz, & Sanders, 1987). Training in family problem-solving skills has been a regular component of Oregon Social Learning Center (OSLC) interventions for nearly two decades (Forgatch & Patterson, 2005). For the ODS II intervention, we expanded the problem-solving component for mothers to apply toward personal objectives (e.g., education and career). Olds and colleagues incorporated similar strategies in their intervention that resulted in broad-ranging effects for maternal outcomes (e.g., Olds et al., 1997).

At baseline, the mothers in the ODS I and II reported precipitous income loss following marital separation, with 76% of the families in ODS II receiving public assistance and more than 50% living below the poverty threshold (Forgatch & DeGarmo, 2002). In an investigation designed to understand the negative economic outcomes of divorce on mothers, Smock (1993) studied two cohorts of divorcing young women during two decades from the late 1960s through the late 1980s. Regardless of decade, three factors contributed to economic recovery: full-time work, education, and repartnering. Advanced maternal education is associated with many positive adjustment factors within families, but a good education is especially helpful when it comes to obtaining well-paying jobs (Duncan et al., 1994; Hernandez, 1997; McLoyd, 1998). Repartnering as a strategy for recovering from poverty may work, but repartnering tends to be a temporary state. Although 75% of divorced people repartner, repartnering lasts approximately 5 years with marriage and even less without marriage (Bumpass & Sweet, 1989; Bumpass, Sweet, &

Martin, 1990). Divorce status and child support are also associated with maternal income following separation. Because our sample was of recently separated mothers, we included whether or not mothers had divorced in our models of fiscal outcomes. We also added a measure of child support, although there are significant differences between the amount a court awards and what the mother receives (Duncan & Hoffman, 1985). Controlling for these variables, we anticipated that the ODS intervention could contribute to fiscal recovery for mothers in the experimental group relative to their counterpart controls. In turn, we expected that fiscal recovery would account for the reduced financial stress found earlier.

Many investigators with correlational data have tested models showing that poverty disrupts parenting practices. Some have shown the association between poverty and negative child outcomes to be mediated by parenting problems (e.g., Duncan et al., 1994; McLoyd, 1998). Other studies have found relations between income, maternal depression, parenting practices, and child outcomes (Webster-Stratton & Hammond, 1988). Such correlational data cannot evaluate causal relations. We know of no experimental studies that have demonstrated *how* an intervention designed primarily to improve child outcomes achieved improved child outcomes *and* improved poverty status unless the intervention provided direct financial assistance to the families (e.g., Huston et al., 2001; Salkind & Haskins, 1982).

Hypotheses

To better understand intervention effects on fiscal outcomes, we tested two sets of hypotheses related to the “mother as person” dimension of the divorce model. We hypothesized that a number of resources would lead to a reduction in financial stress and benefits to income: status as divorced and/or repartnered, receipt of child support, longer working hours, and higher occupational status. Because family incomes are volatile, we evaluated the more stable measure, income-to-needs, which provides an index of subsistence living (Duncan et al., 1994). Given the intervention’s association with reduced financial stress, we hypothesized several improved economic factors for mothers: gross annual income, discretionary income, poverty threshold status, and income-to-needs ratio. We predicted that previously identified intervention effects (i.e., improved parenting practices, child outcomes, and maternal depression) would account for the benefits to income-to-needs ratio and financial stress.

Methods

Participants

Participants were 238 recently separated single mothers and their sons residing in a medium-sized city in the Pacific Northwest. Families were recruited through media advertisements, flyers distributed throughout the community, and divorce court records. Mothers in eligible families (a) had cohabitated with an intimate partner for at least 12 months; (b) had ceased cohabitating with their partner within the prior 3 to 24 months; (c) resided with a biological son in Grades 1 through 3; and (d) did not cohabit with a new partner. To increase power to detect significant intervention effects on boy adjustment, we limited the sample to young boys: Study 1 of ODS had found greater growth in adjustment problems for boys in Grades 1 - 3 than boys in Grades 4 - 8 (Forgatch et al., 1996).

At baseline, mothers had been separated for an average of 9.2 months ($SD = 5.5$). In terms of marital status, 13% were never married, 28% were separated, 2% were legally separated, 16% filed for divorce with status pending, and 40% had finalized divorces. Families tended to be small, with 2.1 children on the average. Mothers’ mean age was 34.8 years ($SD = 5.4$); boys’ mean age was 7.8 years ($SD = .93$). The racial/ethnic composition of the boys was 86% White, 1% African American, 2% Latino, 2% Native American, and 9% from “other” racial/ethnic groups including those identified as belonging to more than one group. This distribution reflected the racial/ethnic makeup of the community in which the study was conducted. The mean annual family income was \$14,900, which was similar to that reported

for other female-headed households with children in the county at that time (i.e., \$15,300; U.S. Census Bureau, 1993).

The sample had adequate range in educational and occupational categories. The majority of mothers (76%) had some academic or vocational training beyond high school, with 17% having completed a 4-year college degree or higher. Approximately 20% of the women completed their education with high school graduation; 4% had not completed high school. Most mothers were classified within the lower- and working-class ranges in terms of occupation (Hollingshead, 1975): 32% unskilled, 21% semiskilled, 23% clerical/skilled, 22% minor professional to medium business, and 3% major business/major professional.

In previous analyses specified to examine parenting mechanisms and child adjustment outcomes, the experimental and control groups differed on two baseline variables: the number of months since separation and boy's age. On average, mothers in the experimental group had been separated for about 2.4 months longer than those in the control group ($M = 9.84$ and 7.48 , respectively, $p < .01$). Boys in the experimental group were about .28 years younger than those in the control group ($M = 7.65$ and 7.93 , respectively, $p < .05$). These variables along with mothers' age were included in all multivariate models because they are potentially relevant.

Study Design

Families were randomly assigned, with 64% in the experimental group ($n = 153$) and 36% in the no-intervention control group ($n = 85$). The unequal assignment to group condition was done to provide sufficient sample size within the experimental group to examine potential full-implementation effects of the intervention (Vinokur, Price, & Caplan, 1991).

Participants were screened for eligibility, received a description of the study, and were invited to participate knowing they would be randomly assigned to experimental or control condition on the first telephone contact. All interested and eligible participants were scheduled for a home visit. Of the 241 eligible families, 3 declined participation. Before the home visit, a person with no participant contact randomly assigned families to condition using a computerized program. At the home visit, further study information was provided, questions were answered, and informed consent was obtained. Assessment schedules and payment for assessment activities were the same for experimental and control families. At each assessment, there were two separate interviews, one involving procedures for mothers and their participating children (about 2.5 hours) and another for the mother and her participating confidant (about 1 hour).

Participant families received extensive multiple-method, -setting, and -agent assessment five times: at baseline and at 6, 12, 18, and 30 months. A minor assessment was conducted at 24 months but did not include outcomes analyzed for the present paper. An attrition analysis found equal participation for experimental and control groups at each assessment, with a mean of 87% participation for each group for all five assessments (Forgatch & DeGarmo, 2002). All experimental families had completed the intervention by the 6-month assessment.

Intervention

The intervention consisted of a series of parent group meetings held weekly in the early evening hours at OSLC, which is centrally located in the community. Assistance with transportation was provided

when needed. All intervention participants received childcare and dinners separately for mothers and for the children in childcare during sessions. There was no payment for intervention participation per se, although two \$5 drawings were held at each session, one based on attendance and one for home practice assignment completion. The curriculum included 14 weekly topics, with sessions listed by topic and content in Appendix 1. There were 13 parent groups, ranging in size from 6 to 16 ($M = 9.5$). Experimental-group mothers participated in an average of 8.5 sessions ($SD = 5.7$). Of the 153 participants in the experimental group, 29 (19%) attended no sessions, 20 (13%) attended between 1 and 4 sessions, and 104 (68%) attended more than 4 sessions. Intent to treat (ITT) group assignment was applied in all analyses, which provides a conservative estimate of intervention effects. Effect sizes can be underestimated using the ITT approach (Jo & Muthen, 1997) because data from all participants is included whether or not they attended intervention sessions.

Forgatch and DeGarmo (1999) and Forgatch, Beldavs, Patterson and DeGarmo (in press) summarized the content of each intervention session, described interventionist training, and provided particulars regarding program fidelity. The intervention program is fully detailed in the manual *Parenting Through Change* (Forgatch, 1994). The manual contained information for group leaders and materials for mothers. In the leader manual, each session was outlined with agenda, objectives and rationales, procedures, exercises and role-plays, and group process suggestions. Parent materials included summaries of session information, home practice assignments, charts, and other necessary materials. The program also featured a 30-minute videotape, *The Divorce Workout* (Forgatch & Marquez, 1993). The workout metaphor was used to show three families developing skills to manage a variety of parenting and personal problems that accompany separation. Scenes depicted the families growing stronger as they overcame obstacles. The group sessions taught strategies for parenting and personal adjustment. Topics were presented in an integrated step-by-step approach. Skills were introduced in one or more sessions and revisited throughout the remainder of the program. Each session provided discussion time for personal issues.

The “mother as parent” dimension of the program was built around the five theoretically specified parenting practices: skill encouragement, appropriate discipline, monitoring, problem solving, and positive involvement. Mothers learned to apply these skills to increase children’s prosocial development (e.g., praise and incentives for positive behavior, family problem-solving strategies, parental involvement in children’s activities). Mothers also learned to decrease coercive parenting approaches (e.g., negative reciprocity, negative reinforcement, escalation) that promote deviant child development.

Strategies designed to enhance maternal adjustment in the “mother as person” model were also based on social interaction learning principles. Mothers learned skills designed for self-improvement particularly focused on problem solving strategies (e.g., reduce stress, advance educational and career goals, improve financial circumstances). Problem-solving techniques included: specify achievable goals, identify small steps toward the goal that build on one another, establish mini-programs to achieve goals, and evaluate and revise programs regularly. Mothers also learned to negotiate interpersonal conflict (e.g., with ex-partners, co-workers, friends) and to regulate negative emotions (e.g., depression, irritability).

Measures

Dependent Variables

In terms of the dependent variables and the focus of the analyses, we descriptively evaluated several related economic indicators. The first three measures were raw annual income in constant dollars, discretionary annual income in constant dollars, and poverty threshold. The main dependent variables for the multivariate analyses were the income-to-needs ratios and financial stress. Income-to-needs was

evaluated as the key dependent variable because it takes into account raw income and poverty thresholds for a given family size.

Income-to-needs ratio. This score was calculated as a mother's report of *her* gross annual income divided by the poverty threshold for her family size for a given year (see Duncan et al., 1994). Income sources included in this measure were left to the mothers' discretion. For the longitudinal analyses, dollar amounts were corrected for inflation by converting income to 1993 constant dollars based on the percent change in the U. S. Consumer Price Index (Bureau of Labor Statistics, 1998). First, mothers reported their average monthly income in dollar amounts. We then annualized the amount by multiplying by 12¹. Second, the denominator was based on poverty thresholds from data provided by the U.S. Census Bureau Labor Statistics for the years 1993 to 1998.

Annual discretionary income. This variable was calculated by subtracting the amount of subsistence income needed to be above the poverty threshold for a given year for a given family size. In other words, it was the amount of dollars a mother had to spend on her family over and above the amount she needed to remain above poverty. Discretionary income was converted to 1993 dollars.

Poverty threshold status. Threshold data included dollar amounts for a given family size for a given year. Categories were based on family sizes ranging from no children to eight or more. We also computed poverty status as a dichotomous variable coded "1" for families below the poverty threshold and "0" for families with annual incomes that exceeded thresholds.

Financial stress. Seven items measured the financial stress construct. The first was a summative index, with yes or no answers in response to, "Are you able to afford (a) a large enough house, (b) furniture or household equipment that needs replacement, (c) the kind of car you need, and (d) car repairs, fuel, insurance?" The next four items were in response to, "How often does it happen that you do not have enough money to afford (a) the kind of food your family should have, (b) the kind of medical care your family should have, (c) the kind of clothing your family should have, and (d) the leisure activities that your family wants?" and scored 1 (*never*) to 4 (*every month*). The sixth item asked, "How much difficulty do you have in meeting monthly bill payments?" scored 1 (*a great deal of difficulty*) to 4 (*no difficulty at all*). The last item asked, "How do your finances work out at the end of month?" scored 1 (*some money left over*), 2 (*just enough money to make ends meet*), and 3 (*not enough money to make ends meet*). The summative index and the other response items were all rescaled to a 1-to-5 range and then averaged to reflect higher financial stress. Cronbach's alpha reliabilities were .81, .82, .86, .87, and .86 from baseline to 30 months.

Independent Variable

Group assignment. To test intent-to-treat effects (ITT), a dichotomous variable was entered indicating random assignment, coded "1" for experimental and "0" for the no-intervention control groups.

Potential Intervening Variables

Depressed mood. To control for reporter bias, we entered the mothers' depressed mood as a time-varying covariate in the multivariate models. The sum score was from the Center for Epidemiological Studies – Depression scale (CES-D: Radloff, 1977). Twenty items were rated assessing mood in the past week (e.g., felt depressed, fearful, hopeful about future) rated from 0 (*rarely or none of the time*) to 3 (*most or all of the time*). Cronbach's alphas were .92, .94, .91, .92, and .92 from baseline to 30 months.

Months separated. To control for differences in adjustment periods, we controlled for the number of months from the time mothers ceased cohabiting prior to study entry at baseline.

Divorce filing status. To control for selection or financial differences associated with filing status, we computed a variable coded “0” for no divorce filed and “1” for divorce pending or finalized.

Child support. To control for additional income, we entered the monthly dollar amount mothers reported receiving in child support (i.e., actually received, not amount awarded). Child support was reported at each follow-up wave.

Repartnering status. For each follow-up wave, the mothers reported whether or not they had a new romantic, live-in partner for at least 3 months. The variable was coded 0 for remained single and 1 for repartnered.

Hours working. For each follow-up wave, mothers reported the number of hours they worked per week on the average.

Occupational status. For each follow-up wave, the mothers’ report of primary occupation was coded using categories ranging from 1 to 9 from the Hollingshead Four Factor Index of Social Status (Hollingshead, 1975).

Educational status. For each follow-up wave, mothers reported the years of education obtained.

Analytic Strategy

We applied hierarchical linear growth modeling (HLM: Bryk & Raudenbush, 1992; Raudenbush, 1995), a multilevel regression technique capable of modeling data with uneven time intervals; in our case, baseline and 6, 12, 18, and 30 months. Growth models combine individual and group levels of analysis, taking into account mean growth for the sample and individual variation in growth. The current analysis was a two-level model with repeated assessments of outcomes modeled as the level one dependent variable. These growth rates are nested within individual and group characteristics modeled as the level-two predictors. In that sense, we modeled level-two characteristics (e.g., intent-to-treat status, occupational conditions, child support, repartnering) hypothesized to predict growth in mothers’ level-one variables over time (i.e., change in income-to-needs ratio and change in financial stress).

Linear slopes were estimated as repeated measures, specifying variation in individual trajectories. The individual growth curves and their variance then became the outcome focus of analysis. The outcome slopes were then regressed on fixed or time-varying predictors. The level-one model (Equation 1) was the individual trajectories of financial stress and income-to-needs ratio specified as a function of an intercept and growth rate determined by repeated assessment time spacing, a time-varying control for depressed mood, and a random error term:

$$Y_{ti} = \pi_{0i} + \pi_{1i}(\text{Time})_{ti} + \pi_{2i}(\text{Depressed Mood})_{ti} + e_{ti} \quad (1)$$

where Y is the dependent variable for individual i repeated over time. The π_{1i} coefficient is the growth rate for person i over the data-collection period and represents individual rate of change from baseline to 30 months. We specified baseline as $t = 0$, and each follow-up was the number of months since baseline. The intercept parameter, π_{0i} is then the income or financial stress for an individual at $(\text{Time})_{ti} = 0$ or baseline. The π_{2} parameter controls for mothers’ depressed mood at each time interval.

Combining levels one and two, the level-two model then specifies the individual variation in baseline intercepts (Equation 2) and slopes, the change over time, as dependent variables (Equation 3) plus random error terms. In our analysis, the mean intercept for baseline status was specified as

$$\pi_{0i} = \beta_{00} + \beta_{01}(\text{divorce status}) + \beta_{02}(\text{boy age})_i + \beta_{03}(\text{mother age})_i + \beta_{04}(\text{mos. separated})_i + \beta_{05}(\text{mother's education})_i + \beta_{06}(\text{mother's occupation}) + \beta_{07}(\text{child support})_i + r_{0i} \quad (2)$$

and the mean growth rates were specified as

$$\pi_{1i} = \beta_{10} + \beta_{11} \dots \beta_{14}(\text{control variables})_i + \beta_{15}(\text{group assignment})_i + \beta_{16}(\text{repartnering})_i + \beta_{17}(\text{hours working})_i + \beta_{18}(\text{occupation})_i + \beta_{19}(\text{education})_i + \beta_{110}(\text{child support})_i + r_{11} \quad (3)$$

where, for example, β_{00} is the average baseline intercept for the sample controlling for filing status, boy and mother age, months since separation, education, and occupation. β_{05} represents the unique effect of education on baseline levels of income or financial stress. For growth rates, β_{15} represents the unique effect of the intervention group assignment on the rate of change in income-to-needs or financial stress controlling for other variables over time.

