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Increasing the Number of Social Initiations During  
Cooperative Play In Children With Autism Through the Use  
Of A Multiple-Script-Set Procedure

by

Andrea J. Gold

A dissertation submitted to the Graduate Faculty in  
Psychology in partial fulfillment of the requirements for  
the degree of Doctor of Psychology, The City University of  
New York

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This manuscript has been read and accepted for the Graduate Faculty in Psychology in satisfaction of the dissertation requirement for the degree of Doctor of Psychology.

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## Abstract

Increasing the Number of Social Initiations During  
Cooperative Play In Children With Autism Through the Use Of  
A Multiple-Script-Set Procedure

By

Andrea J Gold

Advisor: Professor Claire L. Poulson

The present study evaluated the effect of a multiple-script-set procedure on the number of social initiations emitted by children with autism during three daily 10-minute sessions of cooperative play. Four children with autism participated in this study. The experiment was conducted in two phases. In Phase 1, a multiple-baseline-across-subjects experimental design was used to determine the extent to which a multiple-script-set procedure increased social initiations emitted by the three participants. In Phase 2, a single-subject-multiple-baseline experimental design across activities was used to determine the extent to which a multiple-script-set procedure increased the number of social initiations emitted by each participant. Two types of activity schedules were used throughout the study. They were a primary activity schedule that contained a written text depicting the activity to be completed, and a secondary

activity schedule that contained a written text depicting the component of the activity to be completed and the word "Talk." Reinforcement was contingent upon cooperative-play skills and social initiations. Auditory scripts were not presented during baseline. During the treatment condition, a set of five auditory scripts was presented and systematically faded out from end to beginning by deleting words. As auditory scripts were faded out, new sets of scripts were presented. The introduction and fading of the scripts were associated with a systematic increase in the number of social initiations emitted by the three participants. Therefore, it can be concluded for this group of children that the multiple-script-set procedure caused the increase in social initiations. In addition, in Phase 2, there was a systematic increase in the number of social initiations emitted by each child across activities for two of the four children. This study demonstrated that a multiple-script-set procedure could be used effectively to increase the number of social initiations emitted by two of the children with autism to a peer during cooperative activities. The other two children, who acquired the social initiations during cooperative play, may have learned simply through reinforcement operations.

This paper is dedicated to my wonderful family. Their continuous support, encouragement, and love helped me to achieve all of my goals.

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Increasing the Number of Social Initiations During  
Cooperative Play In Children With Autism Through the Use of  
A Multiple-script-set Procedure

Stimulus control and reinforcement procedures have a long history of use in the analysis of human complex behavior in people with developmental disabilities (Catania, 1992). Often such analyses are undertaken with children with autism (Lovaas, 1977). One of the defining characteristics of children with autism is a deficit in social interaction skills. These deficits may be displayed by the child with autism as a failure to develop relationships with other children, parents, or other individuals (American Psychiatric Association, 1994). A child with autism may actively avoid initiating play or social interactions with other children (Koegel & Koegel, 1995; Siegel, 1996). For example, a child with autism may move away from a group of children who are playing, or may take a toy away from another child and play with that toy inappropriately. Therefore, it is critical to identify procedures to teach social interaction skills as well as appropriate play skills to children with autism.

Peer modeling is one technique that has been used to teach social interaction skills to individuals with developmental disabilities (Goldstein, Kaczmarek,

Pennington & Shafer, 1992; Gumpel & Frank, 1999; Pierce & Schreibman, 1995, 1997). In one such study, Pierce and Schreibman (1997) used a peer-modeling procedure to teach two school-aged children with autism to engage in a variety of social responses (e.g., playing with a same toy, initiating interactions) during play activities. Typically developing peers were used as the models. The typically developing peers were first taught how to model appropriate social and play behavior with the instructor through modeling and behavioral rehearsals. When the criterion for mastery of these procedures was reached, the typical peers then implemented these procedures with the children with autism. Pierce and Schreibman found that the duration of engagement of the children with autism in the same activity as the peer increased. In addition, the number of social initiations (e.g., "I like cars") made by the child with autism to the peer increased.

In studies such as those described above, a high degree of teacher involvement is required to establish and maintain peer interactions. Teacher involvement might include the teacher reinforcing, prompting, and providing frequent behavioral rehearsals with the peer models. As a result, the ongoing presence of the teacher in the experimental setting might become part of the

discriminative stimuli for responding. Therefore, when the teacher is no longer involved, the social interaction skills might not be maintained.

One type of procedure that can be used to teach social-interaction skills in the absence of continued teacher involvement is the use of a script-fading procedure (Krantz & McClannahan, 1993; Krantz & McClannahan, 1998; McClannahan & Krantz, 1999; Stevenson, Krantz & McClannahan, 2000). These procedures enable the child to initiate interactions independently of continued discriminative stimuli and reinforcement provided by teachers, parents, or caregivers.

Krantz and McClannahan (1993) used a written script-fading procedures to teach four adolescents with autism to initiate interactions to peers during individual art activities. The content of the written scripts included statements about completed, current, or future activities (e.g., "I like your picture"). Teachers initially provided manual guidance to assist the learners in pointing to the scripted statement and/or in facing the recipient to whom the statement was intended. These manual prompts provided by the instructors were faded within the first 27 sessions. Teacher proximity to the learner was also faded to the corner of the classroom. For each participant, script

fading began after he/she completed the scripted interactions without manual guidance. Scripts were faded by deleting words from the end to the beginning of the script. The number of social initiations increased with the introduction and systematic fading of the scripts. In addition, as the scripts were faded, increases in the number of unscripted initiations occurred. The participants recombined elements of scripted initiations to generate novel initiations. These responses were maintained over a two-month period.

In another study, conducted by Krantz and McClannahan (1998), the effectiveness of a written script-fading procedure on increasing social initiations of three preschool-aged children with autism was assessed. Each child was presented with a photographic-activity schedule that contained pictures of 16 activities. For ten of these activities a written script was attached to the top and bottom of each picture. Because these children had limited language, the written script consisted of one of two phrases, "Look" or "Watch me." Initiations made by the child were directed to an adult who was seated in the corner of the classroom. Scripts were faded from end to beginning by successively cutting away portions of the cards on which the text appeared. After the systematic

introduction and fading of the written scripts, the number of social initiations emitted by the child to the teacher increased during the activities that were associated with the scripts. In addition, during activities that were never associated with scripts, the number of social initiations also increased. When new activities and new teachers were rotated into the schedule at the end of the study, the children continued to initiate social interactions.

For children who are non-readers, auditory scripts are another type of script that has been used to teach social initiation skills. Stevenson, Krantz, and McClannahan (2000) demonstrated that auditory scripts could be used effectively to teach social-initiation skills to four adolescent children with autism who were non-readers. Auditory scripts were recorded on Language-Master® cards. When the card was inserted into the Language-Master® machine it played the pre-recorded script. The content of the scripted initiations included statements (e.g., "I like candy") and questions (e.g., "What is your favorite food?"). The recipient of the initiation was a teacher who was seated in the corner of the classroom. Photographs of the Language-Master® cards were embedded within a leisure-activity schedule. These photographs signaled an

opportunity for social initiations to be embedded in the leisure activity chain. When the child turned to a page in his schedule book that contained a picture of a Language-Master® card he then walked over to the teacher, removed a card from a clipboard on her lap, ran the card through the Language Master®, and repeated the phrase. The teacher responded to the initiations of the child by elaborating on the statement or question presented to her. If the child said "Do you like candy?" the teacher responded by saying, "Yes, I like chocolate candy". After approximately four exchanges the teacher made a closing statement (e.g., "Talk to you later") and the child returned to his activity schedule. Manual guidance was used to assist the child in returning to his activity schedule if it was required. Script fading began when the child completed the scripted response without manual guidance. When scripts were recorded the final words were omitted. Thus, scripts were faded by deleting words from the end to the beginning of the script. Stevenson et al. found that the number of scripted and unscripted social initiations emitted by the child increased when auditory scripts were introduced and faded. The results of this study were similar to those obtained by Krantz and McClannahan (1993, 1998).

The studies described above have successfully increased the number of social interactions made by children with autism, while each child independently followed an individual activity schedule. Activity schedules can also be used to teach cooperative play. A study conducted by Gold, Young, Vener, and Poulson (unpublished) demonstrated that activity schedules could be used effectively to teach cooperative play to six young children with autism. Cooperative play was defined as a child obtaining the material(s) for an activity with a peer (e.g., getting a bucket of Legos), and completing at least three components of the activity, resulting in one permanent product (one Lego tower not two). Eight activities were used in that study. Six of the activities were training activities associated with reinforcement. Two activities were probe activities that were never associated with reinforcement. During baseline, a pair of children was instructed to "play with your friend." The activity schedule was not presented. During treatment, one activity schedule, which consisted of photographs of the eight activities (one per page), was presented to each pair of children. These authors found that the percentage of activities completed cooperatively systematically increased over baseline levels with the introduction of the activity

schedules across pairs of children. In addition, cooperative play generalized from training activities to probe activities for two of the three pairs. Anecdotal reports indicated that although the children played cooperatively, they did not initiate social interactions while playing. This deficit highlights the need for identifying procedures to increase social interactions of children with autism to their peers during cooperative play.

In previous studies on script-fading, scripts were used to increase the number of social interactions while the child completed activities individually. In those studies, the goal of script fading was to fade out the scripts as the discriminative stimuli for talking and thereby increase the unscripted statements that are already in the children's repertoire. The experimental designs used in those studies consisted of multiple-baseline designs across subjects. From such designs one may draw conclusions about the effectiveness of the independent variable on the group of children participating but not for individual children.

The present study was designed to expand on the script-fading literature in several ways. First, the present study was designed to increase social initiations

using scripts in a discrete-trial format. This type of format was selected because the children that participated in this study did not emit a high rate of unscripted statements prior to the start of the study. As such, multiple script sets were used to teach a wide variety of statements. Second, the present study used scripts to increase the number of social initiations during cooperative activities. Third, an additional experimental design was used to assess the effects of the independent variable on individual children. Therefore, in Phase 2 of this study a multiple-baseline-across-activities design was used for each child. The purpose of the present study was to evaluate the effectiveness of a multiple-script-set procedure on increasing the number of peer-directed social initiations in three daily 10-minute sessions of four young children with autism during cooperative play activities.

## Method

### Participants

Four children, ages 5 to 7 years, participated in the study. All of the children attended the New York Child Learning Institute (NYCLI). Rachel was a 7-year old girl who attended NYCLI for 3 ½ years prior to the start of the study. Mitchell, a 5-year old boy, attended NYCLI for 1 year. Both Carl and Max were 6-year old boys who had been at the Institute for 2 years. All of the children were diagnosed with autism by an independent agency and displayed deficits in language and social interaction skills. Each of these children had previously demonstrated skill in following independent activity schedules. Rachel, Carl, and Max had been previously taught to play cooperatively using activity schedules. All children imitated words and short phrases from an auditory script.

### Setting and Apparatus

All sessions took place in a small classroom (2.44 m x 3.66 m) at the Institute. The classroom contained one square table (0.61 m x 0.61 m), one long rectangular table (0.61 m x 1.52 m), two stools, two chairs, and a shelf containing the three activities. The activities that were used in this study were a coloring activity, a Lite-Brite® activity, and a racing car activity. Two types of activity

schedules were used in this study, a primary activity schedule and a secondary activity schedule. The primary activity schedule consisted of a binder (30.48 cm x 27.94 cm) containing three pages. A written word (e.g., Coloring) was displayed on each page, prompting the learner to obtain the materials for the specified activity. The primary activity schedule was placed on a small table to the right of the toy shelf. Two secondary activity schedules were inside the bin along with the materials for each activity. The secondary activity schedules consisted of a binder (12.7 cm x 17.78 cm) containing at least 25 pages. On five of the pages the word "Talk" was printed in the center of the page. On the remaining pages, a written text (one per page) indicating the component of the activity to be completed by the child was printed in the center of the page (e.g., "Put in blue peg").

Auditory scripts to be presented on a tape recorder were recorded by the experimenter and played on an EIKA Language Master® (Model LM-1). Fifteen cards with pre-recorded phrases (e.g., "I like to color") were used. There were five cards per activity. The overall topic of the phrases was a child's preferred activities. There were statements about favorite foods, games, movies, songs, books, places, things he or she did on weekends, and things

he or she liked to do with family members. The list of scripts used for each child is presented in Appendices A-D.

Each child had two token motivational systems, one for talking to a peer and the other for appropriate play behavior. The token motivational system for talking to a peer consisted of a laminated card (10.16 cm x 15.24 cm) containing the word "Talk" displayed five times and the phrase "I got all of my Talks, so I get \_\_\_\_\_." It was located on the inside cover of the secondary activity schedules. The child selected a 5.08 cm x 1.27 cm card with the name of the preferred activity/item printed on it and placed it on the motivational system. These were fastened using Velcro™. The cards with the preferred activities/items were located on a clipboard that was placed on a chair to the left of the toy shelf. The token motivational system for appropriate play behavior consisted of a laminated 21.59 cm x 27.94 cm sheet of paper containing the word "Yes" 30 times and the phrase "I got all of my Yes', so I get \_\_\_\_\_." This token motivational system was located on a typing stand on the left side of the table.

A video recording camera (RCA DSP3®, Model # CC428) was placed in the corner of the classroom to record cooperative play responses of each child.

General Procedure.

The experimenter and two instructors conducted all experimental sessions. The experimenter was a doctoral student in Psychology with training in Applied Behavior Analysis. She was also Assistant Director of NYCLI. The instructors were each managers of a classroom at the Institute.

Three consecutive ten-minute sessions were conducted per day. Before the first ten-minute session the experimenter instructed the children to "play with your friends and talk a lot." Each pair of children was presented with one primary activity schedule containing a written word to prompt the children to obtain the three activities sequentially. For each activity, two secondary activity schedules, one for each child were presented. The secondary schedule contained pages depicting the component to be completed (play trials) and pages with the written word "Talk" (talk trials).

Prior to the start of the experimental session the child selected a preferred activity/item from a list located on the back of his/her clipboard and verbally reported that to the instructor. The child's selection would then be written on the motivational system for appropriate play using a Dry Erase® marker. Tokens for

appropriate play were delivered by circling the word "Yes" on the motivational system. When all of the "Yeses" were circled the child was given access to the preferred activity/item. Prior to beginning each activity, the child removed the token motivational system for talking (located in the front cover of the secondary schedule) and fastened it to the top of the token motivational system for appropriate play behavior. The child selected a written card with a preferred activity/item and fastened it with Velcro™ to top the motivational system for talking. Tokens were delivered by circling the word "Talk" on the motivational system with a Dry Erase marker. When all of the "Talks" were circled the child was given access to the preferred activity/item.

After each child had placed his/her preferred activity/item on his/her token motivational system for talking, a timer was set for ten minutes. This signaled the start of the activity. The instructors provided manual guidance for cooperative play responses when needed. Tokens were provided for independent cooperative play responses and for social initiations. When the timer rang, the children removed the token motivational system for talking and placed it in the front cover of the secondary activity schedule, cleaned up the activity, and returned to

the primary activity schedule. Data were collected on the number of social initiations emitted by a child during both play trials and talk trials during the Coloring, Lite-Brite®, and Playing-with-cars activities.

#### Response Definitions

Social initiation. A social initiation was defined as a child emitting a statement that included at least a noun and a verb while orienting toward his or her peer. Statements that consisted of only the name of the activity (e.g., Lite-Brite®), or the name of the recipient, or word-for-word repetition of the text in the secondary schedule (e.g., "Put in blue peg"), or statements that were directed toward the materials instead of toward the recipient peer were not included in this definition. This definition of social initiations was similar to the one used by Krantz and McClannahan (1993).