HLM provides several advantages for evaluating intervention results. First, it can handle mistimed and missing longitudinal data for estimating slopes. Random error and linear slope coefficients require 3 or more time points in the data. Each family had completed baseline in our data. Therefore, individuals who had 1 or 2 missing data points out of the 4 follow-up assessments were not excluded from analyses. Second, HLM estimated growth based on each individual’s actual assessment timeline. For example, slopes can be estimated for one person assessed at 6-month intervals (e.g., baseline and 6, 12, 18, and 30 mos.) while another person’s can be estimated for sporadic assessments that varied because of the realities of scheduling (e.g., baseline and 5.6, 13, 19, and 32 mos.). Repeated measures analysis of variance (MANOVA) focuses on means and not variance in trajectories and requires listwise deletion of data assumes the time spacing (equal or unequal spacing) and is the same for all individuals. A third advantage of the growth curve approach for the purposes of intervention analysis is that slopes computed from repeated measures are more reliable estimates of change than are pretest-posttest comparisons, given any level of measurement or sampling error (Kraemer & Thiemann, 1989). All hypothesized intervention effects were tested in the models below as intent to treat randomized groups, using two-tailed alpha levels.

Results

The means and standard deviations for several economic indicators are presented in Table 1 across time for each group condition. There were no significant substantive differences in the findings for mean comparisons using pair-wise, list-wise, or HLM-deletion methods. Pair-wise means were listed because HLM models families with partial longitudinal data but requires complete data for Level 2 predictors of growth. That is, not all cases are required to have 5 time points to estimate a linear slope. Overall, the findings were consistent across all indicators: There were no cross-sectional group differences for any point in time but the *rate* of change was significantly different. Using growth curve models, the experimental group showed greater growth in annual income, discretionary annual income, and income-to-needs ratios, and greater reduction in poverty status and financial stress.

Table 1. Means and Standard Deviations, and Intervention Effects for Economic Indicators

	Experimental		Control		Group × Time Effect β
	M	(SD)	M	(SD)	
<u>Gross Annual Income†</u>					\$1,289.56*
Baseline	\$14,457.22	(9,059.22)	\$14,920.05	(13,905.23)	
6 months	14,035.68	(8,523.05)	14,227.81	(9,104.12)	
12 months	16,728.11	(9,635.52)	14,920.12	(10,357.81)	
18 months	17,553.29	(12,411.53)	14,828.68	(9,169.42)	

30 months	18,112.76 (12,196.52)		16,886.69 (12,267.96)		
<u>Discretionary Income</u> †					\$1,194.06*
Baseline	\$2,046.49 (11,415.14)		\$1,236.98 (12,287.72)		
6 months	1,281.50 (9,895.26)		1,907.26 (12,707.87)		
12 months	3,496.87 (11,377.08)		1,951.69 (10,459.67)		
18 months	5,048.75 (12,942.01)		2,445.27 (10,792.78)		
30 months	6,768.76 (15,209.58)		3,950.72 (13,840.01)		
<u>Poverty Threshold Status</u>					-0.20*
Baseline	0.52 (0.50)		0.51 (0.50)		
6 months	0.53 (0.50)		0.50 (0.50)		
12 months	0.43 (0.49)		0.41 (0.49)		
18 months	0.45 (0.50)		0.44 (0.50)		
30 months	0.38 (0.49)		0.42 (0.49)		
<u>Income-to-Needs Ratio</u>					0.10*
Baseline	1.20 (0.80)		1.24 (1.04)		
6 months	1.15 (0.75)		1.19 (0.78)		
12 months	1.34 (0.82)		1.22 (0.76)		
18 months	1.37 (0.91)		1.19 (0.69)		
30 months	1.40 (0.89)		1.34 (0.96)		
<u>Financial Stress</u>					-0.12**
Baseline	3.19 (0.87)		3.24 (0.79)		
6 months	3.19 (0.87)		3.23 (0.88)		
12 months	2.94 (0.90)		3.16 (0.99)		
18 months	2.90 (0.95)		3.30 (0.96)		
30 months	2.80 (0.91)		3.15 (0.94)		

Note: †Dollars converted to 1993 constant dollars; *** $p < .001$; ** $p < .01$; * $p < .05$

The first two variables in Table 1 are gross annual income in constant dollars and annual discretionary income in constant dollars. Both of these variables provide actual dollar amounts and are provided for descriptive purposes because they are easily interpreted markers of financial well-being. Reflecting the economics of separation for mothers, on the average neither group condition approached pre-separation levels of income after 2½ years into the study; in fact, their income reports basically dropped in half and never approached predivorce levels by the time of this report. Annual income in raw dollars *prior* to separation was \$34,087 for the experimental and \$29,996 for the controls; baseline levels in raw uncorrected dollars were \$14,082 and \$15,392, respectively. In terms of their rate of change in constant income over time, both groups steadily increased but the experimental group gained at a faster rate: $\beta = \$1,289.56$ ($p < .05$) of gross annual income and $\beta = \$1,194.06$ ($p < .05$) in discretionary money. Because the data in this

report spanned 2½ years, the linear slope coefficients translated to an average of over \$3,223.90 more for the experimental group in annual income over the course of the study and \$2,985.15 more in money above poverty.

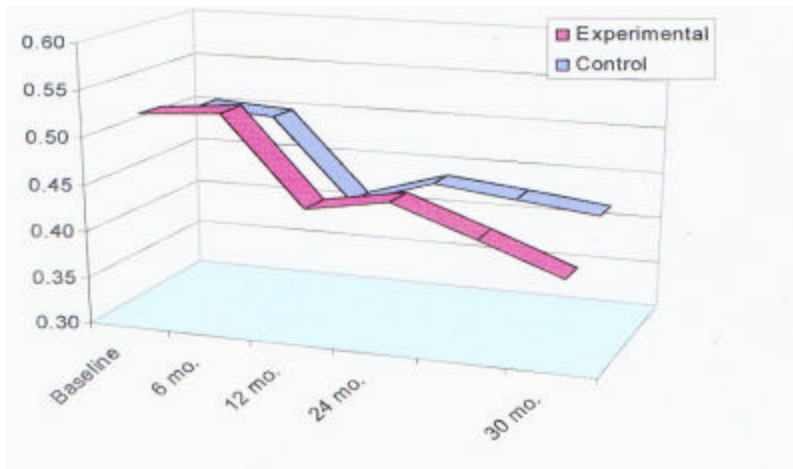


Figure 1. Changes in poverty threshold levels for two groups

Examining the poverty thresholds, roughly half of the sample in both group conditions was below poverty at baseline. After 2½ years, the proportion of families below poverty was reduced to 38% in the experimental condition and 42% in the control. Examining raw mean proportions, this represented a 14% drop in poverty in the experimental group compared to a 9% drop in the control. Again, parametric and nonparametric tests revealed no cross-sectional differences between groups for poverty threshold status. However, the rate of change revealed significant differences for the group slopes. For the specific test of change in poverty thresholds, we conducted the HLM Bernoulli estimation procedure for repeated measures of binary outcomes. That model showed a significant difference in the rate of change in poverty threshold. The improvement for the experimental group relative to the control was greater by 20% ($\beta = -.20$ a year, $p < .05$); that is, the recovery from poverty was a 20% faster rate when looking at individual differences in trajectories. Figure 1. Changes in poverty threshold levels for two groups

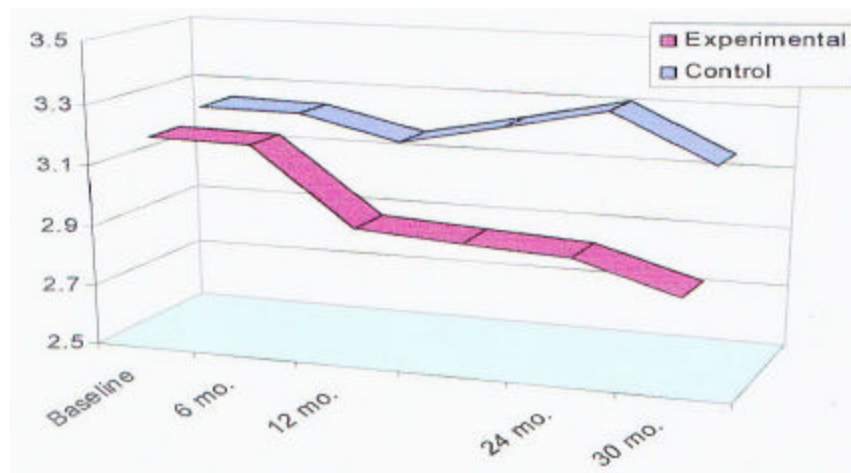


Figure 2. Changes in financial stress for two groups

We next focused on the multivariate analysis of the main dependent variables, which had greater specificity as measures of mothers' economic recovery. Recall that the income-to-needs ratio is defined as the annual income divided by that amount of income needed for a given family size to be above the poverty threshold. Thus, this measure of subsistence income takes into account annual income, family size, and poverty threshold, and reflects a more specified indicator of economic adjustment. Like the slow-paced financial recovery displayed for gross annual income, the income-to-needs ratio steadily increased over time for both groups. Again, there were no cross-sectional differences in the income-to-needs ratio but the group by time effect was significantly different for the two groups ($\beta = .10$, $p < .05$). The income-to-needs ratio was increased by 25% more on the average for the experimental group over the span of this report. Financial stress showed a steady decline over time for both groups with a steeper decrease for the intervention group ($\beta = -.12$ a year, $p < .01$). Cross-sectional differences occurred at both the 18- and 30-month follow-ups ($t = 2.74$, $p < .01$ and $t = 2.37$, $p < .05$, respectively). Figure 2 displays the differences in maternal reported financial stress over 30 months for the two groups.

Table 2- Unstandardized Beta Coefficients for Growth Model of Change in Income Needs Ratio and Change in Financial Stress (n = 191)

	Income-to-Needs Ratio	Financial Stress
<u>Dependent Variable is Initial Status π_{0I}</u>		
Intercept β_{00}	-0.172	3.055***
Divorce Filing Status β_{01}	0.263**	-0.108
Boys' Age β_{02}	-0.096	0.037
Mothers' Age β_{03}	0.022*	0.021
Months Separated β_{04}	-0.002	-0.014
Mothers' Education β_{05}	0.105***	-0.071**
Mothers' Occupational Prestige β_{06}	0.136***	-0.081***
Child Support (dollar amount $\times 10$) β_{07}	0.000	-0.002**
<u>Dependent Variable is Growth Rate π_{1I}</u>		
Intercept β_{10}	-0.468	-0.077
Divorce Filing Status β_{11}	-0.039	-0.037
Boys' Age β_{12}	0.021	0.030
Mothers' Age β_{13}	0.005	-0.004
Months Separated β_{14}	0.001	-0.000

Group Condition β_{15}	0.083*	-0.107*
Repartnering (6 to 30 months) β_{16}	0.114	-0.219*
Working Hours (6 to 30 months) β_{17}	0.001	-0.002
Occupational Status (6 to 30 months) β_{18}	0.013	-0.021
Educational Status (6 to 30 months) β_{19}	-0.007	0.007
Child Support Awarded (6 to 30 months) β_{110}	0.000	-0.001*
<u>Maternal Depression as Time Covariate π_{21}</u>	-0.007**	0.010***

*** $p < .001$; ** $p < .01$; * $p < .05$

We then tested the unique contribution of hypothesized predictors of initial status differences in the outcomes as well as unique predictors of growth. The first set of hypotheses focused on the contributions of changes in child support, working hours, repartnering status, and occupational prestige. Time-varying variables were entered as average levels of change for the follow-up assessment period from 6 to 30 months. The unstandardized beta coefficients are shown in Table 2 with three decimal places because scaling of predictors and outcomes produced small unstandardized coefficients.

Looking at initial status differences in the outcomes, as expected, controlling for mothers' depressed mood, both education and occupation were associated with higher scores on the income-to-needs ratio at baseline ($\beta_{05} = .105$, $p < .001$ for education and $\beta_{06} = .136$, $p < .001$ for occupation). Conversely, education and occupation were associated with lower levels of baseline financial stress ($\beta_{05} = -.071$, $p < .001$ and $\beta_{06} = -.081$, $p < .001$, respectively). Older mothers had a higher income ratio score at entry into the study ($\beta_{04} = .022$, $p < .05$), but age was not associated with lower reports of financial stress. Interestingly, the amount of child support received was not a unique predictor of the mothers' income-to-needs ratio but was a significant predictor associated with lower levels of financial stress ($\beta_{07} = -.002$, $p < .05$). The baseline child support was multiplied by a constant of 10 to show the effect at three decimal places. In other words, for every \$1 in child support in the first year of the study, there was a reduction of .0002 units on the financial stress score. To reduce one full unit, the mother would need to receive on the average about \$400 a month (that is, \$4800 a year \times .0002 = .96 or roughly 1). Finally, filing status was associated with higher levels of income-to-needs at baseline, meaning poorer mothers were less likely to officially file for divorce in the sample of separated mothers.

Focusing on evaluation of intervention effects, results showed a significant impact on financial resources over time independent of other divorce status and socioeconomic indicators hypothesized to predict growth in financial well-being. Controlling for maternal depressed mood, the experimental group increased in income-to-needs ratio ($\beta_{15} = .083$, $p < .05$) relative to the control group, and reported greater declines in financial stress ($\beta_{16} = -.107$, $p < .05$).

Repartnering, indicated by the number of new romantic, live-in partners that could have contributed to the mothers' household income, was not associated with gain in the income-to-needs ratio but was significantly associated with reductions in financial stress ($\beta_{17} = -0.219$, $p < .05$). This finding is noteworthy in that mothers' perceptions of stress reduced over time if they repartnered. At the same time,

the multivariate analysis indicated that mothers assigned to the experimental group experienced real increases in financial well-being that were not associated with establishing new romantic partners. The findings for child support payments were related to those findings for romantic partners. Receiving child support was associated with lower reports of financial stress ($\beta_{16} = -.0001, p < .05$) but not related to the income-to-needs ratio. In other words, child support did not account for real differences in growth in income but the mothers were less stressed if they received child support. Concerning the effects of depressed mood in each wave of data, the control variable for depressed mood was significantly associated with lower levels of income ($\pi_{21} = -.007, p < .01$) and higher levels of financial stress ($\pi_{21} = .01, p < .001$). Finally, although the post-intervention scores did not mediate the effects of the intervention on the outcomes in Table 2, we tested to see if there were intervention differences in education, occupation, and working hours post-intervention and found none.

For the next hypothesis, we wanted to see if changes in subsistence income accounted for the changes in financial stress by modeling the income-to-needs ratio as a time-varying covariate in the model of financial stress presented in Table 2. More specifically, we tested a mediational model to determine whether changes in income-to-needs accounted for the intervention effect associated with reductions in financial stress. As expected, growth in the income-to-needs ratio was significantly associated with decreases in financial stress ($\pi_{21} = -.303, p < .001$). That is, controlling for depression, for every 1 unit increase on the income-to-needs ratio per year, there was nearly a one-third unit decrease in financial stress. In the model including income-to-needs as a predictor of financial stress, the intervention effect was reduced to nonsignificance. Thus, the intervention effect was mediated by changes in income-to-needs and accounted for the differences in reductions of financial stress between group conditions.

Having previously established intervention effects showing improvements in parenting practices and child adjustment that were a result of the parenting intervention, we then tested the final set of hypotheses evaluating whether benefits in parenting practices and indirectly child outcomes were associated with concomitant changes in standard of living. Neither changes in parenting practices nor child outcomes accounted for the intervention results on standard of living (results not shown).

Discussion

Children living in single-mother households have constituted a disproportionate share of the poverty population in this country for more than two decades (Duncan & Hoffman, 1985; McLoyd, 1998). The solution is not to encourage these mothers to get married, because even if the marriage results in a temporary respite from poverty, it is unlikely to endure (Bumpass & Sweet, 1989; Bumpass et al., 1990). For long-term benefits to these families, we must bolster the parenting and personal skills of mothers raising children on their own. This report suggests that providing single mothers with skills training in parenting and personal arenas can have benefits for the families in terms of parenting practices, child outcomes, and financial growth.

In the *Parenting Through Change* program (Forgatch, 1994), women improved their parenting skills, which in turn benefited their children's adjustment and their own adjustment. The child-rearing methods have been demonstrated effective in preventive and clinical programs using PMTO for samples of families with youngsters of all ages (Dishion & Patterson, 1992; Patterson, Chamberlain, & Reid, 1982; Reid et al., 1999). An added component in *Parenting Through Change* was to teach the women techniques expressly designed to profit their personal well-being. Previous reports indicated that mothers made predicted personal gains from the program, with reductions in depressed mood and financial stress (DeGarmo et al., 2004; Forgatch & DeGarmo, 2002). In the present study, we also found several fiscal benefits for mothers in the experimental group relative to their control counterparts.