Orientation. For Rachel and Mitchell, correct orientation was defined as facing his or her peer. For Carl, correct orientation was defined as directing his eyes toward the face of his peer. For Max, correct orientation was defined as Max walking around the table (so that he was on the same straight edge of the table as his peer) and extending his arm or forearm toward the peer with one or

more fingers pointed in the peer's direction. Max's fingers may or may not make contact with the peer.

Unscripted social initiations. Unscripted social initiations were statements that differed from the most recently presented script by more than a conjunction, an article, a pronoun, the recipient's name, or the context. This definition was similar to the one used by Krantz and McClannahan (1993).

Cooperative play. Cooperative play was defined as a pair of children engaging in the following chain of responses: 1) obtaining the materials for an activity with a peer; 2) completing at least three components of the activity; and (3) producing a single permanent product. This definition was consistent with the definition of cooperative play used in the study conducted by Gold, Young, Vener, and Poulson (unpublished).

Obtaining an activity with a peer. Obtaining the materials for an activity with a peer was defined as one of the following: 1) both children walked over to the toy shelf and one child picked up the container with the activity while the other child's head was oriented toward the toy shelf, the activity, or the peer; or, 2) one child walked over to the toy shelf and picked up the container with the activity while the other child took at least one

step toward the toy shelf with his/her head oriented toward the toy shelf until his/her peer had picked up the activity; or, 3) both children walked over to the toy shelf and both picked up the container with the activity.

Completing at least three components. Completing at least three components of the activity meant that each child correctly provided at least three components toward the completion of the activity without manual guidance. Each component of the activity was scored only one time. If the same component was used multiple times (e.g., if the child put the Lite-Brite peg in then took it out, then put it back in again) recorded only on the first time that component was used. These definitions were similar to the ones used by Gold, Young, Vener & Poulson, (unpublished).

#### Procedure

Experimental Design. The experiment was conducted in two phases. In Phase 1 of the experiment, a multiple-baseline-across-children experimental design was used to assess the effects of a multiple-script-set procedure on the number of social initiations emitted by three children with autism during cooperative play. The proportion of social initiations that was unscripted was also measured. To demonstrate experimental control, in a multiple-baseline design across subjects, the introduction of treatment

during the playing-with-cars activity was staggered across three children. A fourth subject, Max, participated in the study. He was not included in this phase of the study because different procedures were used with him.

In Phase 2 of the experiment, a single-subject-multiple-baseline experimental design across activities was used to assess the effect of a multiple-script-set procedure on the number of social initiations emitted by a child with autism. The four children that participated in this study were divided into two pairs on the basis of convenience for the Institutes teaching schedule. The pairs were Rachel and Mitchell, and Max and Carl.

Baseline. The baseline procedure was the same as the general procedure described above. Auditory scripts were not present during the baseline condition.

Treatment. Treatment consisted of the presentation of a set of five auditory scripts. The experimenter placed the scripts in a container located next to the Language Master®. When the child turned to a "Talk" page in the secondary schedule he/she took a card, ran it through the Language Master® machine and repeated the phrase on the card. If the child did not imitate the phrase or did not orient toward the peer, the instructor manually guided the child to run the card through the Language Master® machine

and orient toward his/her peer while imitating the phrase. Manual guidance consisted of standing behind the child and moving the child's hands to complete the response. Tokens were delivered following both prompted and independent responses. The Language Master® cards were removed during play trials.

Scripts were faded if a child met criterion on correct imitation of the script, without regard to the child's physical orientation to the peer. This was done to facilitate quick fading of the scripts because it appeared that it would take many sessions to get physical orientation. Scripts were faded from end to beginning by deleting words. For Rachel, Carl, and Max, individual scripts were faded after two consecutive sessions in which the child imitated the scripts without prompts. Once script fading began, consecutive fading steps were implemented following one session during which the child independently imitated the portion of the phrase on the Language Master® card. After one session in which the scripts were faded out (the Language Master® cards were blank) a second set of five scripts was presented and faded according to the same criteria. For Mitchell, the fading steps were changed because with the criteria described above we lost experimental control. As a result,

individual scripts were faded after five consecutive sessions, rather than one, in which he imitated the script without prompts. Once script fading began, fading steps were implemented following five consecutive sessions during which he independently imitated the portion of the phrase on the Language Master® card. After one session in which the scripts were faded out (the Language Master® cards were blank) a second set of five scripts was presented and faded according to the same criteria.

When the data showed an increase in the number of social initiations over baseline levels emitted by a child during the first activity, treatment began for the second activity. The procedures described above were the same for the second and third activities.

Procedural Validity. Procedural validity data were scored from the videotapes. Data were collected during the last five sessions of the baseline condition and the last five sessions of the treatment condition for each activity.

The percentage of sessions with the initial instruction presented correctly was 100% for both baseline and treatment conditions for all four children. In addition, for all four children, auditory scripts were never presented during "Talk" trials of the baseline

condition. During the treatment condition, auditory scripts were presented on every "Talk" trial.

Data on the percentage of correct social initiations followed by reinforcement were also collected. During both baseline and treatment conditions, for all four children, the percentage of correct social initiations followed by reinforcement was 100%.

Data on the percentage of incorrect social initiations followed by the correction procedure were only collected during the last five sessions of the treatment condition for each activity. Therefore, there were no such data for baseline conditions. For all four children, the percentage of incorrect social initiations followed by the corrections procedure was 100%.

Interobserver Agreement. Three primary observers and one secondary observer collected interobserver agreement data on the social initiations emitted by a child. All primary observers had a Masters in Education or Psychology. Each had received training in behavior analysis for approximately 2-9 years. The secondary observer also had a Masters in Education and had received training in behavior analysis specifically for this study. For the scoring of data on social initiations one primary observer was standing behind each child and the secondary observer was

seated in the corner of the classroom approximately 1.5 m from the primary observers. Using a pencil and paper, the observers scored the occurrence or nonoccurrence of social initiations. In addition, the primary and secondary observers collected interobserver agreement data on procedural validity measures and cooperative play responding. These data were collected from the videotapes. The observer and the experimenter scored the targeted responses, using a pencil and paper, on separate days.

An agreement was defined as both observers independently recording the occurrence or nonoccurrence of the target response. A disagreement was defined as one observer recording the occurrence of the target response and the other observer recording the nonoccurrence of the response. Level of interobserver agreement was calculated using the formula: total number of agreements divided by total number of agreements plus disagreements multiplied by 100.

#### Interobserver Agreement On Social Initiations.

Interobserver agreement was obtained on the number of social initiations emitted by a child. These data were collected during a minimum of 20% of all sessions. The percentage of sessions during which interobserver agreement

data were collected for each child are presented in Table 1.

The percentage of interobserver agreement data on the number of social initiations emitted by each child are presented in Table 2. During the baseline condition, neither Rachel nor Mitchell emitted any social initiations. Therefore, interobserver agreement data could not be collected. For Carl the level of interobserver agreement was 75% with a range from 60%-100%. Low agreement scores were obtained for Carl when few occurrences of social initiations were observed. During the treatment condition the level of interobserver agreement was 97% or higher.

Table 3 shows the percentage of interobserver agreement data on the number of unscripted social initiations emitted by each child. For all four children, the mean percentage of agreement was 80% or higher, with one exception. For Mitchell, the mean percentage of agreement during the coloring activity was 64%.

#### Interobserver Agreement On Procedural Validity.

Interobserver agreement data were also collected on the procedural validity data described above. The interobserver agreement on the percentage of initial instructions presented correctly by the experimenter,

during both baseline and treatment conditions for all four children, was 100%.

Interobserver agreement data on the percentage of auditory scripts presented correctly are presented in Table 4. For all four children, during the "Talk" trials of the baseline condition, across all three activities, no auditory scripts were presented. During the "Talk" trials of the treatment condition, across all three activities, the percentage of agreement on the percentage of auditory scripts presented correctly was 100%.

Table 5 shows the interobserver agreement data on the percentage of correct<sup>sm</sup> social initiations followed by reinforcement. For all four children the level of interobserver agreement data was 98% or higher.

Interobserver agreement data on the percentage of incorrect social initiations followed by the correction procedure are presented in Table 6. Across all activities, the percentage of interobserver agreement was 100% with one exception. For Rachel, during the coloring activity, there was one disagreement. The mean percentage of interobserver agreement for that activity was 96% with a range of 80%-100%.

#### Interobserver Agreement On Cooperative Play.

Interobserver agreement was collected on the percentage of

activities completed cooperatively by each child. These data are presented in Table 7. For all of the children, the level of interobserver agreement was 100%.

## Results

### Phase 1: Multiple-baseline-across-children design.

Figure 1 shows the number of social initiations emitted by each child during the "Talk" trials of the playing with cars activity. With the introduction of the multiple-script-set procedure, there was a systematic increase in the number of social initiations emitted across children.

### Phase 2: Multiple-baseline-across-activities design.

For two of the children, Rachel and Mitchell, there was a systematic increase in the number of social initiations emitted by each child across activities with the introduction of the multiple-script-set procedure. For both Carl and Max, the multiple-script-set procedure was introduced in two of the three activities. Within those two activities, there was an increase in the number of social initiations over baseline levels. Treatment was not introduced in the third activity, for both Carl and Max, because social initiations increased during baseline for that activity.

Rachel. Figure 2 shows the number of social initiations emitted by Rachel during the "Talk" trials of the playing-with-cars, Lite-Brite®, and coloring activities. During all baseline sessions for the playing-

with-cars, Lite-Brite®, and coloring activities, the number of social initiations emitted was 0. With the introduction of the multiple-script-set procedure there was a systematic increase in the number of social initiations emitted by Rachel during the "Talk" trials of each activity. From sessions 46 to 59, when prompted initiations were no longer reinforced the increase in number of social initiations emitted by Rachel was maintained.

Mitchell. The number of social initiations emitted by Mitchell during the "Talk" trials of the playing-with-cars, coloring, and Lite-Brite® activities is presented in Figure 3. The data for Mitchell showed the same pattern as Rachel's data. With the introduction of the multiple-script-set procedure across activities, there was a systematic increase in the number of social initiations emitted by Mitchell.

Carl. Figure 4 shows the number of social initiations emitted by Carl during the "Talk" trials of the playing-with-cars, coloring, and Lite-Brite® activities. Carl had a different pattern of responding from that of Rachel and Mitchell. Although there was an increase in the number of social initiations emitted during the playing-with-cars and coloring activities with the introduction of the multiple-script-set procedure, treatment was not introduced during

the Lite-Brite® activity. This was because the number of social initiations emitted by Carl increased during baseline. During the first 29 sessions of the Lite-Brite® activity, the number of social initiations emitted had a range of 0-1. During the remaining sessions (sessions 30-66), the number of social initiations increased to 5. This increase in social initiations began following the third session of treatment for the playing-with-cars activity.

Max. The number of social initiations emitted by Max during the "Talk" trials of the playing-with-cars, Lite-Brite®, and coloring activities is presented in Figure 5. This Figure differs from the others because Max had an additional experimental condition during the playing-with-cars activity. Max was the first child to participate in this experiment and we overestimated his skill level. So, for his first treatment condition his social initiations produced reinforcement only when they were independent of any experimenter prompts. Under this first treatment condition Max did not emit any social initiations. As a result, Max never earned his preferred activity/item. Therefore, a second treatment condition was designed for Max that permitted reinforcement for both prompted and independent social initiations. During the remaining activities, when the multiple-script-set procedure was

introduced, both prompted and independent social initiations were reinforced. Because Max successfully earned his reinforcers during this condition we revised the treatment procedure for all children.

For Max, there was an increase in the number of social initiations emitted during the playing-with-cars and Lite-Brite® activities with the introduction of the multiple-script-set procedure. Treatment was not introduced during the coloring activity because the number of social initiations emitted by Max increased during baseline. During the first 33 sessions of the coloring activity, the number of social initiations emitted was 0. The number of social initiations emitted increased to 2 during session 34 and 5 during session 35. From sessions 36 to 66 the number of social initiations had a range of 0 to 5. This increase in social initiations began following the third session of treatment for the Lite-Brite® activity.

As described in the procedure section above, the "Talk" trials were embedded in the play trials. The question arises whether social initiations during play trials increased. During the "Play" trials, as opposed to the "Talk" trials, few social initiations were emitted. For each child, there were between 0-2 social initiations emitted during all conditions. Thus, for all four

participants there was no difference in the number of social initiations emitted by each child during the "Play" trials of the playing-with-cars, Lite-Brite®, and coloring activities.

All four children emitted social initiations during the treatment condition. Depending on the topic and the child, many of those social initiations were unscripted. Table 8 presents the data for unscripted social initiations for all four children. The Table shows a difference in the percentage of unscripted social initiations emitted by Rachel and Mitchell and those emitted by Carl and Max. For Rachel and Mitchell, approximately 22% of the social initiations emitted were unscripted. The percentage of unscripted social initiations emitted by Max and Carl was much higher (approximately 50% of the social initiations was unscripted).

Throughout the study, all four children played cooperatively. The number of activities completed cooperatively for each child is presented in Table 9. For both baseline and treatment conditions, for Rachel and Mitchell, 100% of 15 activities were completed cooperatively. Carl and Max completed 95% of 20 activities cooperatively during the baseline condition and 100% of 10 activities cooperatively during the treatment condition.

## Discussion

Because there was a systematic increase in the number of independent social initiations emitted by all three children with the introduction of the multiple-script-set procedure in Phase 1 of the study, one may conclude that the increase in responding by the group of children was caused by the multiple-script-set procedure. These findings are consistent with the findings in the literature on the use of script-fading procedures (Krantz et al., 1993; Krantz et al., 1998; Stevenson et al., 2000).

In Phase 2, the multiple-baseline-across-activities design, for Rachel and Mitchell, one may conclude that the multiple-script-set procedure caused the increase in social initiations across the activities for each child. Previous studies in this area have not addressed the social initiations of individual children in a single-subject design. For the other two children, Carl and Max, experimental control by the multiple-script-set procedure was lost. For Carl, this was because he emitted social initiations during the baseline condition of the Lite-Brite® activity. The number of social initiations during the third activity, Lite-Brite®, began to increase following the third session of treatment for the playing-with-cars activity and was maintained for the remainder of

the study. Similarly, for Max, experimental control was lost because he emitted social initiations during the baseline condition of the third activity, coloring. This increase in social initiations began following the third session of treatment for the Lite-Brite® activity and was maintained for the remainder of the study. Because experimental control was lost, we cannot conclude that it was the multiple-script-set procedure that caused the increase in the number of social initiations.

While it is tempting to conclude that this increase in responding was the result of generalization from training from two of the activities to the third activity, we cannot draw that conclusion. Instead, it is possible that reinforcement for correct social initiations during baseline conditions might have been sufficient to cause this increase. That is, by the third activity, reinforcement alone was sufficient to produce and maintain social initiations.

It is interesting that the pattern of responding in the baseline condition of that third activity was very different for Carl and Max. For Carl, there was a gradual increase in the number of social initiations emitted during the baseline condition of the Lite Brite® activity. This is suggestive of reinforcement effects. Nevertheless, for

Max, there was an abrupt increase in social initiations during the baseline condition of the coloring activity. This occurred following the introduction of treatment in the second activity (Lite Brite®). Max's pattern of responding is indicative of discriminative stimulus control. It was unclear why this discriminative control might have occurred because all three activities were colorful, table-top activities that involved a manipulation of the components to complete the activities. So, the source of discriminative control for Max's responding was unknown.