As anticipated, families in both experimental and control conditions experienced some economic resurgence over the 2.5 years of the study; however, mothers in the experimental group reported a greater rise out of poverty than did their control counterparts. On the average, and using 1993 dollars, the experimental group dropped from about \$8,100 pre-separation per capita annual income to about \$5,000 at baseline, while the control group dropped from about \$7,300 to about \$4,700. These findings can be mapped onto Smock's data (1993), which used 1987 dollars. For both Smock cohorts, the per-capita income before disruption was roughly \$8,000-9,000, and post separation was about \$6,000-6,500, a decline of about 20%. The ODS sample experienced a decline of about 35%. Using the baseline and 30 month levels of annual discretionary income, the economic recovery was on the average \$4,700 for the experimental group and \$2,700 for the control group. Income-to-needs ratios showed an increase for experimental mothers relative to controls over the course of the study.

The HLM models enabled us to evaluate intervention effects on income-to-needs ratio and financial stress, taking appropriate controls into account (i.e., education, occupation, hours working, repartnering status, divorce status, child support, and maternal depressed mood). The intervention produced significant improvements on both dependent variables over the 30-month interval, with an increase in income-to-needs ratio and a decrease in financial stress. Higher education and occupational prestige were associated with beneficial effects on both dependent variables at baseline. Maternal ratings of depressed mood was a significant covariate of change in both dependent variables, with more depression positively related to increased financial stress and negatively related to improved income-to-needs ratio. Divorce status did not function as a predictor of change in the longitudinal analyses for either dependent variable. Other predictor measures displayed somewhat different patterns for the two dependent variables, suggesting that income-to-needs ratio and financial stress have reasonable discriminant validity. Baseline receipt of child support predicted lower baseline financial stress, and divorce status by baseline was related to baseline income-to-needs. Child support awarded remained a predictor of growth in financial stress but not income-to-needs ratio.

Recall that other studies found full economic recovery for mother-headed families with repartnering (Duncan & Hoffman, 1985; Smock, 1993). In our study, neither experimental nor control groups achieved full recovery, regardless of repartnering status, and we found no differential effects for mothers' rate of repartnering in experimental and control groups. The effect of repartnering operated on financial stress but not on actual income. This finding was somewhat puzzling. Perhaps women with cohabiting partners perceive their families to be more financially secure than mothers on their own, even though there is little if any difference in actual income. Another explanation may be that the measure of maternal income does not accurately assess financial resources brought into the relationship by the partner. Because the window of this report was only 30 months, the time to find repartnering benefits to income-to-needs ratio may have been too short. On the other hand, because repartnering tends to be temporary, it may not have a lasting effect on fiscal recovery.

Intervention programs using PMTO have repeatedly shown benefits to child outcomes. Investigators citing somewhat different theoretical backgrounds but employing some similar intervention procedures have demonstrated that teaching effective child rearing strategies to parents can turn children's negative trajectories into positive paths (Kazdin & Weisz, 1998; Taylor & Biglan, 1998). At the Oregon Social Learning Center, PMTO programs have yielded successful outcomes with families of chronically delinquent adolescents and their biological parents (Bank, Marlowe, Reid, Patterson, & Weinrott, 1991), in treatment foster care (Chamberlain & Reid, 1998), with families of preadolescent conduct disordered youngsters (Patterson et al., 1982), at-risk adolescent families (Dishion & Andrews, 1994), families of at-risk elementary-school-aged youngsters (Reid et al., 1999), recently separated single mothers (Forgatch & DeGarmo, 1999, 2002; Martinez & Forgatch, 2001), and recently married stepfamilies (Forgatch, DeGarmo, & Beldavs, 2005). With the exception of the single mother and stepfamily program, all of these studies used randomized assignment to the PMTO experimental

condition or to active contrast interventions. The ODS and stepfather programs used random assignment to experimental or no-intervention control. Some behavioral geneticists claim that parents, especially those with personality problems of their own, simply cannot make the changes necessary to help their children (Rowe, 2001). Such claims can lead to do-nothing policies, which would be unfortunate indeed given the availability of effective programs for disadvantaged samples (Brooks-Gunn et al., 1994; Huston et al., 2001; Salkind & Haskins, 1982).

Most published studies show intervention effects on outcome variables; some have demonstrated predicted effects on the presumptive mechanisms, but few have actually tested for and demonstrated an intervention's effect on mechanisms, which then alter the outcomes as expected. To achieve this, the theory must fit the practice, the intervention must be efficacious, the measurement must have sensitivity to change and predictive validity, and the mechanisms must produce the hypothesized effects. As Rutter and colleagues (2001) have noted, this level of theory building and testing requires extensive work. The ODS intervention established causal status for the parenting mechanisms because: (a) the rigorous randomized experimental design employed multiple-method and -agent assessment; (b) the intervention was conducted strictly with mothers so that changes observed in child behavior would have to come from the parents; (c) the intervention produced the expected effect on parenting practices; and (d) changes in the parenting practices produced the expected changes in child outcomes. At 12 months, the divergence between children's trajectories for the control and experimental was small, so that the child effects were produced indirectly through the program's benefits to parenting (Forgatch & DeGarmo, 1999). By 30 months, however, the difference in child outcome trajectories achieved statistical significance, and the program's direct effect on change in observed noncompliance was mediated fully by the intervention effect on parenting practices (Martinez & Forgatch, 2001). It has taken decades to conduct such an experimental test of a theoretical model in family research. Nevertheless, we see ourselves as in the early iterations of a long process in which we will come to better understand the interconnections between parents' roles in their adult lives (in intimate relationships, at work, with friends) and their roles as mothers and fathers.

Although the present study indicates a promising entrée, we were unable to identify the mechanisms that contributed to the fiscal benefits for experimental-group families. We tested 3 sets of variables that were significantly improved by the intervention as potential explanatory mechanisms for the intervention effect on income-to-needs and financial stress: benefit to parenting practices, reduction in maternal depression, and improved child outcomes. None of these proved to be mediators of the intervention effect on either financial stress or on income-to-needs ratio. Several potential predictors were not significantly affected by the intervention (e.g., maternal education, occupational prestige), and other possible predictors were not adequately measured (e.g., adult problem solving, social support). Nevertheless, there was an intervention effect on fiscal outcomes. Failure to understand precisely how the intervention produced financial benefits to this population at risk for poverty may make it difficult to replicate this finding. Of course, replication is essential since the personal adjustment module was novel to this PMTO intervention. Future studies that may replicate similar findings for fiscal benefits would do well to improve the theory and the assessment of presumed mechanisms and income outcomes.

Divorce takes families through a gradual process of multilevel adjustment, with changes beginning before physical separation and continuing indefinitely (Block, Block, & Gjerde, 1988; Chase-Lansdale, Cherlin, & Kiernan, 1995; Hetherington & Clingempeel, 1992). Each family must draw on existing strengths to find its course through the transitions ahead. Some start the journey with many resources; others start with few but gather wisdom along the way. The unlucky are endowed with little, find nothing but obstacles in their path, and slip into a steady decline. With approximately 50% of American families likely to make at least one divorce transition, we need programs that buttress strengths, augment skills, and offer the support necessary to manage the challenges they are likely to encounter. Lichter states well the long-term repercussions of ignoring the problems of children living in poverty:

“The effects of high rates of economic deprivation among today’s children may only be fully realized by tomorrow’s adults” (Lichter, 1997, p. 122).

Our rates of children living in poverty are high compared to other Western industrialized countries that range from 1.6% in Sweden to 9.3% in Canada (McLoyd, 1998). Now is the time to invest in our children’s future by providing resources to poor families so that all our children can fulfill their potential. Such family support should come from programs with demonstrated effectiveness.

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Footnote

¹We also compared the annualized monthly income to the mothers' reported gross annual income based on 9 income categories ranging from 1 (*less than \$5,000*) to 9 (*more than \$50,001*). To specify dollar amounts, categories were recoded to midpoints with first and last categories using \$2,500 and \$75,000 based on methods by Duncan et al. (1994) using the same categories. For the multivariate analyses, no substantive differences were found between annualized monthly and the binned categories. Therefore, we presented results using the measure with greater specificity.

APPENDIX, NEXT PAGE

Appendix 1
Parenting through Change: Agenda

<u>Week</u>	<u>Session Title & Content</u>
1	Working through Change: Introductions to the intervention, each other, and role as <i>agents of change</i> , specifying goals, identifying strengths
2	Encouraging Cooperation: Giving good directives, recognizing children's cooperation and noncompliance, tracking behavior
3	Teaching New Behaviors: Parents as teachers, breaking goals into achievable steps, using small incentives to promote skill development,
4	Setting Limits: Providing small contingent negative sanctions for specific problem behaviors (time out backed up with privilege removal)
5	Following Through: Balancing encouragement with negative sanctions (5 positive to 1 negative); practice using encouragement and sanctions
6	Promoting School Success: Establishing school routines (standard study time & place, good setting, all family members in skill-building activities
7	Communicating with Children: Using active listening skills, lead in without dominating, using indirect ways to talk about feelings
8	Observing Emotions: Identifying specific emotions in oneself and one's children; recognizing differences between one's own emotions and others'
9	Managing Emotions: Strategies and practice in regulating negative emotions and promoting positive emotions
10	Problem Solving: Methods and practice in interpersonal problem solving, with family and separately with adults
11	Managing Conflict: Application of strategies from sessions 1, 3, 7, 8, 9, and 10 for interpersonal conflict within and outside of the family
12	Monitoring Children's Activities: Identifying methods to find, assess, and check in on safe and appropriate childcare arrangements
13	Building Skills: Application of strategies to multiple living circumstances, family and personal skills development
14	Balancing Work and Play: Importance of self care, attention to developmental challenges ahead, troubleshooting, review

The Early Impact Program: An Early Intervention and Prevention Program for Children and Families At-Risk of Conduct Problems

Stephen Larmar & Terry Gatfield

Abstract

The Early Impact (EI) program is an early intervention and prevention program for reducing the incidence of conduct problems in pre-school aged children. The EI intervention framework is ecological in design and includes universal and indicated components. This paper delineates key principles and associated strategies that underpin the EI program. Discussion emphasises the mutual interplay between the universal and indicated components of the intervention design and risk and protective factors associated with pre-school aged children and families at-risk of dysfunctional behavior. This preventative approach is consistent with the literature that emphasises the significance of early intervention and prevention strategies for children with conduct problems that are ecological in breadth and that target risk factors at the home and school level.

Keywords: Prevention, Conduct problems, Children at-risk

Conduct problems develop early in a child's life and can lead to more serious problems in adolescents and adulthood (Dadds, 1995; Kazdin, 1995). According to Kazdin (1995) the prevalence of conduct problems in children and adolescents falls between the range of 2% to 6%. Clinically diagnosed disorders such as Oppositional Defiant Disorder (ODD) and Attention Deficit Hyperactivity Disorder (ADHD) are known to develop in early childhood (Webster-Stratton, 1998). Conduct Disorder (CD) is often evidenced at a later stage in development, however, the onset of CD may occur in some children with research supporting the distinction between the onset of CD in childhood and its emergence in adolescence (Olson, Bates, Sandy, & Lanthier, 2000; Patterson, DeBaryshe, & Ramsey, 1989).

Child-onset CD classifies those individuals whose dysfunctional behaviors are evident in childhood. Such children usually exhibit behaviors indicative of ODD or ADHD and develop further behaviors associated with the diagnostic classification for CD. Contemporary models of maladjustment indicate that early onset of conduct problems significantly influences later dysfunction (Patterson, De Garmo, & Knutson, 2000).

The effects of conduct problems upon families, schools and other community settings have significant ramifications for society. Children with child-onset CD are at high risk for school failure, substance abuse, violence, and delinquent behaviors in adulthood (Webster-Stratton & Reid, 2003). According to recent reports by the Australian Government Attorney General's Department and the Australian Early Intervention Network for Mental Health of Young People, the development of early intervention frameworks, particularly for preschool aged children, is of vital importance (Sanders, Gooley, & Nicholson, 2000; Davis, Martin, Kosky, & O'Hanlon, 2000). Given that conduct problems develop early in an individual's life, there is a concern that many existing forms of treatment are often administered too late in the child's trajectory towards maladjustment. Clinic and school based treatments are often designed to reduce the symptoms of conduct problems rather than address influences in the child's world that are associated with the onset of dysfunctional behavior.

There is an emerging body of literature that supports the effectiveness of early intervention models in the treatment and prevention of conduct problems (August, Realmuto, Hektner, & Bloomquist, 2001; Frick, 1998; The Conduct Problems Prevention Research Group, 2002; Walker, Severson, Feil, Stiller, & Golly, 1998; Webster-Stratton, 1998). Current research has given priority to the development of early intervention and prevention frameworks for children and families at-risk, given the prevalence of

conduct problems in community populations (Greenberg, Domitrovich, & Bumbarger, 1999). Such frameworks allow for the early detection and treatment of dysfunction to prevent the individual from moving towards maladjustment.

Recent findings in the prevention literature also lend support to the significance of broader systems in the individual's world that influence the development of dysfunction (Frick, 2000; Snyder, McEachern, Schrepferman, Zettle, Johnson, Swink, & McAlpine, 2006). Where previous intervention frameworks have failed to encompass broader dynamics associated with the development of problem behavior, current models of treatment emphasise the significance of influences derived from multiple settings in the individual's world such as the home and school environment. The most promising forms of treatment target risk factors identified in both the individual's home and school setting as a means of facilitating more holistic intervention frameworks. The significant effects of multicomponent intervention designs emphasise the need for further research in prevention that acknowledges dynamics in the home and school settings that influence the onset and development of conduct problems (Cummings, Davies, & Campbell, 2000).

Risk Factors Influencing the Developmental of Psychopathology in Children

The identification of specific risk factors and their interplay with the individual's ecology provide significant insights into the dynamics associated with the onset of conduct problems and considerations necessary for tailoring intervention frameworks such as the EI program (Larmer 2002) to arrest the development of psychopathology. Various risk factors have been explored extensively in the literature to determine the significance of their interaction with the individual and can be categorised within the broader domains of characteristics associated with the child, family and educational setting.

The child's 'difficult' temperament has been known to influence the development of conduct problems later in life (Frick & Morris, 2004; Loeber & Farrington, 2000; Raine, 2002). The mutual interplay between the child's temperament and parental control in early childhood may also serve to increase the risks of later dysfunction (Bates, Pettit, Dodge, & Ridge, 1998; Olsen et al., 2000). Callous-unemotional (CU) traits evidenced in the individual with conduct problems also serve to increase the risk of maladjustment (Frick, Cornell, Barry, Bodin & Dane, 2003).

Moffitt and Caspi (2001) identify the personal and genetic dimensions as another factor influencing the child's susceptibility to the development of dysfunction. Genetic disposition is also a component known to influence the development of severe conduct problems and later delinquency (Rutter, 1989).

Another significant factor contributing to the emergence and maintenance of behavioral disorders in children is the influence of family. Prior investigations acknowledge interpersonal dynamics within the family as a major contributing factor to the development of conduct problems (Hollenstein, Granic, Stoolmiller, & Snyder, 2004; Patterson, 2002; Loeber, Drinkwater, Yin, & Anderson, 2000; Loeber, Farrington, Stouthamer-Loeber, Moffitt, Caspi, & Lynam, 2001; Loeber, Green, Lahey, Frick, & McBurnett, 2000). Parent criminality (Reid, Eddy, Fetrow, & Stoolmiller, 1999), aversive parenting practices including negative reinforcement and coercion (Bor & Sanders, 2004; Jaffee, Caspi, Moffitt, & Taylor, 2004), dysfunctional interactions between the parent and child (Loeber, Farrington, Stouthamer-Loeber, & Van Kammen, 1998; Shaw, Winslow, Owens, & Vondra, 1998), marital disharmony (Frick & Loney, 2002), and low socio-economic status (Keiley, Bates, Dodge, & Pettit, 2000; Loeber et al., 2001; Webster-Stratton & Hammond, 1998) are contributing factors to the onset of externalising disorders in children.

Another risk factor supported by the literature encompasses characteristics of the school environment (Frick, 2004; Kazdin, 1995). Such characteristics may include factors such as organisation, socio-demographic characteristics, class size and other dimensions of school culture (Rutter, Maughan, Mortimore & Ouston 1979). Peer rejection and the child's alliance with deviant peer groups in the school

setting can also contribute to the development of dysfunction (Dishion, Nelson, Winter, & Bullock, 2004; Snyder, Prichard, Schrepferman, Patrick, & Stoolmiller, 2004; Vitaro, Brendgen, Pagani, Tremblay, & McDuff, 1999).

Protective Factors

Protective factors that reduce the risk of individuals developing conduct problems have also been identified. Protective factors serve to ameliorate those risk factors present in the individual's life promoting resilience. Three categories of protective factors are outlined by Greenberg et al. (1999) including: personal attributes of the individual such as cognitive ability, social competence and the individual's temperament; the individual's interaction within their immediate and broader environment including a secure attachment to parents as well as other individuals who provide emotional and/or psychological support and who demonstrate pro-social values; and the interacting systems in the individual's world such as school and home relations, the quality of the educational system with which the individual is a part and regulatory activities.

The literature gives clear support to the association between the influence of risk and protective factors evident in multiple settings in the individual's world and the individual's trajectory towards psychopathology. Further, current research in early intervention and prevention indicates that intervention frameworks designed to arrest the onset of dysfunction in children must be multifaceted in order to target risk factors evident at the individual, familial, and educational levels. Cogent prevention programs require a dual focus on strategies that protect young children from risk factors that influence deleterious outcomes and encourage protective factors that serve to reduce the risks of ongoing dysfunction.

The EI Intervention

The underlying philosophy and associated strategies of the EI program serve to address identified risk and protective factors through a framework that is comprehensive, easily disseminable in regular community settings, and that targets individuals prior to the onset of conduct problems developing. The program includes both universal and indicated components at the home (parent training), school (social skills curriculum and teacher training in child management practices) and child level (remedial assistance in acquiring social skills necessary to healthy adjustment). Further, an overarching emphasis of the EI program's multimodal design is to facilitate stronger partnerships between home and school that serve as a protective factor against the development of dysfunction.

Developmental Theory Underpinning the EI Program

The EI program is based on current advances in the psychology and educational literature. In the design of the EI framework particular consideration was given to the development of a comprehensive model of treatment that targets multiple risk factors associated with the development of psychopathology. The intervention's design was informed by developmental theory that acknowledges the interactivity of a range of factors that influence the development of conduct problems in children (Frick, 1998; Kazdin, 1995). Influences associated with the child's home environment such as child and parent interactions and socio-environmental factors were considered in the development of the program. Factors at the school level were also identified to inform the program's design including peer interactions and teacher engagement with the child. Finally, factors at the level of the individual were determined such as social competence, problem solving ability and emotionality to provide an intervention framework that targeted risk factors in the individual.

The intervention consists of three overarching components that consider the influences outlined above: the school component which includes a universal curriculum focussing on the teaching of social skills and teacher training in proactive strategies of management that can be readily applied in regular

classroom contexts; the individual component which includes remedial assistance in the teaching and acquisition of skills necessary for the child's psychosocial adjustment and; the home component which focuses on training and equipping parents in their capacity to engage positively with the child.

The EI Program Design

EI is built upon two overarching components, the school component and the familial component and is organised into two phases, the intensive phase and the extended phase. The school and familial components are complimentary in design and structure with each integrating strategies focussing upon adaptive adjustment in the target child. The implementation of strategies also serves to facilitate consistency across the home and school contexts in order to target potential risk factors evident in both the home and school settings. The intensive phase of EI is implemented over a period of ten weeks with an extended phase that provides 'booster treatments' for the remainder of the school year. It is intended that the intensive phase be implemented in the second term of the academic school year to allow for universal screening of children in first term.

As part of the school component, teachers involved in the intervention process are trained to implement screening procedures that serve to identify children at-risk for ongoing behavior problems. Further, the training equips teachers to apply specific strategies of management outlined within the EI program's framework to assist teachers to manage student behavior at the class level. The training is conducted by a program facilitator (usually a school counsellor or educational specialist working in the domains of psychology and/or education) who is drawn from the participating school and works in a consultative capacity to promote teacher participation and reduce teacher resistance. Training equips teachers and related school personnel to implement a school behavior management framework and complimentary curriculum.

An overarching intention of the EI program is that the curriculum and strategies of management be implemented in preschool to year two classes. The intervention is designed to 'catch' this population of students. Kazdin (1995) suggests that early intervention models of treatment must target children at the point at which the intervention will have the most significant impact. Research suggests that early intervention programs are most efficacious for at-risk students with an age range between four to seven years (Kazdin, 1995). The teacher's approach to the management of the child's behavior and the complimentary EI curriculum work in concert to promote protective factors and target those risk factors evident in the individual and their immediate peer group that impact upon the child's socio-educational needs.

Whereas the school component of EI combines a universal and indicated approach, the home component of the EI program is indicated in focus. Parents of children identified as at-risk are invited to participate in an intensive parent-training program that forms part of the broader intervention. The parent-training is conducted over six sessions and the design of this component was informed by contemporary practices in the field of child psychology (Sanders, Gooley, & Nichol森, 2000). Individuals involved in the facilitation of the sessions receive a day of training with the program facilitator to equip them in the delivery of the parent-training component. The training of parents in specific strategies of management and overarching principles that facilitate a safe and supportive home dynamic serve to encourage protective factors in the home setting. Further, the strategies and content presented in the training also target specific risk factors associated with parenting practices, child and parent interactions and broader socio-environmental considerations that place the child at-risk.

The School Component

The implementation of the school component of EI includes teacher training in the implementation of specific strategies of management that can be universally applied to regular class groups. The strategies are delineated in the EI teacher's manual, *Encouraging Positive Behavior in the*

Classroom (Larmer, 2002). These strategies are underpinned by sound educational theory and encourage a framework of classroom management that is democratically focussed and that acknowledges the needs of both students and the classroom teacher (Greenberg, Domitrovich, & Bumbarger, 1999; Hoff, & DuPaul, 1998).

Recommended strategies identified within the program's framework include: setting of limits and boundaries; facilitating a classroom environment where both the teachers' and students' needs are acknowledged; establishing an inclusive and learning enhancing physical classroom space; positive teacher communication; strategies to redirect inappropriate behavior; the use of logical consequences including timeout; the facilitation of class meetings; and strategies to encourage cooperative partnerships between teachers and parents in order to strengthen the link between home and school.

The EI Curriculum titled '*The Early Impact Curriculum: A Program for Encouraging Positive Behavior in Young Children*' (Larmer, 2002) was formulated for the intensive and extended phases of the program. A number of teaching strategies are included to facilitate the delivery of the curriculum. Teaching strategies centre upon the concepts explored in the curriculum including: positive communication; friendship formation; social problem solving; developing self-control; and engaging in pro-social behaviors. The curriculum is organised into discrete modules, and is arranged around simple lesson plans for ease of interpretation and integration into the class' existing curriculum. The curriculum is intended to provide a flexible framework for the teacher, with suggested experiences of learning formulated to accommodate a range of teaching and communication styles and to ensure teachers are not enslaved to the program.

The EI teacher training process also includes training teachers to facilitate a simple screening process that allows for the early detection of children who are considered to be at greater-risk of dysfunction. The screening process includes a measure that provides a general descriptor outlining typical characteristics associated with a child with conduct problems and a classification framework that enables teachers to determine the degree to which children in a class group match the descriptor. Those children with a classification that closely matches the descriptor are considered to be more at-risk of conduct problems and so are targeted for inclusion in the indicated component of the EI intervention.

The Individual Component

As part of the indicated component of the program a behavior support specialist works in collaboration with the classroom teacher to provide additional support to children identified as more at-risk for ongoing behavior problems. The enlisted specialist is usually recruited by the classroom teacher who refers the identified child to the school's local support program. Specialists comprise school counsellors or specialist teachers who hold post-graduate qualifications in either education or psychology. The specialist receives a day of training in the program curriculum as a means of facilitating support that is congruent to the program's goals and philosophy. They also work in collaboration with the classroom teacher who provides supervision of this additional support process to ensure that the remedial assistance provided throughout the program facilitation aligns with the integrity of the program. Further, the classroom teacher and behavior support specialist liaise with the program facilitator to generate an individual management plan for the targeted child that includes discrete behavioural goals and complimentary strategies that serve to enhance the child's engagement in the program. It is intended that the regularity with which the specialist meets with the student be contingent on the severity of the student's behavior as well as the availability of the specialist to provide additional support (Barry, & Haraway, 2005). The behavior support specialist works for approximately one half hour session each week with the identified student throughout the intensive phase of the program. This additional support serves to identify and encourage pre-existing protective factors evident in the child's home and school environment and target risk factors that may be adversely affecting the child. The reduction of the specialist's involvement is negotiated with the classroom teacher and program facilitator towards the conclusion of the indicated component of the EI intervention.

The Home Component

The home component of the EI program consists of training parents in specific child management practices that can be implemented in the home setting. Key strategies and associated information about positive parenting practices are presented in the EI parent's manual, *Encouraging Positive Behavior in Young Children* (Larmar, 2002). These strategies and ideas are based on current advances in the psychological literature and are underpinned by sound principles drawn from the fields of early childhood and psychology (Cummings, Davies, & Campbell, 2000; Sanders et al., 2000). An underlying tenet of the home component of the program is to promote the parent's autonomy in managing their child's behavior. Therefore, the majority of incorporated strategies serve to increase and sustain parent self-direction encouraging generalisation of acquired skills into the home context. Such generalising strategies include exploiting current functional contingencies, training diversely and incorporating functional mediators (Osnes & Lieblein, 2003). Parents of children participating in the program are encouraged to attend a series of parent training sessions focussed on constructive approaches to managing young children. The training is facilitated over three 120-minute training sessions to promote access for all participants. However, this framework can be adapted to facilitate the parent training process over six 60-minute sessions. Parent trainers receive training in the facilitation of the home component of the EI program and initiate contact with all potential participants to provide parents with a comprehensive understanding of the program's intentions. This process also serves to ascertain any barriers to engagement as a means of reducing potential resistance that may lead to low treatment integrity (Cautilli, Riley-Tillman, Axelrod, & Hineline, 2005).

Each session of the parent- training program is designed to encourage participant interaction and trainers work collaboratively with the parent participants to explore the content presented in the program manuals. The parent-training framework focuses on behavioral principles of child management and emphasises key factors associated with proactive parenting. Further, as part of the home component the parent trainer also focuses on the provision of individual support and facilitates support networks amongst the group participants. In this way the parents can assist one another to overcome potential barriers to participation that may increase parental insularity through strategies such as: the coordination of care of dependent children during the training sessions; and/or the organisation of transportation to the training venue (Fernandez & Eyberg, 2005). The content presented throughout the parent training program includes: a parent's values, beliefs and experiences and the ways these factors influence the parenting role; parental authority; child development and influences underlying a child's behavior; positive communication; rule and limit setting; parent consistency; strategies to reinforce appropriate behavior; consequences and timeout; problem solving and problem ownership; exercising assertiveness; managing anger; quality time; and parent preservation. The strategies presented in the training sessions closely align with key strategies included in the school component that encourages teachers to employ similar strategies in the classroom setting. This serves to facilitate consistency for the child across the home and school contexts.

Treatment Integrity and Process Measures of Engagement

To maintain treatment integrity and quality control in the delivery of the EI intervention the program facilitator works in a consultative capacity with key personnel involved in the intervention including participating teachers, parent trainers and behaviour support specialists. O'Donohue and Ferguson (2006) assert that in order to sustain an intervention program's effectiveness, quality control mechanisms are essential. To ensure the fidelity of the EI intervention the program facilitator is equipped to assist in the provision of training and provide oversight of the facilitation of the program through specialised training with the EI program author. It is intended as part of the program design that the program facilitator works closely with key personnel involved in the implementation of the various program components throughout the intervention period to ensure that the intervention functions effectively and is sustainable within the school context. Further, the facilitator provides oversight of the

indicated children at post-intervention in order to coordinate the relevant school-based support infrastructures to sustain the intervention's affects.

Initial Findings of the EI Program Evaluation

Conclusions drawn from a recent evaluation of the EI program provide initial evidence to support its social validity and effectiveness in reducing the incidence of problem behavior in children. For a full description of findings drawn from the EI evaluation see Larmar, Dadds, & Shochet, 2006. The EI evaluation consisted of a randomised controlled trial involving 455 preschool aged children who were assigned to either control or experimental conditions. A chief aim of the evaluation was to determine the social validity of the EI program as evidenced by teacher, parent and behavior consultant engagement in the intervention. Findings at the post-intervention period revealed that teacher, parents and the behavior consultant were consistently engaged in the EI intervention and reported high levels of satisfaction with the EI program (Larmar et al., 2006). Such findings lend support to the social validity of the program in terms of consumer engagement. In particular, teacher, parent and consultant participants reported increased confidence in managing problem behavior in children at post-intervention. Further, teachers indicated that they had benefited from their involvement in the program and considered the EI program framework to be an easily disseminable design that could be facilitated in regular school contexts.

A second aim of the evaluation was to determine the effectiveness of the EI program as a means of reducing the incidence of problem behaviors in children. At the school level an intervention effect was found at post-intervention that revealed a significant difference in the behaviors of children who participated in the intervention compared with those who were designated to control conditions (Larmar et al., 2006). Data associated with child behavior at the school level indicated significant improvement in the children who participated in the EI program. Such findings reinforce the effectiveness of the EI program in reducing the incidence of problem behaviors in children at the school level and emphasise the significance of evaluating early intervention frameworks in order to develop a more comprehensive understanding of the variables influencing behavior change.

However, the home component of the EI program revealed no significant intervention effects at post-intervention (Larmar et al., 2006). Based on current advances in preventative research it would seem that the design of the EI program home component should serve to reduce the incidence of problem behavior. A possible explanation for the lack of significant change in the behavior in children at the home level could be that the majority of parents of indicated children attended only one third of the parent-training component of the program. This reduced dosage may have accounted for the lack of reported change in parenting practices. Further, limited changes in the parent's management of the child may have influenced the degree of behavior change in the child in the home setting.

Despite the findings of the home component of the EI evaluation, other recent intervention and prevention studies targeting children and families at-risk have reported lower incidences in problem behaviors for intervention groups compared to control groups at the home level (August et al., 2001; The Conduct Problems Prevention Research Group, 2002; Walker et al., 1998; Webster-Stratton, 1998). Such outcomes lend support to the significance of intervention frameworks in reducing problem behaviors in children in the home setting

Conclusions

This paper has provided a description of an empirically validated early intervention and prevention program for pre-school aged children and families at-risk of conduct problems. Initial discussion focussed on developmental pathways associated with the onset of conduct problems including risk and protective factors. Emphasis was given to the delineation of the EI program's comprehensive intervention design, including universal and indicated components, that serves to target risk and protective factors in young children and their families. Strategies included in the program design were identified and a summary of findings of an initial evaluation of the EI intervention was presented to

indicate the program's social validity and effectiveness in reducing the incidence of conduct problems in preschool-aged children.

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Parent-Child Interaction Therapy and High Functioning Autism: A Conceptual Overview

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Abstract

Externalizing behaviors are a common component of the clinical presentation of Autism Spectrum Disorders and are typically the initial focus of treatment for children within this population. This article examines the appropriateness of Parent-Child Interaction Therapy (PCIT) as a first-line, gateway treatment for preschoolers with High Functioning Autism who demonstrate co-occurring difficulties with aggressive and noncompliant behavior. Although PCIT has shown initial success in treating children with High Functioning Autism, much of the knowledge is based on clinical case studies thus warranting further empirical research before conclusions can be drawn.

Keywords: Parent-Child Interaction Therapy, High Functioning Autism, Externalizing Behaviors

Autism Spectrum Disorders (ASD) are childhood psychiatric conditions characterized by a deficit in social interaction skills, communication abilities, and behavioral patterns marked with repetitive, idiosyncratic behaviors that typically function to serve as self-stimulatory actions. Due to the overlap of behavior seen in more than one diagnosis on the Autism spectrum (e.g., Autistic Disorder & Asperger's Disorder), it is sometimes difficult to differentiate between developmental disorders, particularly when the clinical presentation of problem behavior is more sophisticated and falls on the higher end of the autism spectrum. Although a discussion on how to discriminate diagnostically between developmental disorders goes beyond the scope of this article, it is worth noting that some researchers contend that children with Asperger's Disorder typically develop secondary psychiatric conditions in the form of externalizing behaviors (Polirstok & Houghteling, 2006). Though the literature suggests that a formal diagnosis of a behavioral disorder may be more unique to Asperger Syndrome, the presence of behavioral difficulties (i.e., oppositionality, aggressiveness, limited attention span) in children with ASD is widely cited and recognized. In fact, some research has demonstrated that most children who fall on the autism spectrum present to clinics with problem behavior as the primary focus of treatment (Mandell, Walrath, Manteuffel, Sgro, & Pinto-Martin, 2005). As any child with excessive problem behavior has difficulty entering or staying enrolled in a structured classroom, it is understandable that parents, in order to increase their child's school readiness, oftentimes seek treatment to target these behaviors.

As disruptive behavior is typically the primary presenting problem for children with ASD, clinicians oftentimes take a behavioral approach to treatment. Although traditionally used with typically-developing children, one intervention that has demonstrated success in improving parent-child relationships, reducing problem behavior, and increasing child compliance is Parent-Child Interaction Therapy (PCIT: Hembree-Kigin & McNeil, 1995). PCIT is an empirically-based, short-term parent training program for young children ages 2-7 who engage in disruptive problem behavior. Clinically, due to the prevalent behavioral component of developmental disorders, many children with autism spectrum disorders have been referred for PCIT in the last several years. Although the impact of PCIT has not been tested empirically with this population, the increase of referrals has raised the question of whether PCIT may be an effective gateway therapy to enhance children's readiness for more comprehensive treatments that target behavioral concerns specifically associated with autism (e.g., social skills). Clinically, we have

seen that PCIT has been a successful first-line treatment in that children become more compliant and less aggressive, thereby increasing their cooperation with more intensive and focused therapy. In addition, our clinical experience demonstrates that parents tend to be more optimistic about undertaking additional services once their child's behavior is under better control. Although PCIT is showing success with the high-functioning Asperger's/Autism population, it is important to note that not all children with ASD are expected to benefit from PCIT. For example, children with poor receptive language skills (<24 months) who do not understand simple instructions likely would not benefit from PCIT. PCIT may only be indicated for children who would be described as falling on the higher-functioning end of the autism spectrum.