The present study extended the findings of the research conducted by Krantz and McClannahan (1993), Krantz and McClannahan (1998), and Stevenson, Krantz and McClannahan (2000) in several ways. First, in the studies conducted in 1993 and 2000, script-fading procedures were used to increase the number of social initiations emitted by adolescents with autism between the ages of 9 and 15. The present study demonstrated that scripts could be used effectively to increase the number of social initiations emitted by four young children with autism between the ages of 5 and 7. Second, in the study conducted by Krantz and McClannahan in (1998), written scripts containing the phrases "Look" and "Watch me" were used to teach young

children with autism to initiate social interactions. In the present study, the length of the phrases was increased. In addition, a greater variation in the content of the phrases was presented. Third, in the studies conducted by Krantz and McClannahan (1998) and Stevenson, Krantz and McClannahan (2000), the social initiations emitted by the individuals with autism were directed toward an adult. In the present study, the initiations emitted by a child with autism were directed toward a peer. Fourth, in each of these prior studies, script-fading procedures were used to increase the number of social initiations emitted by the participant during independent activities. In the present study, scripts were used to increase the number of social initiations emitted by a child during cooperative play activities. Lastly, the script-fading studies described above attempt to make already learned language occur in a free operant manner. That is, they are moving toward eliminating the experimental discriminative stimulus for talking. In the present study the scripts were presented in a discrete-trial format, with the scripts embedded among the cooperative play materials. The goal was for the materials to eventually provide discriminative stimuli for talking. That would have required fading out the "Talk" cards and Language Master® materials. This was not fully

achieved in the present study because the end of the school year arrived before further fading could occur. This would be a valued goal in future studies of multiple-script-set procedures.

One limitation of the present study concerns social validity measures. This study presents social validity in the sense that the child was required to orient toward the recipient while he or she was talking. Nevertheless, social validity measures with respect to content and number of social initiations were not obtained due to time constraints. Future researchers could obtain social validity measures on such responses by comparing data on the content and number of social initiations obtained with typical children and those with children with autism. One could also use questionnaires to ask consumers to evaluate the quality of the children's interactions.

A social interaction between two children involves social initiations and responses to those social initiations by the recipient peer. In the present study, because the children were involved in cooperative play, it did not seem to the experimenter an important goal for the recipient to make an overt response to the casual comments of the peer such as, "I like to draw bridges." After all, both participants were engaged in activities that did not

require discussion. Indeed, the scripts contained no questions directed toward the recipient peer. Social validity data could be obtained on the extent to which others view responding to the peer during cooperative play as an important goal. For children with autism, such a goal might always be desired because of their communication deficits. Thus, future researchers may want to train responding of the recipient peer.

In the context of teaching the recipient peer to respond, the type of script used could become an issue. With auditory scripts, the recipient's verbal behavior might come under control of the Language Master® recording, rather than the peer's verbal behavior. Thus, in teaching the recipient to respond, future researchers should consider the use of written scripts, rather than auditory scripts.

Despite the limitations described above, the present study made contributions to the literature on increasing social initiations by children with autism. The multiple-script-set procedure was found to be effective in producing an increase in social initiations during cooperative play by the group of children with autism. As described above, the same procedure was effective for two of the children, individually. Additionally, the other two children may

have learned to initiate social interactions during cooperative play with reinforcement procedures alone.

Table 1

Number and Percentage of Sessions During Which  
Interobserver Agreement Was Collected

Child	Activity	<u>Baseline</u>		<u>Treatment</u>	
		n*	(%)	n*	(%)
—					
Rachel	Play w/Car	8/17	(47%)	14/42	(33%)
	Lite Brite	15/41	(37%)	7/18	(39%)
	Coloring	13/29	(45%)	8/30	(27%)
Mitchell	Play w/Car	11/24	(46%)	12/35	(34%)
	Lite Brite	17/44	(39%)	5/15	(33%)
	Coloring	14/29	(48%)	9/30	(30%)
Carl	Play w/Car	9/29	(31%)	11/39	(28%)
	Lite Brite	18/66	(27%)	-	-
	Coloring	13/52	(25%)	7/14	(50%)
Max	Play w/Car	2/10	(20%)	13/56	(23%)
	Lite Brite	7/32	(22%)	7/34	(21%)
	Coloring	14/66	(21%)	-	-

Note. n\* = the number of sessions during which Interobserver agreement collected over the total number of sessions. Dashes indicate that treatment was not introduced for that activity.

Table 2

Percentage of Interobserver Agreement for Social  
Initiations Emitted By Each Child During "Talk" Trials of  
the Playing With Cars, Lite Brite, and Coloring Activities

Child	Activity	<u>Baseline</u>	<u>Treatment</u>
		n* (%)	n* (%)
Rachel	Play w/Car	0/0 (-)	63/63 (100%)
	Lite Brite	0/0 (-)	35/35 (100%)
	Coloring	0/0 (-)	33/33 (100%)
Mitchell	Play w/Car	0/0 (-)	42/43 (98%)
	Lite Brite	0/0 (-)	21/21 (100%)
	Coloring	0/0 (-)	42/42 (100%)
Carl	Play w/Car	0/0 (-)	38/39 (97%)
	Lite Brite	6/8 (75%)	- -
	Coloring	0/0 (-)	24/24 (100%)
Max	Play w/Car	0/0 (-)	37/37 (100%)
	Lite Brite	0/0 (-)	33/34 (97%)
	Coloring	22/23 (96%)	- -

Note. n\* = the number of agreements over the number of agreements plus disagreements. Treatment was not introduced during the Lite Brite activity for Carl and the Coloring activity for Max.

Table 3

Interobserver Agreement on the Number of Unscripted Social Initiations Emitted by Each Child During "Talk" Trials of the Playing With Cars, Lite Brite, and Coloring Activities

Child	Activity	<u>Treatment</u>	
		n	x(r)
Rachel	Playing with Cars	60/65	92%(80%-100%)
	Coloring	34/35	97%(80%-100%)
	Lite Brite	36/40	90%(80%-100%)
Mitchell	Playing with Cars	54/60	90%(20%-100%)
	Coloring	29/45	64%(20%-100%)
	Lite Brite	28/30	93%(60%-100%)
Carl	Playing with Cars	45/55	82%(40%-100%)
	Coloring	28/35	80%(40%-100%)
	Lite Brite	-	-
Max	Playing with Cars	62/64	97%(80%-100%)
	Lite Brite	31/35	89%(40%-100%)
	Coloring	-	-

Note. Dashes indicate that treatment was not introduced for that activity. n\* = the number of agreements over the number of agreements plus disagreements. X(r) = mean percentage of agreement and the range of percentage scores.

Table 4

Percentage of Interobserver Agreement for Presentation of  
Auditory scripts During "Talk" Trials of the Playing With  
Cars, Lite Brite, and Coloring Activities

Child	Activity	<u>Baseline</u>		<u>Treatment</u>	
		n	x	n	x
Rachel	Cars	0/25	-	25/25	100%
	Coloring	0/25	-	25/25	100%
	Lite Brite	0/25	-	25/25	100%
Mitchell	Cars	0/25	-	25/25	100%
	Coloring	0/25	-	25/25	100%
	Lite Brite	0/25	-	25/25	100%
Carl	Cars	0/19	-	25/25	100%
	Coloring	0/37	-	25/25	100%
	Lite Brite	0/50	-	N/A	N/A
Max	Cars	0/25	-	25/25	100%
	Lite Brite	0/50	-	25/25	100%
	Coloring	0/50	-	N/A	N/A

Note. N/A indicates that treatment was not introduced for that activity. n = the number of scripts presented over the total number of "Talk" opportunities. x = the mean percentage of interobserver agreement.

Table 5

Percentage of Interobserver Agreement for Correct  
Presentation of Reinforcement Following Social Initiations

Child	Activity	<u>Baseline</u>		<u>Treatment</u>	
		n	x(r)	n	x
Rachel	Cars	0/0	-	24/24	100%
	Coloring	0/0	-	23/23	100%
	Lite Brite	0/0	-	24/24	100%
Mitchell	Cars	0/0	-	24/24	100%
	Coloring	0/0	-	23/23	100%
	Lite Brite	0/0	-	24/24	100%
Carl	Cars	0/0	-	21/21	100%
	Coloring	1/1	98% (80%-100%)	19/19	100%
	Lite Brite	7/7	100%	N/A	N/A
Max	Cars	0/0	-	21/21	100%
	Lite Brite	2/2	100%	22/22	100%
	Coloring	13/13	100%	N/A	N/A

Note. N/A indicates that treatment was not introduced for that activity. n = the number of social initiations reinforced over the total number of social initiations emitted. x = the mean percentage of interobserver agreement. (r) = the range of percentage scores.

Table 6

Percentage of Interobserver Agreement for Correct  
Implementation of Correction Procedure

Child	Activity	<u>Treatment</u>	
		n	x(r)
Rachel	Playing with Cars	1/1	100%
	Coloring	2/2	96% (80%-100%)
	Lite Brite	1/1	100%
Mitchell	Playing with Cars	1/1	100%
	Coloring	2/2	100%
	Lite Brite	1/1	100%
Carl	Playing with Cars	4/4	100%
	Coloring	6/6	100%
	Lite Brite	-	-
Max	Playing with Cars	4/4	100%
	Lite Brite	3/3	100%
	Coloring	-	-

Note. Dashes indicate that treatment was not introduced for that activity. n = the number of implementations of correction procedure over the total number of incorrect social initiations emitted. x(r) = the mean percentage of interobserver agreement and the range of percentage scores.

Table 7

Percentage of Interobserver Agreement On the Number of  
Activities Completed Cooperatively by Each Child

Child	<u>Baseline</u>		<u>Treatment</u>	
	n	x	n	x
Rachel	45/45	100%	45/45	100%
Mitchell	45/45	100%	45/45	100%
Carl	60/60	100%	30/30	100%
Max	60/60	100%	30/30	100%

Note. n = the number of agreements over the number of agreements plus disagreements. x= the mean percentage of interobserver agreement.

Table 8

Number and Percentage of Unscripted Social Initiations  
Emitted by Each Child During "Talk" Trials of the Playing  
With Cars, Lite Brite, and Coloring Activities

Child	Activity	<u>Treatment</u>	
		n	% of Unscripted Social Initiations
Rachel	Playing with Cars	42/191	22%
	Coloring	12/82	15%
	Lite Brite	28/130	22%
Mitchell	Playing with Cars	16/142	11%
	Coloring	1/136	.7%
	Lite Brite	7/66	11%
Carl	Playing with Cars	75/141	53%
	Coloring	28/53	53%
	Lite Brite	-	-
Max	Playing with Cars	83/197	42%
	Lite Brite	71/153	46%
	Coloring	-	-

Note. Dashes indicate that treatment was not introduced for that activity. n = the number of unscripted social initiations over the total number of socials initiations emitted.

Table 9

Number and Percentage of Activities Completed Cooperatively  
by Each Child

Child	<u>Baseline</u>		<u>Treatment</u>	
	n*	%	n*	%
Rachel	15/15	100%	15/15	100%
Mitchell	15/15	100%	15/15	100%
Carl	19/20	95%	10/10	100%
Max	19/20	95%	10/10	100%

Note. n\* = the number of activities completed cooperatively over the total number of activities presented.