This article gives an overview of the prominent behavioral and educational treatments for Autism Spectrum Disorders demonstrating a number of ways in which researchers and clinicians have conceptualized and treated these diagnoses. Next, an overview of the components of PCIT is outlined, followed by a conceptualization as to how PCIT could possibly serve as an effective adjunct to current interventions for ASD. Finally, several limitations and future directions are discussed.

Overview of Established Treatments for Autism

Applied Behavior Analysis

Applied Behavior Analysis (ABA) is a paradigm that seeks to increase socially appropriate repertoires while decreasing challenging behaviors for children diagnosed with ASD (Green, 1996). ABA uses an empirically-validated and principle-based approach to treat problem behavior, with an emphasis on functional assessment and building skills. The goal is to help the individual to develop skills that will allow that person access to the widest possible range of reinforcers. Behaviorists conceptualize autism as a disorder characterized by both behavioral deficits (e.g., communication, social skills) and excesses (e.g., ritualistic behavior, tantrums; [Green]. To modify behavior, ABA focuses on teaching specific, well-defined behaviors in a systematic manner in the context of repeated trials. For instance, behavior analysts may work on improving speech by targeting a specific skill or behavior such as labeling objects. After an appropriate response or attempt to respond, a positive reinforcer is administered. On the contrary, negative behaviors (e.g., self-injurious behavior) are not reinforced and incompatible tasks are introduced in order to reduce problematic behaviors (Green). Although teaching specific skills has resulted in improvements in specific targeted areas, these skills have often not been found to generalize to other environments and situations without additional training. For instance, studies have shown that teaching language skills to children does not result in increased social interaction unless the children also learn specific peer interaction skills (Lovaas & Smith, 2003).

Overall, ABA has been modifying its treatment procedures for over 50 years and the approach continues to be refined as new research develops. As a result, there are a number of popular and effective treatment approaches from within the ABA framework that are designed to treat problems associated with autism and several of these are outlined below.

The UCLA Young Autism Project

In order to address the difficulty with behavior generalization, Ivar Lovaas and colleagues at the University of California-Los Angeles began developing more comprehensive interventions that target all of a child's developmental and behavioral problems. Lovaas (1987) devised and studied an intensive comprehensive treatment for young children with autism who do not have profound mental retardation. This treatment, often referred to as the UCLA Young Autism Project, employs several therapists who provide 40 hours per week of one-on-one treatment at home, school and the community with the goal of

improving desirable behavior (e.g., language, social behavior) and reducing disruptive behavior (e.g., aggression, tantrums).

In addition to treatment sessions with the therapists, treatment is provided by the child's parents. Specifically, parents are part of the treatment team and learn procedures used by the therapists so that they can also provide treatment (Lovaas, 1987). During the first months of treatment, parents work alongside a therapist helping implement treatment (Lovaas & Smith, 2003). This allows the therapists an opportunity to observe the parents and provide helpful feedback so that parents can become effective therapists for their children.

Typically, children receive treatment for about three years until they begin elementary school. During this time, the children pass through several stages of treatment each with different goals (Lovaas & Smith, 2003). For instance, the first stage uses discrete trial training (DTT) to establish a teaching relationship with the goal of teaching a child to comply with one-step directions (e.g., "come here"). After a teaching relationship has been established, the next stage uses DTT to teach foundational skills, such as identifying objects, playing with toys, matching, and dressing. In the third stage, therapists use DTT and incidental teaching to target communication by teaching the child skills including imitating speech sounds and labeling objects. The next stage emphasizes communication and peer interaction. During this stage, the therapist uses DTT, incidental teaching, and dyads with peers to teach skills such as recognizing emotion and pretend play. The final stage focuses on skills to assist the child who is beginning school. In this stage, the child learns skills including language concepts (e.g., pronouns, past tense, and prepositions), how to converse with others, and how to understand the perspective of others.

The UCLA Young Autism Project has been empirically studied and replicated. Lovaas (1987) first compared three groups of children with autism: a group of children who received 40 hours per week of this intensive intervention, a group of children who received 10 hours or less per week of behavioral treatment, and a special education class. At post-treatment, Lovaas (1987) found that 47% of the children in the 40 hour per week condition achieved average IQs and performed at a satisfactory level in school compared to 3% of the children in the control condition. Replications of this study have found similar improvements (although sometimes not as large), in areas such as IQ and school performance for groups receiving an intensive intervention as compared to controls (e.g., Sallows & Graupner, 2005; Smith, 1999; Smith, Groen, & Wynn, 2000). Additionally, there is evidence that this intervention is effective in community settings (Cohen, Amerine-Dickens, & Smith, 2006). Yet, findings about the overall effectiveness of the UCLA program are not conclusive; as it is difficult to replicate this work given the great many resources and personnel demands that are required to duplicate the study methods.

Pivotal Response Training

Pivotal response training (PRT), a data-driven approach for treating children with autism, is based on applied behavioral analytic principles and is used to treat the language, social, behavioral, and play deficits that characterize children with autism (Koegel, O'Dell, & Koegel, 1987). This treatment differs from other ABA early intervention approaches in that PRT specifically focuses on improvement in broad areas of functioning that will then generalize to many other domains (e.g., Koegel & Koegel, 1995). These changes were made to the traditional ABA approach of Lovaas and his colleagues for the purpose of attempting to improve the efficiency and cost-effectiveness of treating children with autism (Koegel, Koegel, Harrower, & Carter, 1999).

The goal of PRT is to improve independence and self-education in children with autism through intervening in the key pivotal areas of motivation and self-initiation (Koegel et al., 1999). Specifically, PRT is based on the assumption that increases in child motivation and self-initiation will lead to increases in responsiveness and inquisitiveness in their natural environment. Target behavior for these responses are

individualized to each child's presenting needs. However, communication skills and appropriate social interactions are generally emphasized and taught in the child's environment (e.g., home, playroom, playground) through the use of natural stimuli (e.g., toys as opposed to flash card drills) (Koegel, Koegel, & Brookman, 2003). This treatment uses various techniques to increase child motivation such as using child-preferred activities and allowing the child to make choices among a variety of tasks (Koegel, et al., 1987). Other key characteristics of the intervention include mixing new tasks with tasks that the child has already mastered, using natural reinforcement whenever possible, and reinforcing attempts to respond correctly as opposed to only reinforcing correct responses (Koegel et al., 1987). For example, self-initiation is taught by prompting children to ask questions about their environment and providing reinforcement for these questions. For instance, children are prompted to ask, "What's that?" when they are interested in an object (Koegel et al., 2003).

Another feature of this treatment is a focus on parental involvement. Parents often play an important role in treatment by helping to implement the intervention (Koegel et al., 2003). In addition to this role, parents also attend parent education programs. In these programs, parents work with their child and receive feedback on how to improve their child's pivotal responses. Specifically, parents learn techniques and procedures to improve their child's motivation and self-initiation through teaching communication and academic skills (Koegel et al., 2003).

Research on PRT has found positive results in numerous areas including child social-emotional behavior, self-initiation, and communication as well as parental reports of stress, depression, and the quality of the parent-child interaction (see Koegel et al., 2003 for review). This research has examined both individual components of PRT and the complete treatment (e.g., Koegel, Bimbela, & Schreibman, 1996; Koegel, Camarata, Koegel, Ben-Tall, & Smith, 1998). Additionally, researchers have found these improvements in studies using a variety of research designs including single subject reversal, multiple baseline, and random assignment to experimental conditions (e.g., Koegel et al., 1996; Koegel et al., 1998; Koegel, Camarata, Valdez-Mechaca, & Koegel, 1998).

Positive Behavior Support

One of the more common ABA-based treatment models used to treat autism at both home and school is the positive behavior support model (PBS; Carr et al., 2002; Koegel, Koegel, & Dunlap, 1996). The primary goal of PBS is to assist in creating lifestyle changes which will help the children, as well as others in their environment (e.g., teachers, parents, and friends), enjoy an improved quality of life. As a secondary goal, PBS attempts to decrease undesirable behavior by helping the individual achieve their goals in a more socially acceptable and desirable manner (Carr et al., 2002). From a conceptual standpoint, PBS emerged primarily from three sources: ABA, the normalization/inclusion movement, and person-centered values. This considered, it is not surprising that positive behavior support is actually a combination of numerous procedures, most notably drawing from techniques such as behavioral family intervention, systems change models, ABA treatment strategies, and the family support movement (Newsom & Hovanitz, 2006). While an extensive description of procedures used in PBS is beyond the scope of this article (see Lucyshyn, Horner, Dunlap, Albin, & Ben, 2002 for a thorough description), the basic steps include conducting a functional assessment, developing hypotheses regarding the functions of negative behavior in a specific setting, and designing an appropriate behavior support plan. The final step involves implementing a maintainable plan that will increase the overall quality of life for both the family and the child.

Numerous studies have shown PBS to be effective. One early study by Durand and Carr (1992) compared children with developmental disabilities who received functional communication training – an important aspect of PBS – to a control group who received time out from positive reinforcement. Both groups showed overall lower rates of negative behavior, while only the PBS group showed (a) an increase

in unprompted communication, and (b) generalization of treatment gains across different settings and over time (i.e., after the intervention was completed). Dunlap and Fox (1999) used PBS with young children with autism and their families, and found that all of the participating children (N=6) showed significant reductions in problem behavior, demonstrated gains on rates of development, and had reduced frequency of autistic behavior as measured on the Autism Behavior Checklist (Krug, Arick, & Almond, 1980). Furthermore, families reported being more comfortable taking their children out in public and including their children in family activities. Similar results were found by Koegel, Stiebel, and Koegel (1998) who used PBS with three preschool-aged children with autism, finding large reductions in overall rates of aggression toward their siblings, increases in both the parents' and child's levels of happiness, and increases in strangers' levels of comfort in interacting with the family.

More recent reviews of the literature (Carr et al., 1999) show that over 100 studies conducted between 1985-1996 demonstrate the effectiveness of PBS in reducing problem behaviors in children with mental retardation, mental retardation with other diagnoses, and children with autism – in many cases with problem behaviors being reduced by upwards of 80%. Treatment gains found in single-subject studies of children with autism have been even larger in recent years, with average percentage of behavior reductions being 94.6% (see Horner, Carr, Strain, Todd, & Reed, 2002).

Despite widespread support for PBS, questions have been raised as to whether positive behavior support actually constitutes a new or novel treatment approach (Mulick & Butter, 2005), and if using solely non-aversive techniques is truly effective for optimal child development (Newsom & Kroeger, 2005). Also, some researchers have expressed concern assert that accommodation alone may be effective in reducing behavioral problems primarily because of the reduction in new demands. While placing fewer demands on the child reduces opportunities for the child to experience oppositionality, providing fewer challenges and expectations could slow the child's maturation.

TEACCH Method

Another treatment approach in the behaviorist tradition is the TEACCH Model (Treatment and Education of Autistic and Related Communication Handicapped Children; Mesibov, 1994; Schopler, 1994; Schopler & Reichler, 1971), an approach which emphasizes structure in teaching new behaviors, targeting specific skills, and defining conditions and consequences of behaviors through shaping. Similar to the PBS approach, the TEACCH model takes a comprehensive, holistic view of autism treatment. According to TEACCH, comprehensive services are required across the lifespan (Mesibov, 1983) and must be specific to the individual and their personal environment, skills deficits, and unique family situations (Mesibov, 1994). A key factor in the TEACCH method is the child's parents, who are seen as integral to the treatment process and part of a larger collaboration of parents and professionals working separately, but for the common benefit of the child. Four aspects of communication are underscored with this model. The first is functionality, where teaching goals are selected based on their usefulness in daily adult living, with a focus on making communication more meaningful and rewarding for the child. The second is incidental learning, as children are taught new language skills after naturally occurring, child initiated behaviors bring about an opportunity to learn new skills (e.g., asking for a soda from the vending machine). Another aspect is the teaching of non-verbal, alternative forms of communication for children who have difficulties with language or speech production. Finally, the TEACCH method has been strongly influenced by the psycholinguistic literature, which has helped with assessment, improving the communication of behavior, and helping further define communication strategies.

From a philosophical standpoint, the TEACCH approach focuses on tolerance, compromise, acceptance, and personal enhancement rather than normalization or inclusion (Mesibov, 1994). The program accepts that there are differences between people with autism and the general population, yet it

stresses that these differences do not suggest inferiority. The focus is on the individual and working with a person's strengths to assist them in reaching personal goals.

Early research on the effectiveness of TEACCH demonstrated improvements in learning and behavior following the introduction of a structured learning environment in classrooms (Schopler, Brehm, Kinsbourne, & Reichler, 1971) and significant increases in both child compliance and parent teaching skill when used in a home-based program (Marcus, Lansing, Andrews, & Schopler, 1978). Short (1984) found similar results with a home-based TEACCH program, with significant treatment effects for appropriate child behavior and play, communication, and improved parent-child interaction and involvement as compared to wait-listed children. A questionnaire study of 348 parents of children in the TEACCH program found high levels of satisfaction with the treatment, with large numbers of individuals with autism who had completed the program still functioning well in the community following completion of treatment (Schopler, Mesibov, & Baker, 1982).

While initial studies supported the TEACCH method, most failed to include an appropriate control group making it difficult to assess the amount of change brought about by the treatment program versus developmental maturation alone. A more recent study of 22 children with autism by Ozonoff and Cathcart (1998) compared the effects of home-based TEACCH services with a control group who received no supplemental TEACCH services. All children were attending day treatment programs in the community. After four months of services, children in the TEACCH group showed significantly more improvement than children in the control group on tests of fine motor skills, imitation, gross motor skills, and cognitive performance, as well as overall scores on the Psychoeducational Profile-Revised (PEP-R; Schopler, Reichler, Bashford, Lansing, & Marcus, 1990). Furthermore, children in the treatment group averaged 9.6 months of developmental gain during the four month treatment despite the fact that most of the children were also diagnosed with mental retardation.

DIR/Floortime

Developed by Stanley Greenspan, the "Developmental, individual-difference, relationship-based model" (DIR; Greenspan, 1992; Greenspan & Wieder, 1999; Wieder & Greenspan, 2006) is a developmentally sensitive, functionally based approach that attempts to help children "climb the developmental ladder" and reach important developmental milestones. Six major functional milestones, or functional emotional developmental capacities are outlined as being necessary for normal emotional and cognitive development: 1) self-regulation and interest in the world, 2) engaging and relating to others, 3) intentionality and two-way communication, 4) social problem-solving, mood regulation, and formation of a sense of self, 5) creating symbols and using words and ideas, and 6) emotional thinking, logic, and a sense of reality. In addition to the six primary stages, three advanced stages characterize later development throughout adolescence and adulthood: 1) multicausal and triangular thinking, 2) gray-area and emotionally differentiated thinking, and 3) a growing sense of self/reflection on an internal standard (Greenspan & Wieder, 2006). The intervention is designed to facilitate and promote progression through each of these stages by addressing strengths and weaknesses at each stage of development, helping the child acquire and master new skills, and creating learning relationships that are tailored to a child's individual needs.

The DIR model is an intensive program that requires parents to work with their children across multiple settings, often 8 or more times a day for twenty minutes or more at a time. At the core of the DIR model is Floortime, a specific technique where the caregiver literally gets down on the floor to interact with the child, one-on-one, for at least twenty minutes or more in child-directed play or interactions. One of the overlying principles throughout Floortime and DIR is the focus on the child, attending to their needs and creating mutually enjoyable, shared experiences between child and caregiver. Through this, the child is encouraged to reduce their social and emotional isolation, with the rationale being that a child will

feel closer to the caregiver if the caregiver respects and participate in what interests the child. The major steps in Floortime include observing the child's actions, approaching and opening circles of communication by acknowledging the child's emotional tone and gestures, following the child's lead and allowing them to feel like they have an impact on the world, extending and expanding play through supportive comments and careful, empathic questioning, and allowing the child to close the circles of communication (i.e., responding in a manner that completes or compliments the activity at hand) formed during the Floortime activities.