Figure 1

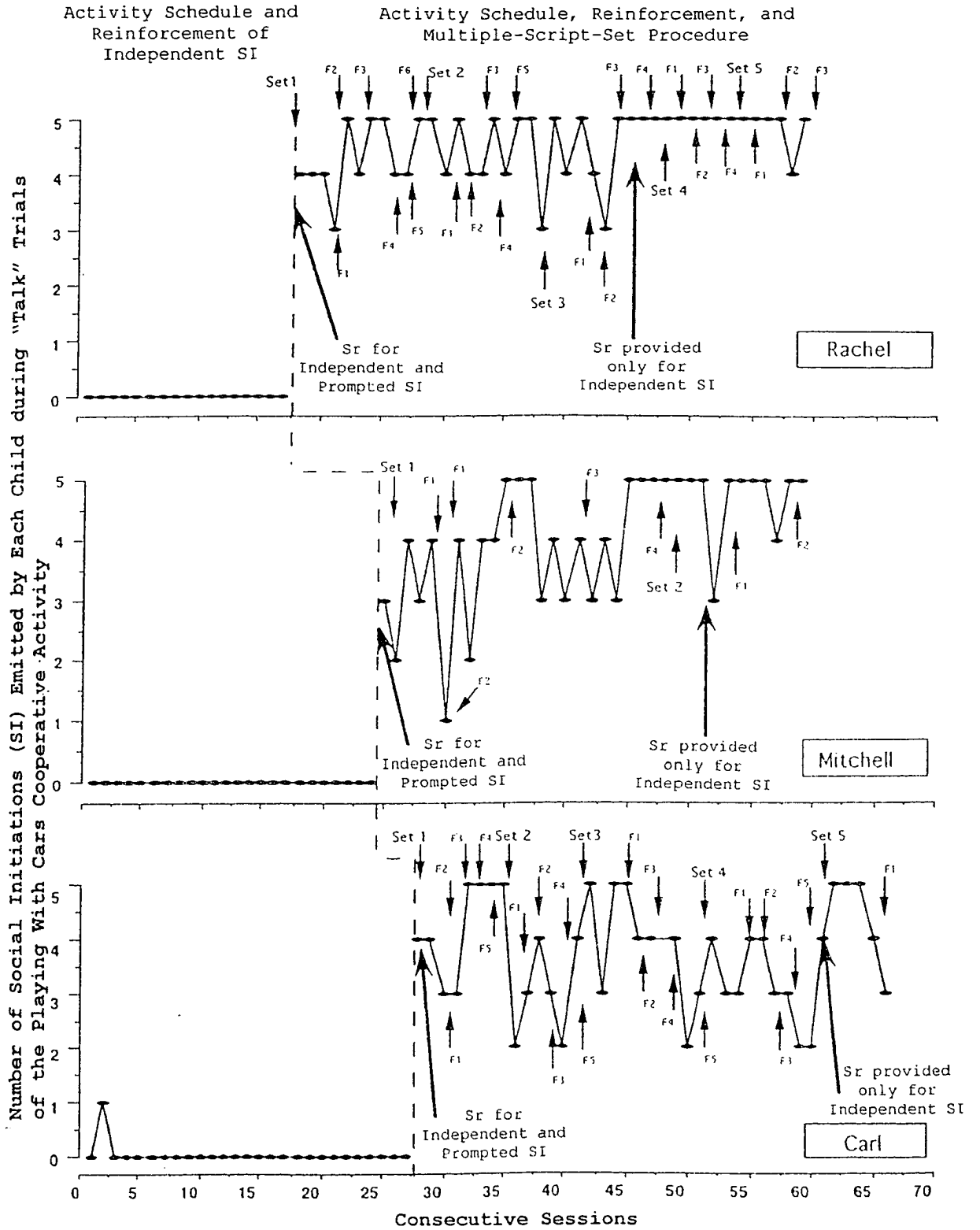


Figure 2

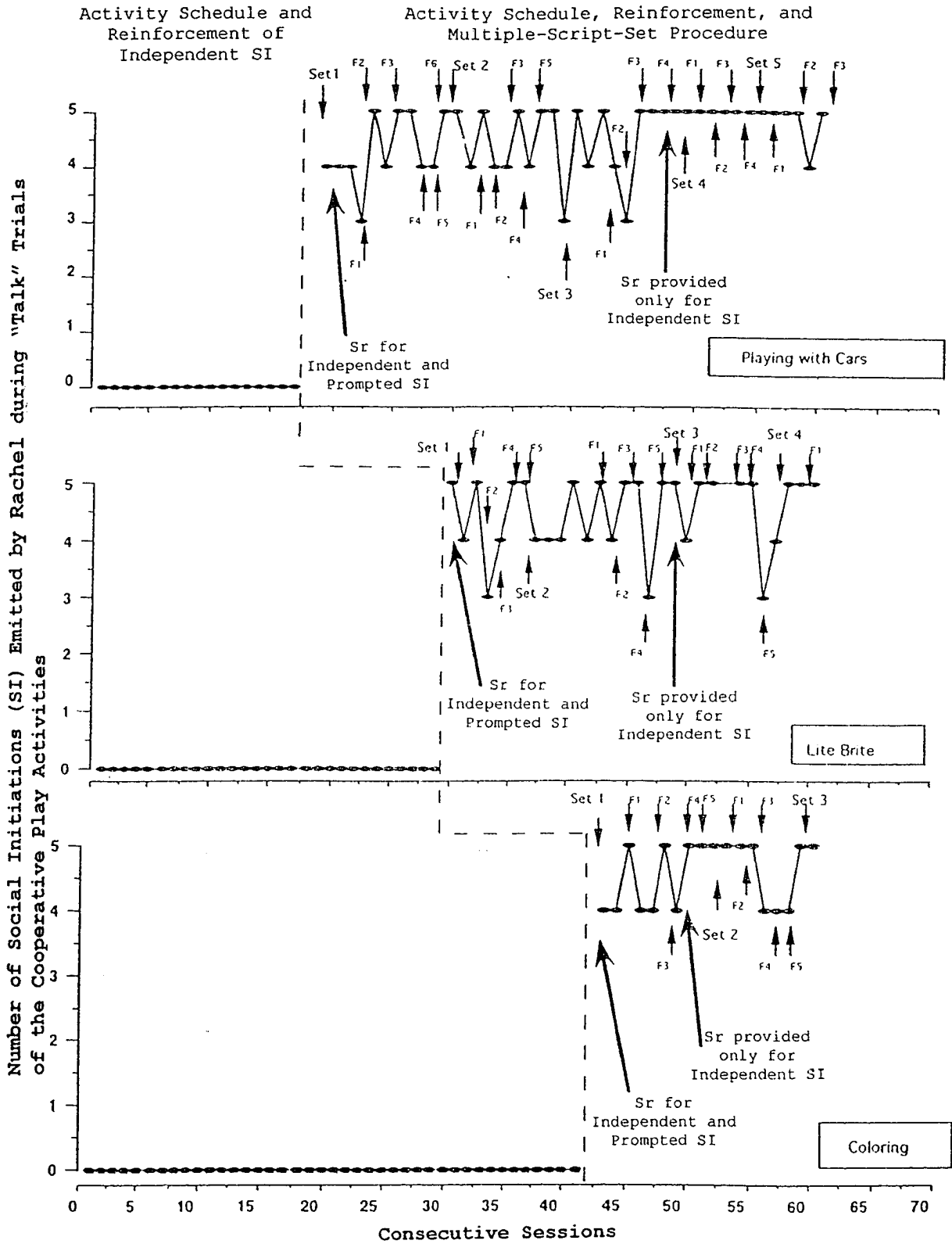


Figure 3

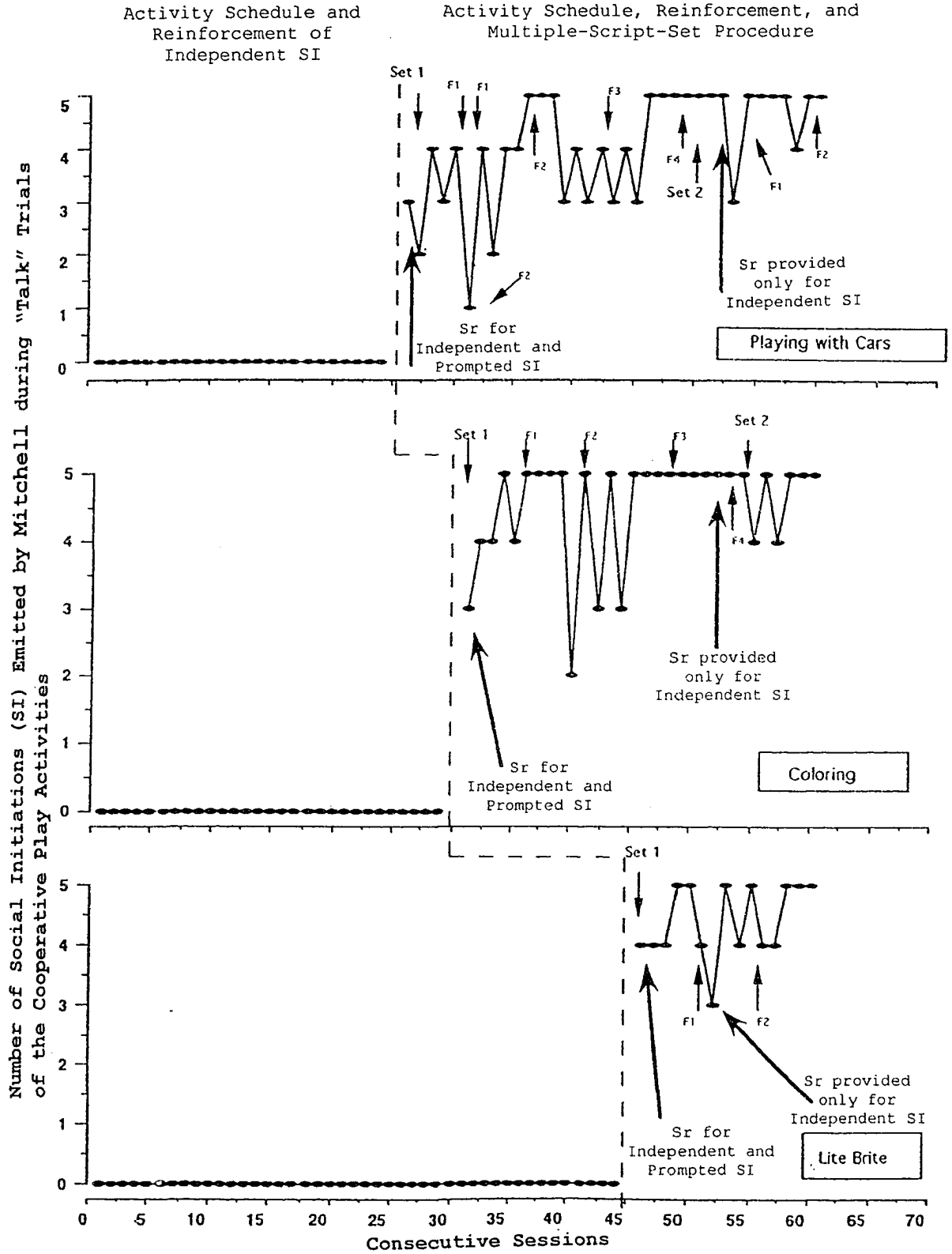


Figure 4

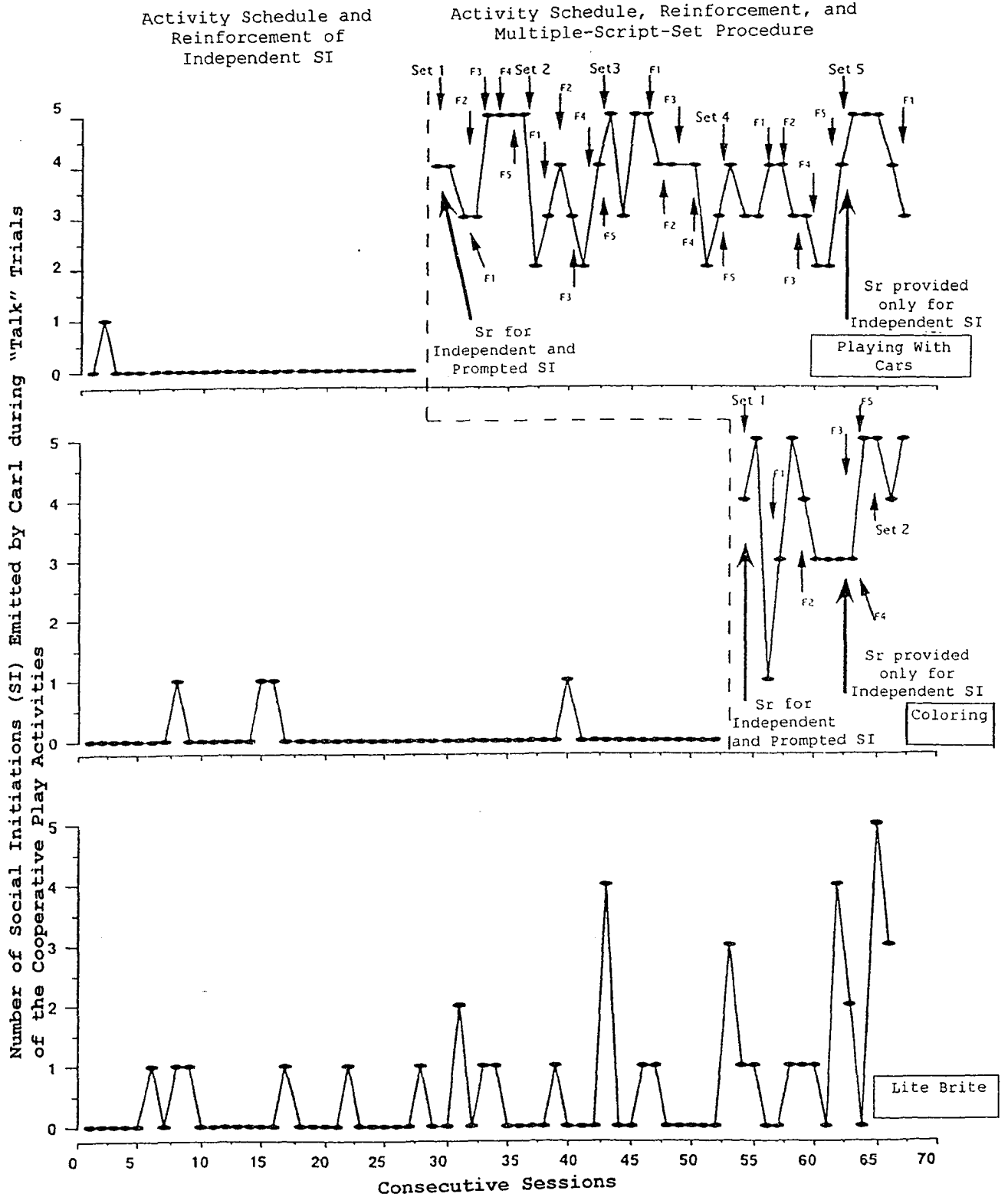
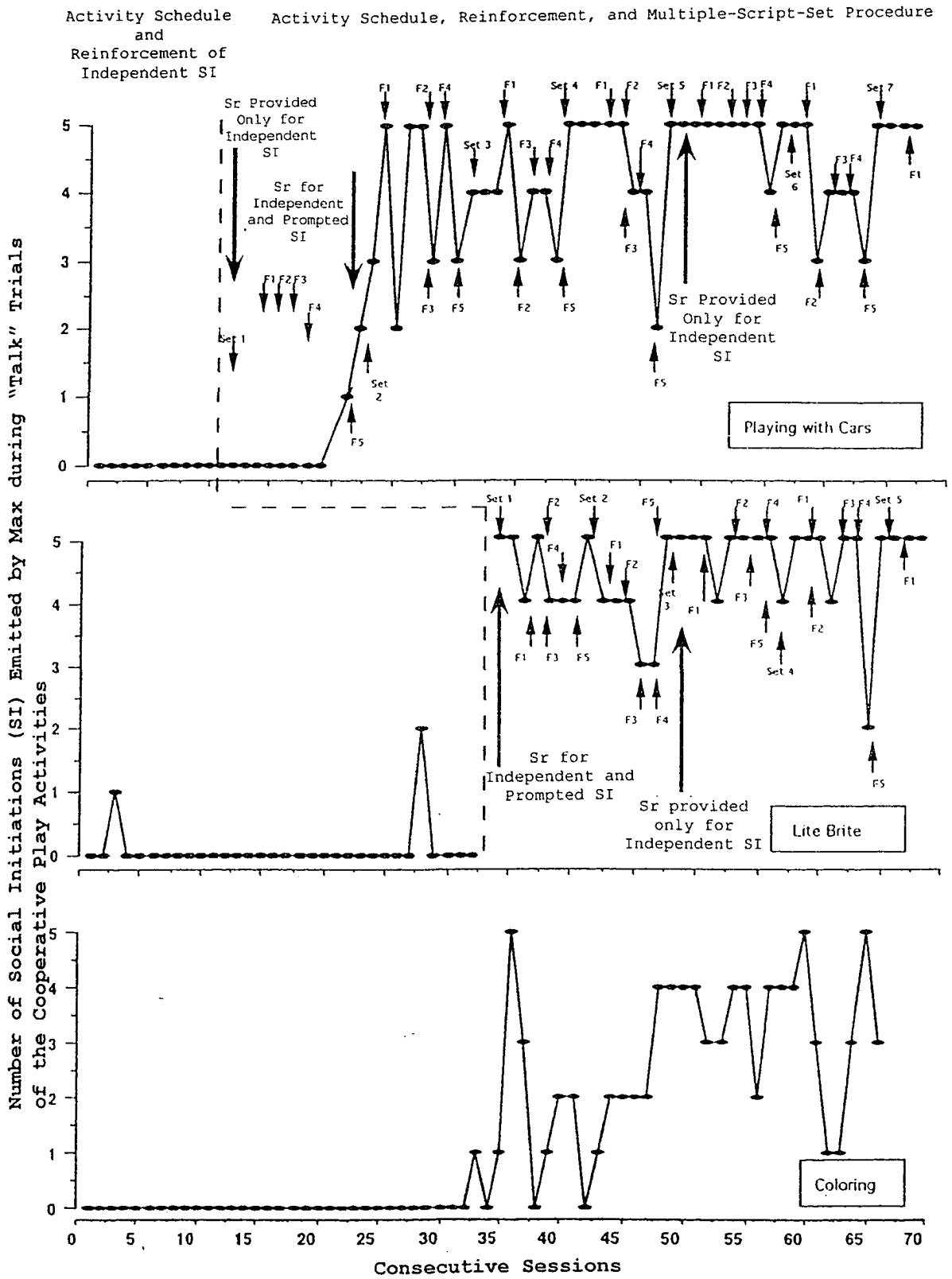


Figure 5



## Appendix A

Script Sets and Fading Steps for Rachel

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Playing-with-cars Activity

Cars Set 1

1. "Mitchell, barbecue chips are my favorite"
2. "Mitchell, I really like ice tea"
3. "Mitchell, I love to eat blintzes"
4. "Mitchell, red peppers are delicious"
5. "Mitchell, cookies taste great"

Cars Set 1- Fade 1

1. "Mitchell, barbecue chips are my"
2. "Mitchell, I really like ice"
3. "Mitchell, I love to eat"
4. "Mitchell, red peppers are"
5. "Mitchell, cookies taste"

Cars Set 1- Fade 2

1. "Mitchell, barbecue chips are"
2. "Mitchell, I really like"
3. "Mitchell, I love to"
4. "Mitchell, red peppers"
5. "Mitchell, cookies"

---

(appendix continues)

## Appendix A (continued)

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Cars Set 1- Fade 3

1. "Mitchell, barbecue chips"
2. "Mitchell, I really"
3. "Mitchell, I love"
4. "Mitchell, red"
5. "Mitchell, cookies"

Cars Set 1- Fade 4

1. "Mitchell, barbecue"
2. "Mitchell, I"
3. "Mitchell, I"
4. "Mitchell, red"
5. "Mitchell, cookies"

Cars Set 1- Fade 5

1. "Mitchell,"
2. "Mitchell,"
3. "Mitchell,"
4. "Mitchell,"
5. "Mitchell,"

Cars Set 1- Fade 6

1. ""
- 

(appendix continues)

## Appendix A (continued)

---

2. ""

3. ""

4. ""

5. ""

Cars Set 2

1. "Mitchell, playdoh is fun"

2. "Mitchell, I love to read books"

3. "Mitchell, I'm really good at puzzles"

4. "Mitchell, *kids for character* is great"

5. "Mitchell, *grand old flag* is my favorite song"

Cars Set 2- Fade 1

1. "Mitchell, playdoh is fun"

2. "Mitchell, I love to read"

3. "Mitchell, I'm really good at"

4. "Mitchell, *kids for character* is"

5. "Mitchell, *grand old flag* is my favorite"

Cars Set 2- Fade 2

1. "Mitchell, playdoh is"

2. "Mitchell, I love to"

3. "Mitchell, I'm really good"

---

(appendix continues)

## Appendix A (continued)

- 
4. "Mitchell, *kids for character*"
  5. "Mitchell, *grand old flag is my*"

Cars Set 2- Fade 3

1. "Mitchell, playdoh"
2. "Mitchell, I"
3. "Mitchell, I'm"
4. "Mitchell, *kids*"
5. "Mitchell, *grand old*"

Cars Set 2- Fade 4

1. "Mitchell,"
2. "Mitchell,"
3. "Mitchell,"
4. "Mitchell,"
5. "Mitchell, *grand old*"

Cars Set 2- Fade 5

1. ""
  2. ""
  3. ""
  4. ""
  5. ""
- 

(appendix continues)

## Appendix A (continued)

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Cars Set 3

1. "Mitchell, *loveshack* is a cool song"
2. "Mitchell, playing computer is great"
3. "Mitchell, I love to ride my bike"
4. "Mitchell, I like to run fast"
5. "Mitchell, I go to the park with Tzirl"

Cars Set 3- Fade 1

1. "Mitchell, *loveshack* is a cool"
2. "Mitchell, playing computer is"
3. "Mitchell, I love to ride my"
4. "Mitchell, I like to run"
5. "Mitchell, I go to the park with"

Cars Set 3- Fade 2

1. "Mitchell, *loveshack* is"
2. "Mitchell, playing computer"
3. "Mitchell, I love to"
4. "Mitchell, I like to"
5. "Mitchell, I go to the"

Cars Set 3- Fade 3

1. "Mitchell, *loveshack*"
- 

(appendix continues)

## Appendix A (continued)

- 
2. "Mitchell, playing"
  3. "Mitchell, I love"
  4. "Mitchell, I like"
  5. "Mitchell, I go"

Cars Set 3- Fade 4

1. ""
2. ""
3. ""
4. ""
5. ""

Cars Set 4

1. "Mitchell, I like to color pictures"
2. "Mitchell, I have fun with my sisters"
3. "Mitchell, cucumbers are delicious"
4. "Mitchell, Richard Scary videos are great"
5. "Mitchell, playing computer is so much fun"

Cars Set 4- Fade 1

1. "Mitchell, I like to color"
  2. "Mitchell, I have fun with my"
  3. "Mitchell, cucumbers are"
- 

(appendix continues)

Appendix A (continued)

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4. "Mitchell, Richard Scary videos are"
5. "Mitchell, playing computer is so much"

Cars Set 4- Fade 2

1. "Mitchell, I like to"
2. "Mitchell, I have fun with"
3. "Mitchell, cucumbers"
4. "Mitchell, Richard Scary videos"
5. "Mitchell, playing computer is"

Cars Set 4- Fade 3

1. "Mitchell, I"
2. "Mitchell, I"
3. "Mitchell,"
4. "Mitchell, Richard"
5. "Mitchell, playing"

Cars Set 4- Fade 4

1. ""
  2. ""
  3. ""
  4. ""
- 

(appendix continues)

## Appendix A (continued)

---

5. ""

Cars Set 5

1. "Mitchell, I love to skate in gym"
2. "Mitchell, tuna sandwich is so delicious"
3. "Mitchell, my new friend is Mikey"
4. "Mitchell, *L Train* is such a good song"
5. "Mitchell, I really like the counting video"

Cars Set 5- Fade 1

1. "Mitchell, I love to skate in"
2. "Mitchell, tuna sandwich is so"
3. "Mitchell, my new friend is"
4. "Mitchell, *L Train* is such a good"
5. "Mitchell, I really like the counting"

Cars Set 5- Fade 2

1. "Mitchell, I love to skate"
2. "Mitchell, tuna sandwich is"
3. "Mitchell, my new friend"
4. "Mitchell, *L Train* is such a"
5. "Mitchell, I really like the"

---

(appendix continues)

## Appendix A (continued)

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Cars Set 5- Fade 3

1. "Mitchell, I love to"
2. "Mitchell, tuna sandwich"
3. "Mitchell, my new"
4. "Mitchell, *L Train* is"
5. "Mitchell, I really like"

## Lite-Brite Activity

Lite-Brite Set 1

1. "Mitchell, *Lucky Ducks* is a great game"
2. "Mitchell, I like playing with my sisters"
3. "Mitchell, going to the country is fun"
4. "Mitchell, I love reading with mommy"
5. "Mitchell, Barney is a great book"

Lite-Brite Set 1- Fade 1

1. "Mitchell, *Lucky Ducks* is a great"
2. "Mitchell, I like playing with my"
3. "Mitchell, going to the country is"
4. "Mitchell, I love reading with"
5. "Mitchell, Barney is a great"

---

(appendix continues)

## Appendix A (continued)

---

Lite-Brite Set 1- Fade 2

1. "Mitchell, *Lucky Ducks*"
2. "Mitchell, I like playing"
3. "Mitchell, going to the"
4. "Mitchell, I love"
5. "Mitchell, Barney is"

Lite-Brite Set 1- Fade 3

1. "Mitchell, *Lucky*"
2. "Mitchell, I like"
3. "Mitchell, going"
4. "Mitchell, I"
5. "Mitchell, Barney"

Lite-Brite Set 1- Fade 4

1. "Mitchell,"
2. "Mitchell, I"
3. "Mitchell,"
4. "Mitchell,"
5. "Mitchell,"

Lite-Brite Set 1- Fade 5

1. ""
- 

(appendix continues)

## Appendix A (continued)

---

2. ""

3. ""

4. ""

5. ""

Lite-Brite Set 2

1. "Mitchell, I really like to scooter"

2. "Mitchell, basketball is so much fun"

3. "Mitchell, racing with my friends is awesome"

4. "Mitchell, my favorite game is hot potato"

5. "Mitchell, I love to color with mommy"

Lite-Brite Set 2- Fade 1

1. "Mitchell, I really like to"

2. "Mitchell, basketball is so much"

3. "Mitchell, racing with my friends is"

4. "Mitchell, my favorite game is"

5. "Mitchell, I love to color with"

Lite-Brite Set 2- Fade 2

1. "Mitchell, I really"

2. "Mitchell, basketball is so"

3. "Mitchell, racing with my"

---

(appendix continues)

## Appendix A (continued)

---

4. "Mitchell, my favorite game"

5. "Mitchell, I love to"

Lite-Brite Set 2- Fade 3

1. "Mitchell, I"

2. "Mitchell, basketball"

3. "Mitchell, racing"

4. "Mitchell, my favorite"

5. "Mitchell, I"

Lite-Brite Set 2- Fade 4

1. ""

2. ""

3. ""

4. ""

5. ""

Lite-Brite Set 3

1. "Mitchell, I love to eat macaroni"

2. "Mitchell, Barney videos are my favorite"

3. "Mitchell, making pizza with playdoh is cool"

4. "Mitchell, I'm really good at the computer"

5. "Mitchell, races are so much fun"

---

(appendix continues)

Appendix A (continued)

---

Lite-Brite Set 3- Fade 1

1. "Mitchell, I love to eat"
2. "Mitchell, Barney videos are my"
3. "Mitchell, making pizza with playdoh is"
4. "Mitchell, I'm really good at the"
5. "Mitchell, races are so much"

Lite-Brite Set 3- Fade 2

1. "Mitchell, I love to"
2. "Mitchell, Barney videos are"
3. "Mitchell, making pizza with playdoh"
4. "Mitchell, I'm really good at"
5. "Mitchell, races are so"

Lite-Brite Set 3- Fade 3

1. "Mitchell, I love"
2. "Mitchell, Barney videos"
3. "Mitchell, making pizza"
4. "Mitchell, I'm really good"
5. "Mitchell, races are"

Lite-Brite Set 3- Fade 4

1. "Mitchell, I"
- 

(appendix continues)

Appendix A (continued)

---

2. "Mitchell, Barney"
3. "Mitchell, making"
4. "Mitchell, I'm"
5. "Mitchell, races"

Lite-Brite Set 3- Fade 5

1. ""
2. ""
3. ""
4. ""
5. ""

Lite-Brite Set 4

1. "Mitchell, bananas are my favorite snack"
2. "Mitchell, *zoo zillions* is a great game"
3. "Mitchell, I really like to dance"
4. "Mitchell, I play a lot of games on Shabbos"
5. "Mitchell, after lunch I play with Frank"

Lite-Brite Set 4- Fade 1

1. "Mitchell, bananas are my favorite"
  2. "Mitchell, *zoo zillions* is a great"
  3. "Mitchell, I really like to"
- 

(appendix continues)

## Appendix A (continued)

---

4. "Mitchell, I play a lot of games on"

5. "Mitchell, after lunch I play with"

## Coloring Activity

Coloring Set 1

1. "Mitchell, I like to play with playdoh"

2. "Mitchell, I'm good on the balance beam"

3. "Mitchell, Britney Spears is my favorite"

4. "Mitchell, *Danny and the Dinosaur* is a great book"

5. "Mitchell, I love to talk about the calendar"

Coloring Set 1- Fade 1

1. "Mitchell, I like to play with"

2. "Mitchell, I'm good on the"

3. "Mitchell, Britney Spears is my"

4. "Mitchell, *Danny and the Dinosaur* is a"

5. "Mitchell, I love to talk about"

Coloring Set 1- Fade 2

1. "Mitchell, I like to play"

2. "Mitchell, I'm good"

3. "Mitchell, Britney Spears"

4. "Mitchell, *Danny and the Dinosaur*"

---

(appendix continues)

## Appendix A (continued)

---

5. "Mitchell, I love to talk"

Coloring Set 1- Fade 3

1. "Mitchell, I like"
2. "Mitchell, I'm"
3. "Mitchell, Britney"
4. "Mitchell, *Danny and*"
5. "Mitchell, I love"

Coloring Set 1- Fade 4

1. "Mitchell, I"
2. "Mitchell,"
3. "Mitchell,"
4. "Mitchell,"
5. "Mitchell, I"

Coloring Set 1- Fade 5

1. ""
2. ""
3. ""
4. ""
5. ""

---

(appendix continues)

## Appendix A (continued)

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Coloring Set 2

1. "Mitchell, I love singing Happy Birthday"
2. "Mitchell, *Captain Cat* is a good book"
3. "Mitchell, my birthday party was awesome"
4. "Mitchell, I like playing *Trouble* with mommy"
5. "Mitchell, *Candyland* is a cool game"

Coloring Set 2- Fade 1

1. "Mitchell, I love singing Happy"
2. "Mitchell, *Captain Cat* is a good"
3. "Mitchell, my birthday party was"
4. "Mitchell, I like playing *Trouble* with"
5. "Mitchell, *Candyland* is a cool"

Coloring Set 2- Fade 2

1. "Mitchell, I love singing"
2. "Mitchell, *Captain Cat* is a"
3. "Mitchell, my birthday party"
4. "Mitchell, I like playing *Trouble*"
5. "Mitchell, *Candyland* is a"

Coloring Set 2- Fade 3

1. "Mitchell, I love"
- 

(appendix continues)

Appendix A (continued)

---

2. "Mitchell, *Captain Cat*"
3. "Mitchell, my birthday"
4. "Mitchell, I like playing"
5. "Mitchell, *Candyland* is"

Coloring Set 2- Fade 4

1. "Mitchell, I"
2. "Mitchell, *Captain*"
3. "Mitchell, my"
4. "Mitchell, I like"
5. "Mitchell, *Candyland*"

Coloring Set 2- Fade 5

1. ""
2. ""
3. ""
4. ""
5. ""

Coloring Set 3

1. "Mitchell, I love to have races in gym"
  2. "Mitchell, I like to go to the library"
  3. "Mitchell, *Brown Bear* is a great book"
- 

(appendix continues)

## Appendix A (continued)

- 
4. "Mitchell, *Chutes and Ladders* is a great game"
  5. "Mitchell, I love to sing the days of the week song"
-

## Appendix B

Script Sets and Fading Steps for Mitchell

---

Playing-with-cars Activity

Cars Set 1

1. "Rachel, pretzels are good"
2. "Rachel, cupcakes are great"
3. "Rachel, I love popcorn"
4. "Rachel, I drink milk"
5. "Rachel, I like cookies"

Cars Set 1- Fade 1

1. "Rachel, pretzels are"
2. "Rachel, cupcakes are"
3. "Rachel, I love"
4. "Rachel, I drink"
5. "Rachel, I like"

Cars Set 1- Fade 2

1. "Rachel, pretzels"
2. "Rachel, cupcakes"
3. "Rachel, I"
4. "Rachel, I"
5. "Rachel, I"

---

(appendix continues)

Appendix B (continued)

---

Cars Set 1- Fade 3

1. "Rachel,"
2. "Rachel,"
3. "Rachel,"
4. "Rachel,"
5. "Rachel,"

Cars Set 1- Fade 3

1. ""
2. ""
3. ""
4. ""
5. ""

Cars Set 2

1. "Rachel, I love turkey sandwich"
2. "Rachel, playing cars is cool"
3. "Rachel, I sing *grand old flag*"
4. "Rachel, riding my bike is fun"
5. "Rachel, I like to scooter"

Cars Set 2- Fade 1

1. "Rachel, I love turkey"
- 

(appendix continues)

Appendix B (continued)

---

2. "Rachel, playing cars is"
3. "Rachel, I sing *grand old*"
4. "Rachel, riding my bike is"
5. "Rachel, I like to"

Cars Set 2- Fade 2

1. "Rachel, I love"
2. "Rachel, playing cars"
3. "Rachel, I sing"
4. "Rachel, riding my"
5. "Rachel, I like"

Coloring Activity

Coloring Set 1

1. "Rachel, *Barnyard Bingo* is cool"
2. "Rachel, I play with Caitlin"
3. "Rachel, I love the park"
4. "Rachel, I sing with mommy"
5. "Rachel, trains are fun"

Coloring Set 1- Fade 1

1. "Rachel, *Barnyard Bingo* is"
  2. "Rachel, I play with"
- 

(appendix continues)

## Appendix B (continued)

- 
3. "Rachel, I love the"
  4. "Rachel, I sing with"
  5. "Rachel, trains are"

Coloring Set 1- Fade 2

1. "Rachel, *Barnyard*"
2. "Rachel, I play"
3. "Rachel, I"
4. "Rachel, I"
5. "Rachel, trains"

Coloring Set 1- Fade 3

1. "Rachel,"
2. "Rachel, I"
3. "Rachel,"
4. "Rachel,"
5. "Rachel,"

Coloring Set 1- Fade 4

1. ""
  2. ""
  3. ""
  4. ""
- 

(appendix continues)

Appendix B (continued)

---

5. ""

Coloring Set 2

1. "Rachel, applesauce tastes good"
2. "Rachel, I love to eat carrots"
3. "Rachel, I like to watch videos"
4. "Rachel, balance beam is cool"
5. "Rachel, spelling words is fun"

Lite-Brite Activity

Lite-Brite Set 1

1. "Rachel, skating is so cool"
2. "Rachel, I read lots of books"
3. "Rachel, *Caps for Sale* is a good book"
4. "Rachel, races are so much fun"
5. "Rachel, I really like computer"