Greenspan and Wieder (1997) examined treatment outcome findings of over 200 children with varying impairment levels treated using the DIR/Floortime approach. After two or more years of intervention, 58% of children demonstrated significant gains in numerous domains of social skills, cognitive tasks, and academic ability. These gains were paired with significant decreases in the amount of self-absorption, avoidance, self-stimulation, and perseveration observed in the children (Greenspan & Wieder, 2006). In addition, these children no longer fell into the Autistic range on the Childhood Autism Rating Scale (CARS). Of the 200 children examined, 25% made moderate gains across most areas of development, and the remaining 17% showed very slow gains from the treatment (Greenspan & Wieder, 2006). While these results are promising, the authors contend that the majority of the families involved in these cases were highly motivated and the children not necessarily representative of most with Autism Spectrum Disorders. A follow-up study was conducted 10-15 years after treatment (Greenspan & Wieder, 2006) on 16 of the children who showed good to outstanding improvements initially. Treatment gains were still apparent after time, with this subset of children still exhibiting little or none of the core deficits and symptoms of Autism Spectrum Disorders at follow-up. While long-term studies have shown promising results, many of the studies examining DIR have lacked appropriate control groups, bringing the validity of the results under some question.

Parent-Child Interaction Therapy

Parent-Child Interaction Therapy is based on Hanf's (1969) two-stage treatment model, social learning theory, and attachment theory. PCIT consists of two phases, child-directed interaction (CDI) and parent-directed interaction (PDI). Like other parent training programs based on Hanf's model, PCIT includes a relationship enhancement component and a behavioral approach to reducing disruptive behavior. However, PCIT differs from many other parent training programs because the treatment incorporates both parents and children in the sessions and involves live coaching. Another feature that distinguishes PCIT from other parent training programs is that treatment progress is data-driven. Specifically, parents must first demonstrate mastery of the CDI skills before progressing to the second phase, PDI. Likewise, mastery of the PDI skills is a pre-requisite to therapy completion.

The two phases of PCIT are conducted in weekly 1-hour sessions. Both phases contain didactic and experiential components. The first session of both phases is didactic, in which the therapist teaches, models, and role plays the skills with the parents alone. The subsequent sessions begin with a brief check-in with the parents, in which a therapist discusses the homework from the previous week and also reviews learned skills. After the check-in, the therapist coaches the parent to help improve their skills using a bug-in-the-ear microphone device from an observation room while the parent and child play together. During the coaching, the therapist helps the parents master the skills by providing support, reinforcement, and corrective feedback.

CDI, the first phase of PCIT, is similar to play therapy because the child leads the play as the parents provide support in an effort to enhance the parent-child relationship. During CDI, parents learn communication skills for creating or strengthening their bond with their child, increasing their positive parenting, and improving their child's social skills. Specifically, the therapist teaches parents to follow the child's lead in play by using the PRIDE skills: Praising the child for a specific behavior (labeled praise),

Reflecting the child's statements, Imitating the child's play, Describing their child's behavior, and using Enthusiasm throughout the play. They also learn to avoid asking questions, criticizing, and giving their child commands because these behaviors prevent the child from leading the play and create an unpleasant environment. After the therapist teaches the parent these skills, the parent practices both in clinic sessions (while being coached) and at home for five minutes daily. With regard to behavior management, parents learn to use selective attention by responding to appropriate behaviors with the PRIDE skills while ignoring negative behaviors. In order to move onto the next phase of treatment, parents must demonstrate mastery of these skills. Specifically, they have to provide 10 descriptions of child behavior, 10 labeled praises, and 10 reflections, while providing 3 or less commands, questions, and criticisms in a 5-minute play situation without the therapist's help.

After the parents have mastered the skills taught in CDI, they progress to PDI, the second phase of PCIT. In this phase, parents continue to use the skills taught in CDI but also learn skills to increase child compliance and pro-social behaviors and decrease inappropriate behaviors. The therapist teaches the parents how to give effective instructions and consistently provide different consequences for child compliance and noncompliance. Additionally, parents learn strategies for enforcing house rules and controlling their child's behavior in public settings.

The first skill that the parents learn in PDI is how to give effective, developmentally-appropriate commands or instructions. Parents learn to give clear, direct commands that let the child know exactly what is expected. In order to increase the child's understanding of the direction, instructions typically involve a visual cue such as pointing or imitating the desired action in addition to the verbal direction. Also, parents are taught to give commands they are certain the child comprehends and is able to perform. For example, at the outset of therapy, children's developmental capabilities are assessed in terms of ability to differentiate colors, identify toys, and perform the appropriate motor actions (e.g., please put the crayon in my hand). Next, parents learn specific steps to follow based on the child's response to the commands. They learn to use these steps every time they give a command so that discipline becomes consistent and predictable. For instance, if the child complies with the command, they learn to give an enthusiastic labeled praise. However, if the child does not comply, they learn to wait five seconds and then issue a warning. If the child still does not comply with the initial command, parents place the child in a timeout chair. In instances when the child does not stay on the timeout chair, a back-up consequence is used to teach the child to stay in timeout (e.g., back-up timeout room). Parents must also master PDI skills, including giving effective commands and following the timeout procedure. In order to master PDI, parents' commands must be effective (i.e., direct, clear), and followed through correctly (i.e., labeled praise for compliance, warning then timeout for noncompliance) at least 75% of the time, and the child must exhibit a compliance rate of at least 75%.

PDI is similar to CDI in that the parents practice these skills in session while a therapist coaches them to ensure that they are following the procedure correctly. Additionally, like CDI, parents practice PDI outside of treatment sessions by giving their child commands during daily compliance exercises that are conducted at home. As skills in PDI progress and parents begin using these skills throughout the day, they are taught to use PDI only when it is important that the child complies and when they are able to follow through with a timeout, if necessary.

Another feature of PDI is that the therapist individualizes the program based on the parent's goals for the child. Specifically, PDI can be used to increase desired behaviors. For instance, if the parents want to increase child eye contact, the therapist could have the parents issue a command directing the child to look at the parent. Then, if the child complies, the parents would follow through with a labeled praise. For instance, they might say, "Thank you so much for looking at me. Now I know you are ready to listen."

PCIT has empirical support for treating young children with disruptive behavior. Specifically, researchers have compared PCIT to both wait-list and classroom controls (McNeil, Capage, Bahl, & Blanc, 1999; Schuhmann, Foote, Eyberg, Boggs, & Algina, 1998; McNeil, Eyberg, Eisenstadt, Newcomb, & Funderburk, 1991) and have found significant reductions in disruptive behavior in children who received PCIT. Evidence shows that the effects of PCIT generalize to untreated siblings (Brestan, Eyberg, Boggs, & Algina., 1997) and to other settings, such as school (McNeil et al., 1991). Additionally, research demonstrates that treatment gains are maintained over time (Eisenstadt, Eyberg, McNeil, Newcomb, & Funderburk, 1993; Eyberg et al., 2001). See Herschell, Calzada, Eyberg, & McNeil (2002a, 2002b) for a more detailed description of clinical procedures and treatment outcome research.

Theoretical Similarities

PCIT is unique in that it contains a blend of therapeutic techniques seen in a number of therapies devised for children with ASD. For example, PCIT, like Floortime and TEACCH, recognizes the importance of consistent, one-on-one parent-child interaction and stresses that the quality of a parent-child bond is important to demonstrate acceptance and support for the child's behaviors and verbalizations. In addition, PCIT is similar to pivotal response training in that it emphasizes the importance of using familiar play objects in an environment that is comfortable for the child in an effort to promote generalization. Indeed, families in PCIT are instructed to use their parenting skills at home on a consistent basis with familiar activities and stimuli that encourage parent-child interaction. A common theme inherent within many interventions for children with ASD is to take a comprehensive approach by allowing parents to play an integral part in therapy. By increasing parental involvement, skills learned within a clinic are then generalized to other settings such as the home and public environments. Likewise, PCIT views the parent as the agent of change in a child's life and therefore trains parents to a mastery level in each component of treatment. In having stringent mastery criteria, requiring consistent practice and providing ample live feedback to parents, PCIT places a great deal of emphasis on treatment fidelity, generalization across environments and maintenance over time. Lastly, PCIT not only stresses the importance of relationship-building through enriching and rewarding parent-child interactions, but also contains an intensive compliance training component (i.e., command-consequence sequence) similar to the discrete trials seen in ABA protocols.

Overall, due to its overlap with current specialized treatments, PCIT presents a number of components that may prove to be helpful for children with ASD. More specifically, PCIT may serve to prepare a child for more intensive therapy by serving as a necessary primer that enhances the parent-child relationship and increases child compliance, thereby setting the stage for greater success across a variety of treatment modalities (e.g. social skills training, academic tutoring).

The Utility of PCIT

Overall, PCIT strives to increase school-readiness skills by using techniques designed to enhance the parent-child relationship, improve language and social skill capabilities, increase attention span, expand the play repertoire with age-appropriate tasks (as opposed to self-stimulatory behaviors), increase the compliance rate, and decrease oppositional and aggressive behaviors. Although our clinical experience has shown initial success in accomplishing these goals, it is important to note that PCIT may not be an effective treatment for all children with ASD in that it relies on social reinforcement as a way to modify behavior (see the "Social Reinforcement" section of this article for a complete overview). Therefore, assessing for a child's capability to respond to social attention is an important aspect of the intervention. One advantage of PCIT is that each session is essentially a continuous functional assessment as therapists are coaching parents through systematic manipulations of antecedents and consequences and monitoring the changes in the child's behavior (Greco, Sorrell, & McNeil, 2001). For example, it is common for a therapist to coach a parent to turn away from the child and ignore a disruptive behavior

(e.g., screaming) and then to assess whether social attention was reinforcing that behavior by determining whether the behavior increased or decreased over time and with repeated trials. Our clinical experience has demonstrated that the behaviors of children with high language ability (e.g., Asperger's) usually display a range of behaviors that are reinforced by social attention. On the other hand, it is recognized that some children with ASD are less responsive to social contingencies. Given that PCIT is based in large part on social reinforcers (e.g., labeled praise, reflection of speech, imitation) the approach may only be effective and appropriate for the portion of children with ASD who can easily be taught to consistently respond to social contingencies. Therefore, PCIT may be limited for a specific portion of the ASD population.

Child-Directed Interaction

Similar to the theoretical implications of Floortime, child-directed play improves the parent-child relationship by allowing the child to lead the play situation, in turn, conveying a message that the child's verbal and behavioral expressions are not only accepted but also encouraged and rewarded through social reinforcement. Children choose the play activities, while parents express approval and interest by following the child's lead through the use of skills like imitation and reflection. As the parent-child relationship improves and the bond is strengthened, it creates a situation in which the child views playtime as a rewarding experience and seeks to increase time spent with the parent and constructive play behaviors develop. Such naturalistic teaching procedures are common in ABA based natural language training programs, which have shown extensive research supporting their use for maintenance and generalization (Peterson, 2007).

In addition to increasing the value of one-on-one time, CDI is also effective in building language and conversational skills. Reflective statements are useful in that they provide immediate attention for any verbal expression increasing the likelihood the child will talk more often during special playtime. For example, a child with ASD in our clinic initially presented with limited verbalizations providing few words during the first several sessions. However, as his mother began to reflect the child's utterances and words on a regular basis, the number of vocalizations increased. After a number of therapy appointments, the child was consistently verbalizing throughout the entire session.

In addition to increasing the number of expressed verbalizations and words, CDI also helps motivate a child to use language in order to obtain desired snacks or objects. For example, in our clinic, one child with language capability often pointed, screamed, or physically guided his parent when he desired a particular object. We taught the parent to ignore the child's inappropriate attempts to acquire particular objects, to prompt his use of words, and then to praise the child for using words. If parents reward inappropriate, yet efficient methods of getting demands met (e.g., yelling, pulling parent toward object), the children will not be motivated to use language, as this requires more effort and concentration. The less the child uses appropriate communication, the more delayed the language functioning is likely to become.

Next, the use of CDI skills increases a child's attention span and ability to remain seated and focused on the task at hand. To accomplish this, parents employ behavioral descriptions (a running commentary of the child's behaviors) which allow a child to focus on an activity for longer periods of time, thereby diminishing the likelihood of off-task behaviors (e.g., repetitive, stereotyped behaviors). Theoretically, the social reinforcement resulting from the parent's focus on the child's play increases time spent on that particular activity. In a particular case of ASD seen in our clinic, CDI skills greatly increased the child's time spent engaged in appropriate play. This, in turn, expanded his play repertoire as he obtained more exposure to objects such as crayons and toys, while spending less time engaging in repetitive, self-stimulatory behaviors (e.g., twirling, opening and closing doors). Overall, CDI establishes a situation for making parent-child interactions more reinforcing to both the parent and child by teaching

the parent to follow the child's lead and demonstrate interest and acceptance of the child's activities. An improved parent-child relationship sets the stage for success during the compliance training phase of treatment (i.e., PDI).

Working with stereotyped, repetitive behavior during CDI

When conducting CDI with children with ASD in our clinic, we have had to address an important theoretical issue with respect to repetitive behaviors. CDI involves two parallel objectives: (a) to improve the parent-child relationship by following the child's lead, and (b) to modify behavior through selective attention (i.e., ignoring inappropriate behavior, redirecting the child's inappropriate activities, and providing attention to incompatible prosocial behaviors). If repetitive, self-stimulatory activities (e.g., frequently reciting the pledge of allegiance, lining up toys) are categorized as "inappropriate," these activities should be ignored and redirected during CDI. However, during functional assessments in our clinic, we have found that many of these behaviors serve a self-stimulatory function and are not maintained by parental attention. Therefore, when we coached the parent to ignore and redirect, the behaviors were extremely resistant to redirection. Additionally, in some cases, the children had few if any behaviors that were "appropriate," such that ignoring repetitive behavior equated ignoring most of the child's behavior repertoire. Thus, when we defined repetitive behaviors as "inappropriate," a great deal of CDI was spent ignoring rather than joining with the child. Attempts to modify the repetitive behaviors clearly interfered with the equally important goal of improving the parent-child relationship, therefore we decided to define self-stimulatory behaviors as "appropriate" during CDI as long as they were not dangerous or destructive. For example, one parent in our clinic was coached to imitate, describe, and praise her child's repetitive pen-spinning behavior. In addition, she was coached to reflect her child's echolalic comments in order to keep him in the lead. Although this seemed somewhat contradictory to the parent, she was reassured that upon mastery of CDI skills she would then lead the play and be able to redirect her son's ritualistic behavior and encourage more age-appropriate tasks and behaviors. By teaching parents skills to keep their child in the lead, it allows children with ASD to engage in familiar and soothing behaviors and to experience parental acceptance in the form of parental imitation, praise, and description of the child's preferred activities.

Parent-Directed Interaction

PDI presents a number of benefits for children with ASD in that it targets noncompliance and allows parents to redirect idiosyncratic play to more developmentally appropriate activities. In this phase of treatment, parents are instructed to give short, simple commands and then subsequently follow-through with appropriate consequences. For compliance, a parent gives verbal praise and then allows the child to lead the play for a brief time period. For non-compliance a structured timeout sequence takes place that ends with compliance to the original command (i.e., no escape). The command-reward or command-timeout sequence is comparable to the applied behavior analysis approach as it parallels the one-step direction employed in discrete trial training such that a basic command is given ("look at me," "please hand me the block") followed by a consequence. In contrast to ABA, PCIT does not typically employ tangible or edible reinforcers but instead uses social rewards in the form of labeled praise and CDI. Also, in contrast to the hand-over-hand prompting used in many ABA programs, PCIT employs a timeout sequence. The timeout is conducted such that the initial command must be met before therapy can progress. In this way, a child cannot learn to escape from having to comply with the initial command. In PDI, compliance is over-trained to the point where it becomes a well-rehearsed habit in the child with High Functioning Autism. Compliance training begins with the use of simple "play" commands (e.g., "please put the man in the house") and progresses to real-life instructions (e.g., "please sit at the table"). Children over-learn compliance by practicing to comply at very high rates in both the clinic and in the

home. During “listening exercises,” children are given a command almost every minute for the 40 minute weekly clinic coaching and for the 10 minute daily home practices.

In our clinical experience, PDI has proven to be helpful in not only reducing a number of oppositional and aggressive behaviors commonly associated with High Functioning Autism, but also has been useful in targeting self-stimulatory behaviors. By administering a simple command while a child is engaging in a self-stimulatory behavior, a parent can redirect that behavior and expand the child’s behavioral repertoire. For example, a child with ASD in our clinic would repeatedly write a series of phone numbers and would spend most of the CDI coaching sessions (and much of the day at preschool) writing the numbers over and over. In CDI, his mother would give him positive attention by using the PRIDE skills: describing his behavior (“Now you are writing a 6”), imitating his writing, enthusiastically praising (“You write your numbers so well!”), and reflecting all verbalizations. However, during PDI the child’s mother was coached to direct her son away from his self-stimulatory behavior to another task (e.g., “Please draw me a tree”). By learning the compliance sequence and not allowing her son to escape from original commands, the parent was not only able to reduce oppositional and self-stimulatory behaviors, but was also able to teach the child different tasks and activities that would never have been possible before (e.g., drawing age-appropriate pictures, playing cards, participating in sports). By redirecting self-stimulatory behavior and managing behavioral difficulties, the parent taught her child skills that increased his capacity to learn and be successful in structured classroom environments. If PDI was not used to disrupt the self-stimulatory behavior, the child may have never expanded his behavioral repertoire and may have fallen even further behind his peers developmentally.