Lite-Brite Set 1- Fade 1

1. "Rachel, skating is so"
  2. "Rachel, I read lots of"
  3. "Rachel, *Caps for Sale* is a"
  4. "Rachel, races are so much"
  5. "Rachel, I really like"
- 

(appendix continues)

## Appendix B (continued)

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Lite-Brite Set 1- Fade 2

1. "Rachel, skating is"
  2. "Rachel, I read"
  3. "Rachel, *Caps for Sale*"
  4. "Rachel, races are"
  5. "Rachel, I really"
-

## Appendix C

Script Sets and Fading Steps for Carl

---

  
Playing-with-cars ActivityCars Set 1

1. "Max, yogurt is so good"
2. "Max, I like fruit cup"
3. "Max, *Gameboy* is cool"
4. "Max, I love playing *Leap Pad*"
5. "Max, *Mighty Math* is a great game"

Cars Set 1- Fade 1

1. "Max, yogurt is so"
2. "Max, I like fruit"
3. "Max, *Gameboy* is"
4. "Max, I love playing *Leap*"
5. "Max, *Mighty Math* is a great"

Cars Set 1- Fade 2

1. "Max, yogurt"
  2. "Max, I like"
  3. "Max, *Gameboy*"
  4. "Max, I love playing"
  5. "Max, *Mighty Math* is"
- 

(appendix continues)

Appendix C (continued)

---

Cars Set 1- Fade 3

1. "Max,"
2. "Max, I"
3. "Max,"
4. "Max, I love"
5. "Max, *Mighty*"

Cars Set 1- Fade 4

1. ""
2. ""
3. ""
4. ""
5. ""

Cars Set 2

1. "Max, I love seeing my grandma"
2. "Max, I have fun at the mall with mommy"
3. "Max, I like playing with my cousins"
4. "Max, shopping with mommy is fun"
5. "Max, playing piano is so cool"

Cars Set 2- Fade 1

1. "Max, I love seeing my"
- 

(appendix continues)

Appendix C (continued)

---

2. "Max, I have fun at the mall with"
3. "Max, I like playing with my"
4. "Max, shopping with mommy is"
5. "Max, playing piano is so"

Cars Set 2- Fade 2

1. "Max, I love seeing"
2. "Max, I have fun at the"
3. "Max, I like playing with"
4. "Max, shopping with mommy"
5. "Max, playing piano is"

Cars Set 2- Fade 3

1. "Max, I love"
2. "Max, I have"
3. "Max, I like"
4. "Max, shopping"
5. "Max, playing"

Cars Set 2- Fade 4

1. "Max,"
  2. "Max,"
  3. "Max,"
- 

(appendix continues)

Appendix C (continued)

---

4. "Max,"

5. "Max,"

Cars Set 2- Fade 5

1. ""

2. ""

3. ""

4. ""

5. ""

Cars Set 3

1. "Max, Britney Spears is the best"

2. "Max, I love to sing the weather song"

3. "Max, NSYNC is my favorite group"

4. "Max, going to the zoo with daddy is fun"

5. "Max, I have a good time with my grandpa"

Cars Set 3- Fade 1

1. "Max, Britney Spears is the"

2. "Max, I love to sing the"

3. "Max, NSYNC is my favorite"

4. "Max, going to the zoo with daddy"

5. "Max, I have a good time with my"

---

(appendix continues)

Appendix C (continued)

---

Cars Set 3- Fade 2

1. "Max, Britney Spears is"
2. "Max, I love to sing"
3. "Max, NSYNC is my"
4. "Max, going to the zoo"
5. "Max, I have a good time"

Cars Set 3- Fade 3

1. "Max, Britney Spears"
2. "Max, I love to"
3. "Max, NSYNC is"
4. "Max, going to the"
5. "Max, I have a"

Cars Set 3- Fade 4

1. "Max, Britney"
2. "Max, I"
3. "Max, NSYNC"
4. "Max, going"
5. "Max, I"

Cars Set 3- Fade 5

1. ""
- 

(appendix continues)

Appendix C (continued)

---

2. ""

3. ""

4. ""

5. ""

Cars Set 4

1. "Max, I read lots of books"

2. "Max, I saw monkeys at the zoo"

3. "Max, I like to draw bridges"

4. "Max, *Play Station* has great games"

5. "Max, I like playing with Magna Doodle"

Cars Set 4- Fade 1

1. "Max, I read lots of"

2. "Max, I saw monkeys at"

3. "Max, I like to draw"

4. "Max, *Play Station* has great"

5. "Max, I like playing with Magna"

Cars Set 4- Fade 2

1. "Max, I read lots"

2. "Max, I saw monkeys"

3. "Max, I like to"

---

(appendix continues)

## Appendix C (continued)

- 
4. "Max, *Play Station* has"
  5. "Max, I like playing with"

Cars Set 4- Fade 3

1. "Max, I read"
2. "Max, I saw"
3. "Max, I like"
4. "Max, *Play Station*"
5. "Max, I like playing"

Cars Set 4- Fade 4

1. "Max,"
2. "Max,"
3. "Max, I"
4. "Max,"
5. "Max, I"

Cars Set 4- Fade 5

1. ""
  2. ""
  3. ""
  4. ""
  5. ""
- 

(appendix continues)

Appendix C (continued)

---

Cars Set 5

1. "Max, I like to ride the elevator"
2. "Max, pinball is a cool game"
3. "Max, I love to squirt Water Duck"
4. "Max, tickles give me goose bumps"
5. "Max, I can wheel barrel backwards"

Cars Set 5- Fade 1

1. "Max, I like to ride the"
2. "Max, pinball is a cool"
3. "Max, I love to squirt"
4. "Max, tickles give me"
5. "Max, I can wheel barrel"

Coloring Activity

Coloring Set 1

1. "Max, my favorite yogurt is vanilla"
  2. "Max, playing computer is the best"
  3. "Max, riding a bike is cool"
  4. "Max, I can draw a train"
  5. "Max, I really like *pacman*"
- 

(appendix continues)

Appendix C (continued)

---

Coloring Set 1- Fade 1

1. "Max, my favorite yogurt is"
2. "Max, playing computer is the"
3. "Max, riding a bike is"
4. "Max, I can draw a"
5. "Max, I really like"

Coloring Set 1- Fade 2

1. "Max, my favorite yogurt"
2. "Max, playing computer is"
3. "Max, riding a bike"
4. "Max, I can draw"
5. "Max, I really"

Coloring Set 1- Fade 3

1. "Max, my favorite"
2. "Max, playing computer"
3. "Max, riding a"
4. "Max, I can"
5. "Max, I"

Coloring Set 1- Fade 4

1. "Max, my"
- 

(appendix continues)

## Appendix C (continued)

- 
2. "Max, playing"
  3. "Max, riding"
  4. "Max, I"
  5. "Max,"

Coloring Set 1- Fade 5

1. ""
2. ""
3. ""
4. ""
5. ""

Coloring Set 2

1. "Max, *Clifford* is a great book"
  2. "Max, silly string is so much fun"
  3. "Max, I like to draw scary monsters"
  4. "Max, I love to have relay races"
  5. "Max, I'm really good at freeze dance"
-

## Appendix D

Script sets and fading steps for Max

---

Playing-with-cars Activity

Cars Set 1

1. "Carl, pretzels are delicious"
2. "Carl, Rice Krispies taste great"
3. "Carl, white skittles are my favorite"
4. "Carl, I really like chips"
5. "Carl, I love to eat fruit cups"

Cars Set 1- Fade 1

1. "Carl, pretzels are"
2. "Carl, Rice Krispies taste"
3. "Carl, white skittles are my"
4. "Carl, I really like"
5. "Carl, I love to eat fruit"

Cars Set 1- Fade 2

1. "Carl, pretzels"
2. "Carl, Rice Krispies"
3. "Carl, white skittles are my"
4. "Carl, I really"
5. "Carl, I love to eat"

---

(appendix continues)

## Appendix D (continued)

---

Cars Set 1- Fade 3

1. "Carl,"
2. "Carl, Rice"
3. "Carl, white skittles are"
4. "Carl, I"
5. "Carl, I love to"

Cars Set 1- Fade 4

1. "Carl,"
2. "Carl,"
3. "Carl, white"
4. "Carl,"
5. "Carl, I"

Cars Set 1- Fade 5

1. ""
2. ""
3. ""
4. ""
5. ""

Cars Set 2

1. "Carl, gameboy is fun"
- 

(appendix continues)

## Appendix D (continued)

- 
2. "Carl, I love to do puzzles"
  3. "Carl, I'm really good at leapfrog"
  4. "Carl, *veggie tales* is my favorite"
  5. "Carl, *God Bless America* is great"

Cars Set 2- Fade 1

1. "Carl, *gameboy* is"
2. "Carl, I love to do"
3. "Carl, I'm really good at leap"
4. "Carl, *veggie tales* is my"
5. "Carl, *God Bless America* is"

Cars Set 2- Fade 2

1. "Carl, *gameboy*"
2. "Carl, I love to"
3. "Carl, I'm really good at"
4. "Carl, *veggie tales* is"
5. "Carl, *God Bless America*"

Cars Set 2- Fade 3

1. "Carl, *gameboy*"
2. "Carl, I love"
3. "Carl, I'm really"

---

(appendix continues)

## Appendix D (continued)

- 
4. "Carl, veggie"
  5. "Carl, God Bless"

Cars Set 2- Fade 4

1. "Carl,"
2. "Carl, I"
3. "Carl, I'm"
4. "Carl,"
5. "Carl,"

Cars Set 2- Fade 5

1. ""
2. ""
3. ""
4. ""
5. ""

Cars Set 3

1. "Carl, I love reading word birds"
2. "Carl, Britney Spears is my favorite"
3. "Carl, NYSNC is great"
4. "Carl, I like to sing"
5. "Carl, dinosaurs are so cool"

---

(appendix continues)

## Appendix D (continued)

---

Cars Set 3- Fade 1

1. "Carl, I love reading *word*"
2. "Carl, Britney Spears is my"
3. "Carl, NYSNC is"
4. "Carl, I like to"
5. "Carl, dinosaurs are so"

Cars Set 3- Fade 2

1. "Carl, I love reading"
2. "Carl, Britney Spears"
3. "Carl, NYSNC"
4. "Carl, I like"
5. "Carl, dinosaurs are"

Cars Set 3- Fade 3

1. "Carl, I love"
2. "Carl, Britney"
3. "Carl, NYSNC"
4. "Carl, I"
5. "Carl, dinosaurs"

Cars Set 3- Fade 4

1. "Carl, I"
- 

(appendix continues)

## Appendix D (continued)

---

2. "Carl,"

3. "Carl,"

4. "Carl,"

5. "Carl,"

Cars Set 3- Fade 5

1. ""

2. ""

3. ""

4. ""

5. ""

Cars Set 4

1. "Carl, my favorite game is leapfrog"

2. "Carl, skittles are the best"

3. "Carl, I love to see grandpa"

4. "Carl, I like to color animal pictures"

5. "Carl, making dinosaurs is so cool"

Cars Set 4- Fade 1

1. "Carl, my favorite game is"

2. "Carl, skittles are the"

3. "Carl, I love to see"

---

(appendix continues)

## Appendix D (continued)

- 
4. "Carl, I like to color animal"
  5. "Carl, making dinosaurs is so"

Cars Set 4- Fade 2

1. "Carl, my favorite game"
2. "Carl, skittles are"
3. "Carl, I love to"
4. "Carl, I like to color"
5. "Carl, making dinosaurs"

Cars Set 4- Fade 3

1. "Carl, my favorite"
2. "Carl, skittles"
3. "Carl, I love"
4. "Carl, I like to"
5. "Carl, making"

Cars Set 4- Fade 4

1. "Carl, my"
  2. "Carl,"
  3. "Carl, I"
  4. "Carl, I"
  5. "Carl,"
- 

(appendix continues)

## Appendix D (continued)

---

Cars Set 4- Fade 5

1. ""
2. ""
3. ""
4. ""
5. ""

Cars Set 5

1. "Carl, racing with my friends is fun"
2. "Carl, I love dinosaur books"
3. "Carl, I like to read *Clifford* books"
4. "Carl, *word bird* is a great book"
5. "Carl, I love the lions at the zoo"

Cars Set 5- Fade 1

1. "Carl, racing with my friends"
2. "Carl, I love dinosaur"
3. "Carl, I like to read *Clifford*"
4. "Carl, *word bird* is a great"
5. "Carl, I love the lions at"

Cars Set 5- Fade 2

1. "Carl, racing with my"
- 

(appendix continues)

## Appendix D (continued)

- 
2. "Carl, I love"
  3. "Carl, I like to read"
  4. "Carl, *word bird* is a"
  5. "Carl, I love the lions"

Cars Set 5- Fade 3

1. "Carl, racing"
2. "Carl, I"
3. "Carl, I like"
4. "Carl, *word bird*"
5. "Carl, I love"

Cars Set 5- Fade 4

1. "Carl,"
2. "Carl,"
3. "Carl, I"
4. "Carl,"
5. "Carl, I"

Cars Set 5- Fade 5

1. ""
  2. ""
  3. ""
- 

(appendix continues)

## Appendix D (continued)

---

4. ""

5. ""

Cars Set 6

1. "Carl, I love to see the tigers"
2. "Carl, *Brown Bear* is a great book"
3. "Carl, I love to shop with mommy"
4. "Carl, I have fun at the mall"
5. "Carl, playing catch with daddy is fun"

Cars Set 6- Fade 1

1. "Carl, I love to see the"
2. "Carl, *Brown Bear* is a great"
3. "Carl, I love to shop with"
4. "Carl, I have fun at the"
5. "Carl, playing catch with daddy is"

Cars Set 6- Fade 2

1. "Carl, I love to see"
  2. "Carl, *Brown Bear* is a"
  3. "Carl, I love to shop"
  4. "Carl, I have fun at"
  5. "Carl, playing catch with daddy"
- 

(appendix continues)

## Appendix D (continued)

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Cars Set 6- Fade 3

1. "Carl, I love to"
2. "Carl, *Brown Bear* is"
3. "Carl, I love to"
4. "Carl, I have fun"
5. "Carl, playing catch with"

Cars Set 6- Fade 4

1. "Carl, I"
2. "Carl, *Brown*"
3. "Carl, I"
4. "Carl, I"
5. "Carl, playing"

Cars Set 6- Fade 5

1. ""
2. ""
3. ""
4. ""
5. ""

Cars Set 7

1. "Carl, I love to pop the balloons"
- 

(appendix continues)

## Appendix D (continued)

- 
2. "Carl, birthday parties are so fun"
  3. "Carl, I love to sing Happy Birthday"
  4. "Carl, I really like piggyback rides"
  5. "Carl, I like to play with magna doodle"

Cars Set 7-Fade 1

1. "Carl, I love to pop the"
2. "Carl, birthday parties are so"
3. "Carl, I love to sing Happy"
4. "Carl, I really like piggyback"
5. "Carl, I like to play with magna"

## Lite-Brite Activity

Lite-Brite Set 1

1. "Carl, singing the weather song is cool"
2. "Carl, I like singing good morning to you"
3. "Carl, I go to church with mommy"
4. "Carl, I love going to the zoo with daddy"
5. "Carl, playing with my sister is fun"

Lite-Brite Set 1- Fade 1

1. "Carl, singing the weather song is"
  2. "Carl, I like singing good morning to"
- 

(appendix continues)

## Appendix D (continued)

- 
3. "Carl, I go to church with"
  4. "Carl, I love going to the zoo with"
  5. "Carl, playing with my sister is"

Lite-Brite Set 1- Fade 2

1. "Carl, singing the weather song"
2. "Carl, I like singing good"
3. "Carl, I go to"
4. "Carl, I love going to the"
5. "Carl, playing with my"

Lite-Brite Set 1- Fade 3

1. "Carl, singing the"
2. "Carl, I like singing"
3. "Carl, I"
4. "Carl, I love going"
5. "Carl, playing"

Lite-Brite Set 1- Fade 4

1. "Carl,"
  2. "Carl, I"
  3. "Carl,"
  4. "Carl, I"
- 

(appendix continues)

## Appendix D (continued)

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5. "Carl,"

Lite-Brite Set 1- Fade 5

1. ""

2. ""

3. ""

4. ""

5. ""

Lite-Brite Set 2

1. "Carl, coloring is so much fun"

2. "Carl, I love to play computer"

3. "Carl, I really like to scooter"

4. "Carl, I like to ride my bike fast"

5. "Carl, racing with my friends is awesome"

Lite-Brite Set 2- Fade 1

1. "Carl, coloring is so much"

2. "Carl, I love to play"

3. "Carl, I really like to"

4. "Carl, I like to ride my"

5. "Carl, racing with my friends"

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(appendix continues)

## Appendix D (continued)

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Lite-Brite Set 2- Fade 2

1. "Carl, coloring is"
2. "Carl, I love"
3. "Carl, I really"
4. "Carl, I like to"
5. "Carl, racing with"

Lite-Brite Set 2- Fade 3

1. "Carl, coloring"
2. "Carl, I"
3. "Carl, I"
4. "Carl, I like"
5. "Carl, racing"

Lite-Brite Set 2- Fade 4

1. "Carl,"
2. "Carl,"
3. "Carl,"
4. "Carl, I"
5. "Carl,"

Lite-Brite Set 2- Fade 5

1. ""
- 

(appendix continues)

## Appendix D (continued)

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2. ""

3. ""

4. ""

5. ""

Lite-Brite Set 3

1. "Carl, riding my bike is so cool"

2. "Carl, tumbling is so much fun"

3. "Carl, my new friend is Dennis"

4. "Carl, I went to the pool this summer"

5. "Carl, *Stuart Little* is a great movie"

Lite-Brite Set 3- Fade 1

1. "Carl, riding my bike is"

2. "Carl, tumbling is so"

3. "Carl, my new friend is"

4. "Carl, I went to the pool"

5. "Carl, *Stuart Little* is a great"

Lite-Brite Set 3- Fade 2

1. "Carl, riding my"

2. "Carl, tumbling is"

3. "Carl, my new friend"

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(appendix continues)

## Appendix D (continued)

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4. "Carl, I went to the"

5. "Carl, *Stuart Little* is"

Lite-Brite Set 3- Fade 3

1. "Carl, riding"

2. "Carl, tumbling"

3. "Carl, my new"

4. "Carl, I went"

5. "Carl, *Stuart Little*"

Lite-Brite Set 3- Fade 4

1. "Carl,"

2. "Carl,"

3. "Carl, my"

4. "Carl, I"

5. "Carl, *Stuart*"

Lite-Brite Set 3- Fade 4

1. ""

2. ""

3. ""

4. ""

5. ""

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(appendix continues)

## Appendix D (continued)

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Lite-Brite Set 4

1. "Carl, I like to play outside"
2. "Carl, *Pacman* is so cool"
3. "Carl, tickles make me laugh"
4. "Carl, I love to go upside down"
5. "Carl, I'm really good at wheel barrel races"

Lite-Brite Set 4- Fade 1

1. "Carl, I like to play"
2. "Carl, *Pacman* is so"
3. "Carl, tickles make me"
4. "Carl, I love to go upside"
5. "Carl, I'm really good at wheel barrel"

Lite-Brite Set 4- Fade 2

1. "Carl, I like to"
2. "Carl, *Pacman* is"
3. "Carl, tickles make"
4. "Carl, I love to go"
5. "Carl, I'm really good at"

Lite-Brite Set 4- Fade 3

1. "Carl, I like"
- 

(appendix continues)

## Appendix D (continued)

- 
2. "Carl, Pacman"
  3. "Carl, tickles"
  4. "Carl, I love"
  5. "Carl, I'm really"

Lite-Brite Set 4- Fade 4

1. "Carl, I"
2. "Carl,"
3. "Carl,"
4. "Carl, I"
5. "Carl, I'm"

Lite-Brite Set 4- Fade 5

1. ""
2. ""
3. ""
4. ""
5. ""

Lite-Brite Set 5

1. "Carl, silly string is so cool"
2. "Carl, I love to play magnet game"
3. "Carl, I'm really good at pinball"

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(appendix continues)

## Appendix D (continued)

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4. "Carl, I like to watch T.V."
  5. "Carl, Richard Scary videos are great"

Lite-Brite Set 5- Fade 1

1. "Carl, silly string is so"
  2. "Carl, I love to play magnet"
  3. "Carl, I'm really good at"
  4. "Carl, I like to watch"
  5. "Carl, Richard Scary videos are"
-

## Appendix E

A Review of the Literature on Cooperative Behavior  
In Typically Developing Individuals and  
Individuals with Developmental Disabilities

A Review of the Literature on Cooperative Behavior  
In Typically Developing Individuals and  
Individuals with Developmental Disabilities

by

Andrea Gold

Queens College and the Graduate Center

City University of New York

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## Appendix E (continued)

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Abstract

This paper is a review of the literature on cooperative behavior with typically developing individuals and individuals with developmental disabilities. First, the definition of cooperative behavior is discussed in terms of the relation between the behavior of the individual and the social environment in which that behavior occurs. Second, differences in methodology between applied and basic research on cooperation are discussed. These include differences in the structure of the task, and the type (novel or familiar) of activity used, the discriminative stimuli for cooperative behavior, and the number of participants needed for cooperative behavior to be scored. Finally, the role of reinforcement contingencies in the development of cooperation is discussed. In addition, the use of concurrent schedules of reinforcement to study choice of cooperation or non-cooperation is reviewed.

By

Andrea J Gold

Advisor: Professor Claire L. Poulson

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(appendix continues)

## Appendix E (continued)

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A Review of the Literature on Cooperative Behavior  
With Typically Developing Individuals and  
Individuals With Developmental Disabilities

Cooperation involves the behavior of two or more individuals that occurs in the context of a particular social environment. Within that social environment, the definition of cooperation varies greatly across studies. Some researchers defined cooperation as the relation between the responses of the individuals in the group and the activity that was presented to them (Ashman & Gillies, 1997; Faught, Balleweg, Crow & Van Den Pol, 1983; Hake, Vukelich & Kaplan, 1973; Johnson & Johnson, 1999; Orlick, 1981a; Peterson & Haralick, 1977; Quilitch & Risley, 1973). In this definition of cooperation, the emphasis is on outcome measures, such as test scores or number of activities completed, rather than the equitable division of responses between group members. Other researchers have defined cooperation as the relation between the responses of the members of the group (Azrin & Lindsley, 1956; Dugan, Kamps, Leonard, Watkins, Rheinberger & Stackhaus, 1995;

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## Appendix E (continued)

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Hake & Vukelich, 1972; Hertz-Lazarowitz & Miller, 1992; Kagan, 1992; Rosenberg, 1960; Slavin, 1995). In this definition of cooperation the emphasis is on the reinforcement contingencies that specify the responses and the criteria for their reinforcement (e.g., response distribution).

These differences in definitions lead to variations in procedural descriptions of cooperation between applied and basic research. In applied research the priority is, first, to teach cooperative behavior and, second, to analyze the learning processes involved in cooperation. In contrast, in basic research the primary purpose is, first, to analyze the learning processes involved and, second, to provide meaningful behavior change. Thus, procedural descriptions of cooperation in applied settings differ from those in experimental settings in terms of the structure and type of activities used, the discriminative stimuli for cooperation, and the number of participants needed for cooperative responding to be scored.

Regardless of the setting in which cooperation is

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studied, there is a general agreement that reinforcement contingencies play a critical role in the development of cooperation (Cosden & Haring, 1992; Hertz-Lazarowitz & Miller, 1992; Rosenberg, 1960). Two types of reinforcement contingencies have been used in the study of cooperation. Individual-reinforcement contingencies involve the delivery of reinforcers contingent upon the cooperative responding of each individual. With group-reinforcement contingencies all participants receive a reinforcer if their responses collectively meet a specified performance criterion. Concurrent schedules of reinforcement have been used to assess the extent to which reinforcement contingencies influence the choice to cooperate.

This paper addressed the literature on cooperative behavior with typically developing individuals and individuals with developmental disabilities. The research that was cited included articles from various journals that addressed the areas of cooperation, cooperative play, cooperative behavior, and cooperative learning. The journals reviewed included: Journal of Applied Behavior

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Analysis; Journal of the Experimental Analysis of Behavior; The Journal of Social Psychology; and Journal of Abnormal Child Psychology.

For the purpose of the present paper, a definition of cooperation should include a description of the cooperative response, a description of the distribution of responding among the members of the group, and a description of the reinforcement contingencies. Within the articles reviewed in each section of this paper the presence or absence of these three elements are discussed. In the first section of this paper the definitions of cooperative behavior are reviewed. In the second section, the differences in procedural descriptions of cooperation between applied settings and experimental settings are reviewed. Finally, in the third section of this paper, reinforcement contingencies and factors affecting the choice to cooperate are reviewed.

Definitions of Cooperative Behavior

A review of the literature on cooperative behavior reveals that the definition of cooperation varies greatly

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## Appendix E (continued)

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across studies. Variations in the definition of cooperation may arise as a result of the essential nature of the behavior itself. Rather than identifying a specific response topography, cooperation is the relation between the behavior of an individual and the social environment in which the behavior occurs.

The relational aspect of cooperation may be illustrated by considering a child building a tower with blocks. If the child is alone in a room building the block tower, it would be unlikely that an observer would identify the child behavior as "cooperative." Yet, this same child behavior is likely to be identified as "cooperative" if the child is in the presence of another child and both children are contributing in the construction of a single tower of blocks.

Among the studies reviewed, two types of relations have been identified to define cooperative behavior. Some researchers have considered the relation between the responses of two or more individuals and an activity in the definition of cooperative behavior (Ashman & Gillies, 1997;

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Bay-Hinitz, Peterson & Quilitch, 1994; Faught, Balleweg, Crow & Van Den Pol, 1983; Gelb & Jacobson, 1988; Hake, Vukelich & Kaplan, 1973; Johnson & Johnson, 1999; Lounsbury & Bell, 1976; Orlick, 1981a; Orlick, 1981b; Peterson & Haralick, 1977; Quilitch & Riskey, 1973; Redd, 1969).

Other researchers defined cooperation in terms of the relation between the responses of two or more individuals (Dugan, Kamps, Leonard, Watkins, Rheinberger & Stackhaus, 1995; Hake & Vukelich, 1972; Hertz-Lazarowitz & Miller, 1992; Kagan, 1992; Rosenberg, 1960; Sharan, 1980; Slavin, 1995). These two types of relations are discussed separately below.

Cooperation as the Relation Between the Responding of Two or More Individuals and an Activity. Studies that defined cooperation as the relation between the responses of two or more individuals and the activity focused on the common goal of the activity presented to the individuals (Ashman & Gillies, 1997; Bay-Hinitz, Peterson & Quilitch, 1994; Faught, Balleweg, Crow & Van Den Pol, 1983; Gelb & Jacobson, 1988; Hake, Vukelich & Kaplan, 1973; Johnson &

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Johnson, 1999; Lounsbury & Bell, 1976; Orlick, 1981a; Orlick, 1981b; Peterson & Haralick, 1977; Quilitch & Riskey, 1973; Redd, 1969). In one such study, conducted by Peterson and Haralick (1977), the cooperative behavior of typically-developing-preschool children and children with developmental disabilities was assessed. Cooperation was defined as the completion of an activity by two or more children. This included responses made with the same stimulus (e.g., sharing finger paints) or responses made with different stimuli (e.g., manipulating pretend foods and pretend pots and dishes to make a meal). Although cooperative responding required the contributions of all participants toward the completion of the activity, this definition of cooperation was not clear. First, the specific response requirements of each individual were not clearly stated. Second, the reinforcement contingencies were not clearly described. The authors reported that reinforcers were delivered for "good play behavior," but they did not define what that was. It was not clear whether reinforcers were delivered contingently upon the

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occurrence of a cooperative response.

Another study that defined cooperative behavior as the completion of an activity by a group of children was conducted by Orlick (1981b). In that study, preschool children participated in games that required the contributions of each child to complete the game. For example, in the beach-ball-balance game two or three children had to balance a ball between their bodies. Reinforcers were delivered contingent upon cooperative responding. Similar games were used in a study conducted by Bay-Hinitz et al. (1994). Again, the definition of cooperative behavior was not clear. The specific response requirements of each individual were not clearly described. Could the children use any part of their body to balance the ball? Did the all of the children have to use the same parts of their bodies (e.g., their tummies) to balance the ball or could they use different parts of their bodies (e.g., could one child used his tummy and the other child used his hand)?

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Cooperation as the Relation Between the Responses of Two orMore Individuals. Some researchers have defined

cooperative behavior in terms of the relation between the responses of two or more individuals participating in an activity (Cosden & Haring 1992; Dugan, Kamps, Leonard, Watkins, Rheinberger & Stackhaus, 1995; Hake & Vukelich, 1972; Hertz-Lazarowitz & Miller, 1992; Kagan, 1992; Rosenberg, 1960; Schmitt, 1987; Schmitt & Marwell, 1971a; Schmitt & Marwell, 1971b; Sharan, 1980; Slavin, 1995). In this definition of cooperative behavior, access to reinforcement is contingent upon the coordinated responses of two individuals. Hake and Vukelich (1972) state that in any cooperative procedure, reinforcers provided to each individual must be, in part, dependent upon the responses of the partner.

One study that defined cooperative behavior in terms of the dependent relation between the responses of two individuals, was conducted by Azrin and Lindsley (1956). In that study, a game was developed in which school-age children placed sticks (styli) into one of three holes on a

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game board. A cooperative response occurred when one child placed his or her stylus into a hole and the other child placed his or her stylus into the hole opposite the stylus of his or her partner within five seconds. One jelly bean was delivered to both children contingent upon the occurrence of a cooperative response. If the response requirements were not met, reinforcers were not delivered. Vogler, Masters and Morrill (1970) closely replicated the stimuli and reinforcement contingencies used by Azrin et al. (1956). In both of these studies, access to reinforcers was contingent upon the yoked responding by the children.

Another study that defined cooperation as the relation between the responses of two individuals was conducted by Loh (1966). In that study, a cooperative response occurred when one child pushed a button on a panel and a second child imitated the button-push response on a similar panel within a predetermined time interval. When a cooperative response occurred, a reinforcer was delivered to both children. If the response requirements were not met,

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reinforcers were not delivered. Again, delivery of reinforcers was contingent upon the yoked responding by the children.

In the above studies, a key element in cooperative behavior was group reinforcement contingencies, whereby all individuals received a reinforcer if their responses collectively met a specified performance criterion. In all of these studies, the definition of cooperation included a description of the cooperative response, a description of the distribution of the distribution of responding among the members of the group, and a description of the reinforcement contingencies.

Summary of the definitions of cooperative behavior. In summary, two relations have been used to define cooperative behavior: (a) the relation between the responses of two or more individuals and an activity; and (b) the dependent relation between the responses of two or more individuals. Although in both relations children are working together to complete a task, the emphasis of each relation differs. In the first relation, the emphasis of cooperative behavior is

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on the contributions of the individuals toward the completion of the activity. In the second relation, emphasis is on the interdependence between the responses of the participants.