Overall, the blend of PDI and CDI skills is advantageous to the child in that it establishes a rhythm or expectation that the child and parent will alternate leading and following during their daily practice sessions. By establishing that the child does not lead the entire play session, an element of flexibility is established for the child. In this way, the child learns that there are times when listening and complying are necessary. Also, the combination of PDI and CDI allows for children with ASD to take a break from demands and again lead the play as they wish. These breaks seem to be important for children with ASD as their anxiety and frustration decrease when they have opportunities to engage in their preferred activities while receiving attention and acceptance from their parents. Alternating between the parent’s lead and the child’s lead also makes the parent-child interactions more reinforcing and compliance less aversive. Ultimately, the rhythm established during PCIT sessions (i.e., one minute of CDI-20 seconds of PDI-one minute of CDI, etc.) may generalize to additional settings, establishing an expectation that a balance is to be struck between behaviors that the child finds comfortable and demands given to the child. As compliance becomes more consistent, greater demands can be placed on the child in turn expanding the behavioral repertoire and improving school-readiness.

Timeout Component

For over 40 years, researchers have debated the appropriateness of the use of aversive procedures in children with developmental disabilities creating a division within the ASD research community. This debate has generated a number of arguments including the definition of aversive: a term that could potentially have a number of meanings ranging from physical pain to temporary mild irritation. In an effort to grant a more precise definition of the term, Turnbull (1986), while delivering his presidential address at the American Association on Mental Deficiency (AAMD), stated that “not every intervention that is unwelcomed by the client or that may cause unpleasant consequences should be regarded as presumptively questionable. To take that approach would be to exclude, for example, timeout, seclusion, medications, or modest repetitions of skill building tasks” (p. 266). Currently, researchers contend there remains ambiguity about a valid definition of this term but recognize that some use of punishment may be necessary for childhood learning and development (Newsom & Kroeger, 2005). Going further, some researchers propose that a solely-positive approach may not be as effective as one that employs a

combination of positive methods and punishment, recognizing that punishment is a necessary first step in establishing an environment where positive consequences can become reinforcing (Sidman, 1989).

Employing a timeout procedure for difficult behaviors is a technique that is widely accepted and used in behavioral parent training programs. In order to insure a safe and accurate implementation of the timeout procedure, PCIT requires clinicians to dedicate a session solely to teaching and practicing the timeout sequence with parents. In addition, parents receive in-vivo coaching during the first timeout sequence in the clinic and are coached to a mastery level (see description of PCIT). Overall, PCIT has been widely accepted within the clinical and research community and has been used with a variety of clinical problems including parents referred for child abuse (Chaffin et al., 2004).

Based on Baumrind's (1971) research, it has long been recognized that an authoritative parenting style (one that is characterized not only by warmth and praise, but also consistent limit setting) enhances the likelihood of more positive child outcomes. Further, as aversive contingencies (e.g., restricted privilege) are commonly used to modify behavior in the natural environment (e.g. workplace, classroom), a solely positive approach may not be comprehensive enough for helping children with high-functioning autism to cope with societal demands (Newsom and Kroeger, 2005).

To summarize, PCIT incorporates both positive parenting skills and limit setting and it has been successful in reducing difficult behaviors with typically-developing children (see the "description of PCIT" section of this paper for a list of treatment outcome studies). PCIT has been shown to have clinical efficacy with a high degree of caregiver acceptability. Yet, in families of children with High-Functioning ASD, there exists need for further empirical research to examine if this treatment is a beneficial gateway intervention. It is possible that PCIT opens the gateway for children to be better able to benefit from more comprehensive and multi-component treatments. In other words, PCIT is expected to improve compliance and social responsivity, two fundamental skills that provide a gateway for treatment that addresses a variety of adaptive behaviors (e.g., social skills training). If children with ASD do not learn at an early age to attend and comply, they remain distracted by stereotypical interests and behaviors that prevent them from progressing with treatments addressing higher-order concerns such as identifying the feelings of others and social reciprocity.

Limitations/Clinical Considerations

Client Characteristics

As PCIT is a specialized treatment that targets specific behaviors, it is important to clarify that it is not an appropriate intervention for all children on the Autism spectrum. Instead, our experience has demonstrated PCIT to be an effective treatment for children with a particular clinical presentation. For instance, PCIT has shown to have preliminary success with High-Functioning Autism and/or Asperger's Disorder. As the delivery of PCIT requires parent-child communication, success of the intervention is dependent on a child's language capability. For example, a child must be able to understand simple instructions and sentences for PCIT to be effective. Children with receptive language capabilities below a 24-month-old level may not be appropriate candidates for PCIT.

Therapist Characteristics

As children with ASD present with a variety of complex behaviors coupled with the fact that PCIT has not been conducted with a large amount of clients from this particular population, it is recommended that only experienced PCIT clinicians attempt to treat children with ASD until more data can be gathered. Although definitive conclusions have not yet been reached regarding the minimum

training requirements for a PCIT therapist, most members of the PCIT Advisory Board advocate that PCIT trainees obtain at least 40 hours of initial training, as well as an advanced training component and/or supervision after completion of approximately 4 to 8 cases (Eyberg & Brestan, 2006). Due to the complexities of the disorder, it is suggested that clinicians with limited PCIT experience refer ASD cases to a more experienced PCIT therapist or to a local agency specializing in treatment of ASD. If future research supports the use of PCIT with ASD, then specialized training programs should be developed to assist advanced PCIT therapists in adapting the program to meet the needs of this population.

Social Reinforcement

One aspect that needs to be thoroughly assessed in considering the appropriateness of PCIT for children with autism is whether social attention is reinforcing. As PCIT utilizes social approval (labeled praise) as a reinforcer, it is important to consider the effect this has on a child's behavior prior to starting therapy. In other words, a functional assessment should be conducted to determine whether behaviors increase when followed by social attention and approval. Some children with autism may find social praise slightly aversive and may seek to avoid or escape parental attention.

As a byproduct of social reinforcement, clinicians must also assess the effectiveness of selective attention and timeout. In our experience, systematically ignoring (the parent turning his back to the child after she engages in undesired behavior) during CDI sometimes does not result in behavior change in children with ASD. In some cases, children did not seek attention when parents turned their backs, but instead used the "break" in play to engage in self-stimulatory behavior. For example, one child with a limited behavioral repertoire would engage in self-stimulatory behavior for a considerable portion of a CDI session. When the child's behavior was ignored, he did not seek to regain his mother's attention but continued with self-stimulatory behavior. In addition, as some children with autism may find timeout to be a place of retreat and one not requiring social demands, it may be counter-intuitive to employ this particular technique. For instance, a child does not comply with a command to hand his mother a red block and is given a warning that he must comply or go to timeout. Upon non-compliance, the child receives a time out where he can "escape" the command for a certain time period and engage in other behaviors such as rocking or flapping. Although the child eventually needs to comply with the command, the timeout chair may serve as a relief from playtime with his mother. In this way, child compliance is negatively reinforced as it results in escape from social demands.

Although timeout may not be effective with some children with ASD, our clinical experience has shown that it typically serves as a more powerful aversive than ignoring. Therefore, it may be necessary for a clinician to begin therapy with the PDI portion first and then progress to CDI (see Eisenstadt et al., 1993). In our experience, the most robust behavioral changes with children on the autism spectrum have taken place during PDI (i.e., compliance training). As PDI establishes a play situation where a child can only escape the social interaction through a timeout, more opportunity to experience social attention is granted in this phase of therapy. Also, in cases when oppositional behavior is destructive or extreme, compliance training may be indicated as an initial part of treatment in order that the child may participate in therapy. For example, one child with ASD would refuse to engage in any behavior and would place his hands over his ears and yell at his mother for a majority of the session. As his refusal was so extreme, PDI needed to initially be implemented in order to increase his receptiveness to parental attention and constructive play activities.

Communication and Social Skills Component

One adjunctive component to PCIT that seems important for increasing and/or enhancing communicative repertoires in children with ASD is social skills training. In a PCIT approach, parents are

coached in different ways to prompt their child to answer questions, ask questions, use eye contact, and initiate/maintain conversations. By administering social skills training at the end of therapy, it allows the parent to teach these critical skills after a child has become more receptive to social interactions and also more likely to comply when prompted to speak. In addition, teaching parents to provide the social skills training is useful in that the parent then serves as co-therapist and can help/prompt the child to use the skills in a more generalized fashion. For example, after successfully mastering CDI and PDI, a parent can be coached in a variety of methods for motivating their child to improve their social competency and can help the child to be exposed to situations in which he/she can use the skills (e.g., restaurant, bowling alley).

In the context of communication and social skills training, it is important to consider the possible distinction between verbal delays and noncompliant behavior. In other words, some children with ASD may not have the capability to use more advanced language and failing to initiate (e.g., saying hello to a teacher or friend) or maintain social communication may not be a refusal behavior. As verbal behavior cannot be physically guided and refusing to engage in a social activity is typically not an act of defiance in children on the high end of the autism spectrum, administering a timeout is seldom warranted when teaching or coaching parents social and communication skills. As a prerequisite amount of language capabilities is needed to ask or answer questions, the social skills component of PCIT is best indicated for children who demonstrate both receptive and expressive language abilities equivalent to or above 24 months.

Answering Questions

In terms of answering questions, it is important for parents to not allow their child an opportunity to escape from responding. Answering questions could be aversive to a child with ASD for several reasons. First, it may require the child to suspend a self-stimulatory behavior and attend to the social interaction. Second, the pragmatic language skills of children with autism spectrum disorders are different than typically-developing children, thus requiring greater effort to understand a question and respond. Lastly, answering a question often results in additional social demands that may be uncomfortable for the child. Thus, it is typical for a child with ASD to ignore the parent in order to escape the demands of answering the question. If a parent fails to repeat the question, then the child's ignoring behavior is negatively reinforced such that the child becomes increasingly unresponsive to conversational demands.

As answering questions is a difficult endeavor for children with ASD, parents are taught to ask questions strategically. For example, in order to reduce the frequency of questions asked, parents are coached to recognize and eliminate them during the CDI portion of therapy. In addition, parents are coached to decrease questions that they do not necessarily need to have answered (i.e., "filler" questions). By reducing the amount of questions asked, the value of questions and the motivation to answer are increased. When asking questions, parents are instructed to ask only questions the child is developmentally capable of answering. For example, the question, "What did you do at school this morning?" may be inappropriate for a child who has difficulty understanding the concept of time (e.g., past or future) and trouble formulating responses to open-ended questions. Also, questions concerning perceptions or attitudes should be avoided in the early stages of social skills training as it may be difficult for the child to convey ideas about these abstract concepts. Instead, parents are coached to begin with questions that are more concrete and easily comprehended (e.g., "What color is this block?") and to reinforce answers with praise as well as breaks in which the child is able to lead the play and be temporarily free from another question.

In addition to asking developmentally-appropriate questions, parents are also taught a broken record method in which the same question is asked repeatedly (with a 5 second pause in between questions) until an answer is received. If the question is not answered after the third delivery, the child is

prevented from engaging in the preferred activity until the child provides an answer. For example, if the child is drawing, the parent would remove the crayon from the child's hand or hold the child's hand until the child answers. Similarly, if a child is running his/her hand back and forth across a table, the parent would pull the chair away from the table and continue to ask the question until the child verbally answers. By repeating the question, it becomes aversive to the child to avoid answering and the lack of response is not negatively reinforced by the parent disregarding the question. Our clinical experience has shown us that the broken record has been effective in obtaining verbal responses. For example, one child's rate of answering questions increased from 10% prior to teaching parents the broken record technique to 90% following implementation of the technique. It is worth noting that occasionally a child may not respond to the broken record. In these cases, a timeout is not an appropriate technique since a verbal response cannot be physically guided. Since a child could possibly escape from answering questions (e.g., sit on the timeout chair for a lengthy period of time until parent allows child off the chair despite the lack of compliance), there exists the possibility that the effectiveness of the timeout procedure would decrease. Instead, it is usually recommended that the parent return to the question, or an easier question, after a brief break.

Suspension of Privilege

Answering Questions

Another technique parents are taught and coached to use are "when-then" statements. A "when-then" statement suspends preferred activity until the requested behavior is performed. For example, one child in our clinic oftentimes sought to play with toys in the laboratory's attached room. Following a question, he would sometimes attempt to escape the play situation to engage in his preferred activity, playing in the attached room. In this situation, the parent was coached to tell the child, "When you answer my question, then you may play in the other room." If the child answered the question, he was verbally praised. If the child would not answer the question, he was unable to engage in his desired activity until he complied with the original request. As stated above, questions should be developmentally-appropriate in that the child has the capability to provide the answer. If uncertain, the therapist should coach the parents to prompt the child with the required words (i.e., "Say, may I please go into the other room?").

Asking Questions

Similar to using suspension of privilege to answer questions, parents are also coached to use the technique to have their child ask questions. Like answering questions, parents are coached to teach their children the particular words necessary to ask the question, if necessary. For instance, when a child reaches to get an object without permission, a parent is coached to say, "When you say can I please have the block, then you may play with it." By having the child use their words for each instance when he/she prefers an object or activity, asking questions becomes a greater part of their verbal repertoire and begins to generalize to a variety of environments (e.g., school, home).

Initiation of Social Interaction

Another social skill we found to increase when using suspension of privilege combined with social reinforcement is initiation of social interaction. Children with high functioning autism oftentimes have difficulty with a number of behaviors required to initiate social interaction such as making eye contact and appropriately beginning or ending conversations (i.e., saying "hello" or "goodbye"). By coaching parents to have their children make eye contact and say "hello" and "goodbye" at every opportunity for social interaction, social skills are over-trained and are likely to generalize to other contexts void of prompts or requests. Typically, parents are trained and coached to teach these behaviors

gradually so that only saying “hello” is required for each social initiation with the social requirements expanded as the child begins to show mastery of the skill. For instance, after a child is saying “hello” on a consistent basis, a parent is coached to have the child make eye contact while saying “hello.” Eventually, the child learns more advanced communication skills that help begin a conversation (e.g., “Do you want to see my picture?”).

Pronoun Reversal

Pronoun reversal is commonly seen in preschoolers with high functioning autism. By withholding preferred activities until desired behavior was performed and verbally prompting the child with the correct word (e.g., “I want to get a drink” as opposed to “You want to get a drink”), pronoun reversals were shown to decrease over time with one child in our clinic. Similar to other social and communication skills described, prompting and “when-then” statements are decreased over time as children produce more correctly-stated pronouns more independently. In addition to “when-then” statements, non-verbal prompting has demonstrated success in reducing pronoun reversal. For example, parents can be coached to extend their index finger as a cue for the use of an “I” statement and then to praise their child for saying “I” in response to the visual cue.

Overall, both the broken record technique and “when-then” statements have led to clinical success when teaching social and communication skills as an adjunct component following the completion of PCIT. In many instances, both techniques can be used in conjunction with one another. For example, a parent may administer a “when-then” statement in a broken record fashion by waiting for 5 seconds between statements and then repeating the “when-then” statement for three consecutive trials. In using these techniques, parents are granted a method in which they are able to decrease their child’s social and communication avoidance by providing a more immediate negative consequence in the form of suspending current preference until behavior is performed. The child, then, learns to respond quickly and consistently to social demands in order to regain access to preferred activities.

Future Directions

Although modifications to PCIT may be necessary to address the complex behaviors commonly seen with children displaying High Functioning Autism, it is important to first empirically test the validity of the standard PCIT model prior to making changes (McCabe, Yeh, Garland, Lau., & Chavez, 2005). There exists a paucity of clinical data (Stevens et al., 2005) and a void of empirical studies examining PCIT with this population, thus further research employing randomized control trials to compare the traditional PCIT models and modified models are necessary.

Conclusion

Historically, cases of ASD have been excluded from participation in PCIT as it was assumed that the treatment would not be effective with this population because of PCIT’s reliance on social contingencies. Yet, many behaviors of children with ASD who are in the high functioning range (e.g., those with the diagnosis of Asperger’s) are reinforced by social attention. Thus, over the past several years, there has been an increase in the number of children with ASD referred to PCIT clinics. As externalizing behaviors are very common in a clinical presentation of ASD, many parents desire to initially treat their child’s noncompliance and aggression before treating other behaviors. Thus, the question has been raised as to whether PCIT should be more readily available as a gateway intervention for preschool children with High Functioning Autism who display co-occurring problems with noncompliance/defiance and aggression. As we have had some success employing PCIT within this population, it has caused us to reconsider whether all children with ASD should automatically be excluded from participating in PCIT. Yet, the appropriateness of using PCIT with this population is only

speculative at this time as information is based on uncontrolled clinical case studies. Research is greatly needed in this area to assist community providers in determining the appropriateness of PCIT as a component of an intensive, multifaceted treatment protocol with children on the autism spectrum.

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Modeling Skills, Signs and Lettering For Children With Down Syndrome, Autism and Other Severe Developmental Delays By Video Instruction In Classroom Setting

G. B. Biederman & B. Freedman

Abstract

This paper addresses optimal strategies in teaching essential life and communication skills to children with Down syndrome, autism and other developmental delays. Evidence from the literature concerning the relative efficacy of hand-over-hand (self-modeling) in contrast to passive observational teaching techniques (e.g., video modeling) shows the theoretical and empirical basis of the suggestion that passive observation is preferable to other instructional strategies directed to these populations. We describe a classroom program that taught basic life skills, sign language, and printing letters to children with severe delays over a seven-year period using such video instruction.

Keywords: modeling, optimal strategies for teaching, observational learning, Down's syndrome.

Education is a human right providing opportunities for all students to maximize their personal, social and academic development. The present emphasis on accountability has focused the discourse on educational improvement because of the perceived link between the ability to be globally competitive and the quality of schools. The belief by governments and the public that the current levels of student achievement are not good enough has created a sense of urgency. Operating in this environment, educational leaders face competing policy pressures and agendas including demands for accountability for the education of students with special needs. What types of interventions, in special education can enable personal, social and academic development? What are the effective methodologies? School districts are still in a reactive mode coping with issues of accountability, new educational mandates, funding changes and parental demands. Assistive technology helps students with special needs to learn. Passive video modeling described in this paper may address this new direction in special education for achievement, accountability and collaboration with parents.

Typical instructional strategies for children with severe developmental delays often include interactive modeling techniques with instructors delivering physical and verbal guidance and social responses such as "Good job!" or "Good girl!" meant as rewards for appropriate student behavior. This response-contingent prompting (Morgan & Salzberg, 1992; Skinner, Adamson, Woodward, Jackson, Atchison, & Mims, 1993) is often used in combination with interactive modeling where the instructor literally leads the student by the hand so that the student sees him/herself modeling the behavior (Robertson & Biederman, 1989). But other modeling techniques use passive modeling strategies (Ezell & Goldstein, 1991; Shelton, Gast, Wolery & Winterling, 1991; Wolery, Ault, Gast, Doyle & Griffen, 1991). In this modeling technique the student merely observes the model's behavior without directly interacting. The basis of social learning theory is that learning can occur through such passive observation of behavior (Bandura, 1971). A teaching intervention found to be effective is the use of video modeling or the use of taped sequences as exemplar of desired behavior (Delprato, 2001; D'Ateno, Mangiapanello & Taylor, 2003). Video modeling when combined with passive modeling can assist in the acquisition of learning.

Robertson & Biederman (1989) have reported in a meta-analysis of all previously reported research that the relative efficacy of interactive modeling is not statistically supported. As early as 1991, Biederman, Ryder, Davey and Gibson found that passively trained tasks were performed better than those interactively modeled. Passive observation has been recently applied to task learning in laboratory situations for children with severe delays (Biederman, Stepaniuk, Davey, Raven & Ahn, 1999;

Biederman, Fairhall, Raven & Davey, 1998; Biederman, Davey, Ryder & Franchi, 1994; Biederman, Ryder, Davey & Gibson, 1991). In these studies which used a within-subjects design (discussed in detail elsewhere, e.g., Robertson & Biederman, 1989), children were instructed using live models in life skills under two contrasting conditions—active (hand-over-hand) modeling vs. passively observed modeling. In this design there is perfect control of subject-relevant variables such as diagnosis, age, sex, and prior learning, because each child receives both conditions. Any significant differences in training outcomes are attributable to the differences in training conditions. In fact, evidence over a decade of research has consistently indicated that the standard instructional practice of interactive (hand-over-hand) modeling in classroom settings may be counterproductive in teaching fine motor skills to students with little or no active language and with other severe developmental delays (Biederman, 1993).

Further research found additional negative effects from interactive modeling: when response-contingent reinforcement is used in interactive modeling, students with marked developmental delays appear to be unable to make appropriate use of verbal cues intended as reinforcement which typically accompany interactive modeling (Biederman, 1993; Biederman & Davey, 1995). The student may perform some subset of a task to be learned and that behavior may appropriately receive verbal reinforcement, but because of attention problems or delays in processing, the student may misapprehend the contingency underlying this reinforcement, causing disruptions in the learning process (cf. Biederman, Davey, Ryder & Franchi, 1994). Biederman, Fairhall, Raven and Davey, (1997) and subsequently, Biederman, Fairhall, Raven and Davey, (1998a; 1998b) found that passive modeling was significantly more effective than hand-over-hand modeling with response-contingent prompting.

Video modeling is an accessible modification technique that uses videotaped scenarios for students to observe rather than live ones (Keenan & Nikopoulos, 2006; Robertson & Collins, 2003). It allows the student to focus on a consistent repetition without distractions (Keenan & Nikopoulos, 2006). Recent literature suggests that children with severe developmental delays may benefit through instructional techniques which include modeling life skills such as dressing and grooming through slow motion repetitive video presentation. Video modeling conveys realistic behavior with complex stimulus and response routines (Delprato, 2001; D'Ateno, Mangiapanello & Taylor, 2003; Hepting & Goldstein, 1996; Houlihan, Miltenberger, Trench, Larson, Larson, & Vincent, 1995; Keenan & Nikopoulos, 2006). The effectiveness of instructional videos in teaching basic life skills to children with developmental delays is consistent with results from classroom instruction with children without developmental delays (McNeil & Nelson, 1991). The participants in this study were able to abstract the necessary skills from the videotaped model and apply them to task performance. Despite the generally positive results from instructional strategies with video presentations, modeling factors that may optimize the effectiveness of such instruction have not been systematically addressed. Basic parameters that are candidates for such examination are presentation speed, number of repetitions of the modeled behavior, and duration of videotaped presentation segments.

In fact, few experiments have attempted to isolate the effects of presentation speed in live modeling conditions. In one study, varying the rate of verbal passage readings to a faster or slower speed than students' usual reading rate produced no improvements in reading (Shapiro & McCurdy, 1989; Skinner et al., 1993). Other studies claim improved accuracy of reading is directly related to an increased presentation speed (Freeman & McLaughlin, 1984; Smith, 1979). Biederman, Stepaniuk, Davey, Raven and Ahn (1999) reported the first evidence in the literature that children with severe developmental delays (Down syndrome or autism as the primary diagnosis) can benefit by *slowing* the presentation speed of video-modeled instruction. This effect is consistent with the literature cited above (see also, Merrill & Mar, 1987). Biederman, Stepaniuk, Davey, Raven and Ahn (1999) reported the first evidence in the literature that children with severe developmental delays (Down syndrome or autism as the primary diagnosis) can benefit by *slowing* the presentation speed of video-modeled instruction. Success has also been reported in modifying the social skills of adolescents with developmental delays (Kelly, Wildman &

Berler, 1980). Even if it were the case that laboratory evidence showed that video modeling was no more effective than live modeling, video modeling would arguably be preferable to live modeling because video presentations are a less labor-intensive instructional tool. Video modeling has a clear advantage for experimentation in that it standardizes instruction. In Biederman et al. (1999) children observed a video model performing two basic dressing skills without prompting, verbal or otherwise, or explanation by an instructor. In the two-task within-subjects design dressing skills that were presented at a relatively slow presentation speed through video modeling were performed better on test than those presented at a relatively fast speed (Biederman, et al., 1999). The present paper describes classroom program in a large school district (70,000 students) using the laboratory techniques described above. In this board about 7,000 children are in special education classes. In terms of diagnoses about 8-10% of children are diagnosed with Down syndrome, 50% with learning disabilities, and about 10% as part of the autism spectrum disorder.

Over a seven-year period video presentation of grooming and dressing skills has been systematically introduced to a large number of self-contained classrooms for children with developmental delays. The method uses small group viewing of models performing tasks at 50% normal speed in repetitive 10-minute segments. Children watched for 14 sessions without attempting the tasks and then were offered the tasks. In 24 classrooms children with appropriate viewing skills and with adequate manipulatory abilities mastered skills that they had never previously performed.

Life Skills:

In the initial stage of this program four skills were videotaped modeled by a female teacher. The selection included zipping, buttoning, snapping, and bow-tying. In the case of the first three tasks, the model wore a vest with buttons, snaps, or a zipper. In the bow-tying video, the teacher's hands are seen tying a bow on a model shoe. The video material was modeled at 50% of normal speed and each task was completed in approximately 30 seconds. Children were selected on the basis of not having had the four tasks in their repertoire and with sufficient vision to view the video and fine-motor manipulation (judged by their teacher) to perform these tasks. The reason that the vests or model shoe were not presented during two-week observation period was to discourage imitation. Robertson and Biederman (1989) have noted that imitation is viewed as the weakest form of observational learning and runs the risk of inhibiting generalization of the target task limiting the skill to the materials supplied within the classroom. In the present program, teachers were instructed not to interact with the children during the observational period or during the child's performance of the task itself. The rationale for this lack of interaction has been discussed above and in Biederman (1993). In each classroom each child in this pilot study was judged by his or her teacher to have adequately performed each of the four tasks (there were 36 children in this initial project). We asked teachers to determine whether these newly learned tasks were retained by the student and generalized to performance not associated with the materials supplied. The teachers reported clear generalization in many students and good retention (at least, over the course of the school term) but we could not track each student in this study. Although anecdotal, teachers report that these tasks are retained and generalized about as well as any new learning in their students. In subsequent years, additional classes received these tasks and additional life skills were added as required by teachers (see Table 1). In addition four specialized tasks were successfully instructed through similar video modeling in an occupational workshop setting (see Table 1). The skills tasks listed in Table 1 were transferred to DVD format to facilitate ease of presentation in the classroom. A menu is provided on the DVD for teacher use. The life skills DVDs are currently in classroom use in the Durham board. Successful implementation of these skills and similar skills are clearly dependent and the motivation of teachers to use this material and frequent in-service teacher education of this program that clearly has counterintuitive elements to usual teacher expectations.

TABLE 1. INSTRUCTIONAL MATERIAL AVAILABLE VIA VIDEO MODELING**I. LIFE SKILLS VIA DVD****Dressing, Grooming and Life Style Skills:**

Snapping, zippering, tying a bow, lacing, putting on socks, cloth wringing, pouring water, setting a table, face washing, hand washing, nail brushing, teeth cleaning, flipping on jacket, putting on backpack, locking locker.

Dressing, Grooming and Life Style Skills:

Snapping, zippering, tying a bow, lacing, putting on socks, cloth wringing, pouring water, setting a table, face washing, hand washing, nail brushing, teeth cleaning, flipping on jacket, putting on backpack, locking locker.

II. SIGNS VIA DVD**Layout of Sign Language DVD**

(Model 1–Jenelle senior, non-hearing, student, Model 2–Wendy sign language instructor adult)

Category 1: Feelings

Feelings1 – Jenelle – tired / sick / happy / angry / sad

Feelings2 – Wendy – disappointed / frightened / excited / safe

Category 2: Social

Social1 – Jenelle – hi / goodbye / please / thank-you / sorry

Social2 – Jenelle – more / stop / yes / no / toilet / home

Social 3 – Jenelle – shoes / coat / mitts / hat / help / school

Category 3: Describing

Describing1 – Wendy – hot / cold / wet / smooth / rough

Describing 2 – Wendy – bumpy / hard / soft / sticky

Describing 3 – Jenelle – in / out / up / down / on / off

Category 4: Transportation

Transportation1 – Wendy – bus / car / bike / motorcycle / truck

Transportation2 – Wendy – boat / taxi / airplane / helicopter

Category 5: Appliances

Appliances – Wendy – refrigerator / washing-machine / dryer / radio / telephone

Category 6: Leisure

Leisure1 – Jenelle – book / ball / computer / tv / music

Leisure 2 – Jenelle – bowling / swimming / shopping / cooking / walking

Category 7: Meal

Meal 1 – Jenelle – eat / drink / cookies / finished / water

Meal 2 – Wendy – meat / milk / juice / apple / banana / crackers

Meal 3 – Wendy – hotdog / pizza / pop / chips / ice-cream / cake

Category 8: Actions

Actions1 – Jenelle – come / go / look / listen / wait

Actions2 – Jenelle – want / sleep / stand / sit / play

Actions3 – Wendy – walk / run / fall / throw / kick

Actions 4 – Wendy – hit / stir / hug / spill / catch

Category 9: Animals

Animals (pets) – Wendy – hamster / cat / fish / bird

Animals (zoo) – Wendy – lion / tiger / elephant / monkey / giraffe

Animals (farm) – Wendy – cow / pig / horse / chicken

III. UPPER AND LOWERCASE ALPHABET PRINTING VIA VIDEOTAPE**IV. OCCUPATIONAL SKILLS AVAILABLE VIA VIDEOTAPE**

Assembling product tags, packing electrical components, assembling button components.

Signs:

Following success with the life skills videos, a sign language video instruction program was attempted with a somewhat different instructional basis. In this program imitation is encouraged and the

active involvement of the instructor is required because learning signs must be embedded in a larger language-learning context. Several signs are presented in series in a video presentation according to the menu selections shown in Table 1 (e.g., feelings: “tired,” “sick,” “happy,” “angry,” “sad.”). Each sign is presented in the following sequence: a picture symbol of the word to be signed is given with an audio presentation of the word. A model is then shown signing (ASL) the word, and the word is heard on audio. Two 50% normal speed presentations of the signs are then presented followed by a final normal speed presentation of the sign with audio. The next sign in the series is then presented in the same way, and the series of signs is presented for 30 min. each day for a 14-observational period. The children are encouraged to “copy” the sign, and the instructor incorporates the experience into the language program s(he) may prefer. Candidates to receive this instruction require the similar vision and manipulation requirements as in skills instruction, but inclusion is a teacher decision and is informed by the child’s current language skills. Teachers report high degrees of success with this program which has been available for about two years. The teacher reports are similar to the accounts received in the skills program.

Lettering:

Printing lower case and upper case letters were also presented via video in a pilot study with a presentation format similar to the signing format. That is a picture of the letter appears with an audio of the letter. A teacher’s hand then prints the letter with audio followed by two 50% speed printings without audio and a final normal speed presentation with audio. Preliminary results from six classes were very positive. As in signing, imitative behavior was not discouraged and the teacher freely interacts with the students during observation and performance. In the printing video, teachers select a single upper or lower case letter for instruction and this is repeated for the 30-min. period. In lettering as well as signing the presentation method uses small groups (4-6 students) viewing the video presentations.

The present classroom experience with video instruction is particularly relevant to the increasing demands for demonstrable achievement by all students. Modeling via video allows students freer access to research-based instruction and enables parents to become more informed and supportive partners in their child’s school experience. In the case of life-skill learning, a few families were given the video material and reported great success in teaching skills to their children with special needs, and in fact, in one case, the parent reported that her (pre-school) child with no delays also benefited from viewing the skills videos. We anticipate that the utility of providing parents with signing videos will be similarly beneficial to both students and parents.

Present-day educational theory does not favor passive instruction. Most educators associate passive learning with teacher-centered learning where teachers direct and active learning with teachers as guides (Mezeske, 2004). However, there a range of possibilities offered by passive learning and clearly video modeling is among them. Googling video modeling resulted in 55,900,000 citations. Video recording becomes an instructional tool where modeled actions provide an exact version of a desired outcome shown to students in order to develop appropriate behaviors. It allows students to memorize, imitate and generalize those behaviors (Neumann, 2000). Because videos are small and portable it can be used at home to strengthen parent/school connections. It has the potential to increase the learning by reinforcing school instruction by home instruction. Nikopoulos & Keenan (2004) reported that for all children, social interaction and reciprocal play skills were enhanced, and these effects were maintained at 1- and 3-month follow-up periods (93). Video modeling instruments such as Special Kids(C) Video Modeling Therapy Programs are used in 30 countries. Video modeling has been clinically shown to increase and sustain learned actions (Charlop-Christy, Le & Freeman, (2001); LeBlanc, Coates, Daneshvar, Charlop-Christy, Morris & Lancaster, 2003; Nikopoulos & Keenan, 2004, 2006). Video modeling is currently being considered as an effective intervention for children in the autism spectrum (Nikopoulos & Keenan, 2004, 2006; Robertson & Collins, 2003). We suggest that he program we

describe in this paper adds weight to the growing evidence that the position of passive instruction for some student populations and in some circumstances needs to be thoroughly reconsidered.

Special education has evolved in response to changing needs and expectations of what learning means for students with special needs. Once students with special needs were segregated, peripheral to school systems, but currently this is no longer true. Today inclusion/integration is the placement of first choice. Students with special needs spend at least 50% of their day in regular classrooms with regular teachers. “It is imperative that inclusion means not only the practice of placing students with special needs in regular classroom but ensuring that teachers assist every student to prepare for the highest degree of independence possible (Ontario Ministry of Education, 2005a, p. 2). Most classrooms have identified students with a range of exceptionalities and learning needs. To ensure that all students achieve, interventions that target specific challenges are required to scaffold their learning. Sometimes these require direct teaching and modeling by teachers, and sometimes other methodologies are required.

School districts are still in a reactive mode coping with issues of accountability, new educational mandates, funding changes and parental demands. Assistive technology helps students with special needs to learn. Passive video modeling may address this new direction in special education for achievement, accountability and collaboration with parents.

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