In the cooperative-behavior literature reviewed, many of the current definitions of cooperative behavior include terms such as "working together," "applying toys to the purposes of the group," and "interacting in a common play venture." Such descriptions do not clearly inform the reader about the relation between the behavior of the individual and the environment in which that behavior occurs. For the purposes of the present paper, the definition of cooperative behavior should include a description of the relational conditions as well as a description of the reinforcement contingencies.

In addition, few of the cooperative-behavior definitions reviewed specify the number of responses required for child behavior to be considered cooperative. The specific responses required of each individual need to be clearly described. Consider an example of two children

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presented with a 30-piece puzzle. One child inserts one puzzle piece into the puzzle frame, and the second child completes the rest of the puzzle. In this example, the second child is completing most of the work requirements, while the first child is getting a "free ride." Hake and Vukelich (1972) state that one of the essential aspects of cooperative behavior is the equitable division of responses. Cooperative behavior does not occur when one member of the group coasts on the efforts of his/her teammates (Kagan, 1992). Therefore, it is important for researchers to describe the response requirements of each individual in the group.

Procedural Descriptions of Cooperative Behavior

Cooperation has been studied in both applied settings (Ashman & Gillies, 1997; Bay-Hinitz, Peterson & Quilitch, 1994; Dugan, Kamps, Leonard, Watkins, Rheinberger & Stackhaus, 1995; Johnson & Johnson, 1982; Orlick, 1981a; Orlick, 1981b; Quilitch & Risley, 1973; Sharan, 1980; Slavin, 1995; Smith, Johnson & Johnson, 1982) and experimental settings (Azrin & Lindsley, 1956; Gelb &

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Jacobson, 1988; Loh, 1966; Lounsbury & Bell, 1976; Schmitt & Marwell, 1968; Shackel, 1976; Smith, Johnson & Johnson, 1982; Vogler, Masters & Morill, 1970). Studies in applied settings are conducted within the natural environment of the participant (e.g., within the individual's educational classroom). Studies that are conducted in experimental settings occur outside of the natural environment of the participant (e.g., a laboratory). In both types of settings, the goal of cooperation is for individuals to work together to complete tasks. Nevertheless, differences in the procedures used to teach cooperative behavior covary with the differences in setting. The procedures differ in the structure of the task, the type of tasks used (familiar versus novel), the discriminative stimuli for cooperative behavior, and the number of participants needed for cooperative behavior to be scored. Procedural descriptions of cooperative behavior in these two types of settings are discussed separately below.

Procedural Descriptions of Cooperative Behavior in Applied Settings. Some studies of cooperation have been conducted

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in applied settings (Ashman & Gillies, 1997; Bay-Hinitz, Peterson & Quilitch, 1994; Dugan, Kamps, Leonard, Watkins, Rheinberger & Stackhaus, 1995; Johnson & Johnson, 1982; Orlick, 1981a; Orlick, 1981b; Quilitch & Risley, 1973; Sharan, 1980; Slavin, 1995; Smith, Johnson & Johnson, 1982). In this type of setting, the activities are structured so that the individuals not only work together to complete a task, but are also responsible for their teammates' learning of the task. Slavin (1995) described three different types of cooperative learning procedures used in educational classrooms. The first type of procedure was called, "the Student- Teams-Achievement Division". In this procedure, individuals were assigned to four-member teams. They were given a lesson (e.g., a math lesson) and they worked within their teams to make sure that all team members had mastered that lesson. All students then took individual quizzes on that material, at which time they were not allowed to help each other. Student quiz scores were compared to their own past averages and points were awarded. These points were added

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to form team scores. When the team scores reached a predetermined number, a reinforcer (e.g., certificates or awards) was delivered. Access to reinforcement was contingent upon the responses of all members of the group meeting a specified performance criterion.

The second type of procedure described by Slavin (1995) to teach cooperation in an applied setting was called, "Teams-Games-Tournaments". This was similar to the "Student-Teams-Achievement Division" with the exception that quizzes were replaced with tournaments in which members of one team competed against members of other teams during academic games. Points were delivered for each correct response made by team members. When the team points reached a predetermined number a reinforcer (e.g., awards or certificates) was delivered. Again, when the responses of all members of the group reached a specified performance criterion, reinforcers were delivered.

The third type of procedure described by Slavin (1995) to teach cooperation in an applied setting, was called, "the Jigsaw Method". In this procedure, tasks were broken

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into parts and each member of a four-member team was assigned to one part. These individuals had to learn their part of the topic and then teach that part to the rest of the team. Each individual was then quizzed on the entire topic. The scoring and reinforcement systems were similar to that of the "Student-Teams-Achievement Division" and "Team-Games Tournament." Again, access to reinforcement was contingent upon the responses of all members of the group.

The student-teams-achievement division procedure was used by Smith, Johnson & Johnson (1982), to compare the effects of cooperative-learning procedures and individual-learning procedures on the academic performance of fifty-five typical and handicapped sixth-grade students. In the cooperative-learning condition, each child was assigned to a four-member team. Each team was given one copy of the curriculum materials and instructed to work together to learn the topic. The children were then tested on the material. During this condition, the authors reported that reinforcers were provided by the teacher and were delivered

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to the group as a whole. In the individual-learning condition, each child was given his or her own copy of the curriculum materials. Each child was instructed to work on his or her own and not to interact with the other children. Each child was then tested on the materials. In this condition, the authors reported that reinforcers were provided by the teacher and were delivered to the individual child. Smith et al. found that both typical and handicapped children in the cooperative-learning group performed at higher levels on the achievement test than their counterparts in the individual-learning group. Their findings suggest that cooperative-learning procedures promote higher levels of achievement on academic tasks than individual-learning procedures. Nevertheless, the reinforcement contingencies for both conditions were not clearly defined. The responses that produced reinforcement were not defined, and it was unclear whether reinforcers were delivered before or after testing occurred.

In another study, conducted by Johnson and Johnson (1982), the effect of a student-teams-achievement-division

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procedure (cooperative-learning procedure) on the acquisition of a math task in thirty-one typical and handicapped eleventh-grade students was compared to the effect of an individual-learning procedure. In the cooperative-learning condition, each child was assigned to a four-member team. Each team was given math worksheets and instructed to work together to complete them. At the end of each week the children were tested on the material. The scores of each child were averaged to obtain a group score. During this condition, the authors reported that reinforcers were provided by the teacher and were delivered to the group as a whole. In the individual-learning condition, each child was given the math worksheets and was instructed to work on his or her own and not to interact with the other children. At the end of the week each child was tested on the materials. In this condition, the authors reported that reinforcers were provided by the teacher and were delivered to the individual child. The results of this study were similar to those obtained by Smith, Johnson and Johnson (1982). Children in the

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cooperative-learning condition scored higher on the weekly tests than the children in the individual-learning groups. In addition, Johnson and Johnson found that children in the cooperative-learning condition exhibited more on-task behavior than the children in the individual-learning condition. Nevertheless, the reinforcement contingencies for both conditions were not clearly defined. In addition, the responses that produced reinforcement were not defined. It was unclear whether reinforcers were delivered before or after testing occurred, and it was unclear how group scores in the cooperative-learning condition were used (e.g., Were they compared to scores obtained the prior week? Was reinforcement based on obtaining a specific criterion?)

In both of these studies, a between-groups design was used to assess the effects of cooperative learning procedures. The authors did not specify the criteria for group assignment. Therefore, it is possible that the differences in test scores between the children in the cooperative-learning condition and the children in the individual-learning condition were the result of individual

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differences among the children. To control for this possible confound, a within-subjects-experimental design could be used.

One such study, conducted by Dugan et al. (1995), used a within-subjects-reversal-experimental design to assess the effects of cooperative learning procedures and individual instruction on the acquisition of social-studies skills in two children with autism and sixteen typical fourth-grade peers. Across all conditions, weekly pretests and posttests were conducted on the social-studies curriculum. During the individual-instruction condition, the teacher conducted a lecture on social-studies material in which she presented key words and facts, posed questions to individuals, and used maps. The children were expected to take notes and read the textbook. During the cooperative-learning condition, each child was assigned to a four-member team. Each team completed the following group activities: a) key-word peer tutoring, b) fact card peer tutoring and, c) a team activity using worksheets or research activities (e.g., find five facts about Johnny

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Appleseed). Reinforcers were delivered contingently upon the occurrence of the following responses: sharing ideas; correcting each other's work; offering praise; reacting calmly; and encouraging and helping others. A return to the individual-instruction condition followed the initial cooperative-learning condition. The final condition was a reintroduction of the cooperative learning condition. The results of this study demonstrated that the difference between pretest and posttest measures for children in the cooperative-learning condition was greater than that of the children in the individual-learning condition for both of the children with autism, as well as, for their typical peers.

In the studies cited above, the cooperation procedures were designed to ensure that individuals worked together to complete academic tasks. Other studies of cooperation in applied settings have used games to teach cooperative behavior to children (Bay-Hinitz, Peterson & Quilitch, 1994; Orlick, 1981a; Orlick, 1981b; Quilitch & Risley, 1973). In one such study, Orlick (1981b) assessed the

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effects of three procedures on the cooperative and noncooperative play behavior of twenty-eight-preschool children. The three procedures were cooperative instruction, individual instruction, and free play. Each child received training in one of the three. In the cooperative-instruction condition groups of two or more children were taught (using verbal instruction and modeling) to work together to complete a game (e.g., to use their bodies together to balance a ball). In the individual-instruction condition each child was taught (using verbal instruction and modeling) to complete the games by himself or herself. In the free-play condition the children were allowed to play on their own with no instruction regarding how to complete the activity. Following training in these three conditions, the cooperative and noncooperative play behavior of these children was assessed during recess. Orlick found that children who had received training on how to play cooperatively with peers engaged in higher rates of cooperative play during recess than children in the

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individual-instruction or free-play conditions. The author reported that the cooperative play behavior of these children generalized from a trained setting to an untrained setting. Nevertheless, the author did not describe the activities that were available during recess. As a result, one cannot determine the extent to which the stimuli differed in the two settings. Therefore, although the author used the term "generalization" to refer to the outcome, the reader of this article cannot be sure that that term is warranted.

In summary, all of the studies reviewed have several features in common. First, in all of these studies, the structure of the activities was designed to ensure that children had to work together to complete the activity. Second, the stimuli used for cooperation (e.g., math worksheets, games) were those that were commonly found in the individual's educational environment. Using stimuli that are commonly found in the natural environment is one way to program for generalization of cooperative skills from trained responses, stimuli, or settings to untrained

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## Appendix E (continued)

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responses, stimuli, or settings (Stokes and Baer, 1977). Third, in addition to the activities themselves functioning as discriminative stimuli, in many of the studies reviewed, an additional discriminative stimulus for working or playing cooperatively was used. This additional discriminative stimulus was a verbal instruction given by the classroom teacher (e.g., the children were told to work together to complete the activities). It was not clear whether it was the verbal instruction that was exerting control over cooperative responding or the activities themselves. If verbal instruction was exerting stimulus control over cooperative responding, researchers might want to further explore the transfer of stimulus control from the verbal instruction of the classroom teacher to the presence of the activities themselves.

Procedural Descriptions of Cooperative Behavior in Experimental Settings. Some studies of cooperative behavior have been conducted in experimental settings (Azrin & Lindsley, 1956; Gelb & Jacobson, 1988; Loh, 1966; Lounsbury & Bell, 1976; Schmitt & Marwell, 1968; Shackel,

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1976; Smith, Johnson & Johnson, 1982; Vogler, Masters & Morill, 1970).

In this type of setting the tasks are structured so that the contributions of two individuals are required to complete the task. Examples of this type of task structure are presented in the following two studies. In the first study, conducted by Shackel (1976), the effects of differential reinforcement on the acquisition of cooperative behavior in two children with autism were evaluated. In this study, the two children with autism were seated at a table and a piece of paper and one crayon were placed between them. The task required the children to draw a picture together. Cooperative behavior was defined as turn-taking responses (e.g., inviting either verbally or gesturally the other child to have a turn), or attending responses (looking at the other child for two or more seconds). Uncooperative behavior was defined as physically disturbing the other child (e.g., grabbing the crayon, hitting) or rejecting the other child (e.g., refusing to share the crayon at request, refusing to

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participate). The cooperative responses of each child were reinforced with edibles and verbal praise. Occurrences of uncooperative behavior were punished using a time-out procedure in which the child was removed from the table for a duration of one minute. Shackel found that cooperative behavior increased when cooperative responses were reinforced and decreased when cooperative responses were not reinforced. Although these findings are consistent with both the literature on operant learning and the literature on cooperative learning, several questions arise. First, the minimum number of responses that each child had to make to be scored as cooperative was not clearly defined. Would it be score as cooperative if one child drew a nose and the other child drew the rest of the face? Second, it was unclear what instructions were given to the children prior to the start of each session. The author stated that "brief instructions were given prior to the start of each session, the duration of which was measured by a stopwatch." It is possible that the instructions might have varied from baseline to treatment

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sessions, and thus might have been confounded with the introduction of the reinforcement procedure. Third, it is unclear whether the time-out procedure was used during both baseline and treatment conditions and what effect that might have had on the acquisition of cooperative behavior. If it was introduced during treatment it also might have been confounded with the introduction of the reinforcement procedure. In addition, it is also unclear what effect the uncooperative behavior of one child had on the other child. Did the child remaining at the table continue to work on the task or were the materials removed? Also, if there was more uncooperative behavior during baseline than treatment, that too might have been a confound. Lastly, it would be interesting to know whether cooperative behavior would have occurred if more than one crayon had been provided and what effect that would have had on the occurrence of uncooperative behavior.

Another study in which the responses of both members of a pair were required to complete a task was conducted by Lounsbury et al. (1976). In that study, the effects of

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## Appendix E (continued)

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three types of training procedures on the cooperative play behavior of twenty-four pairs of nursery-school children were assessed. The three procedures were no training, partial training, and full training. The activity used in this study was an "auto-beep-car activity" that consisted of a wooden box with figure-eight tracks on each end. Each track had a red and yellow car that could be moved along it. Each child manipulated the cars on one of these tracks. When both red cars were placed at specific mirror image points on the track a reinforcer was delivered (a beeper sounded). Cooperative responses were defined as both children placing their respective red cars in the appropriate positions to activate the beeper.

Uncooperative responses were defined as the manipulation of the yellow car or manipulation of the red car that does not produce the beeper. In the no-training procedure the children were allowed to play with the activity any way they wanted for ten minutes. Instructions on how to activate the beeper were not given. In the partial-training procedure one experimenter modeled how to activate

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a similar type of beeper system with a block-building activity. In the full-training procedure two experimenters modeled how to use the beeper system with the car activity. Lounsbury et al. found that children who participated in the full-training procedure made significantly more cooperative play responses than children who participated in the no-training and partial-training procedures. The higher rate of cooperative responding in the full-training pairs might be attributed to the fact that two experimenters modeled the procedures for activating the beeper system with the car activity. In the partial-training procedure only one experimenter modeled the procedure to activate a similar type of beeper system. As a result, although the children who participated in the partial-training procedure might have known that the toy would beep, they might not have known that it required both children to activate the beeper.

Many of the reviewed studies of cooperation in experimental settings have demonstrated the acquisition of cooperative behavior in the absence of specific

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instructions regarding the cooperative relationship. One such study was conducted by Azrin and Lindsley (1956). In that study, an ABA-reversal-experimental design was used to demonstrate the acquisition of cooperative behavior in ten pairs of school-aged children. They designed a game in which two sticks (styli) were placed into one of three holes on a game board. One child placed his or her styli into a hole. When the other child placed his or her stylus into the hole opposite the stylus of his or her partner within a specified period of time (five seconds), a red light flashed and one jelly bean was delivered to both children. Prior to the start of the session, the children were given three instructions. First, the children were told that the game worked by placing their sticks into all three holes. Second, they were told that they could play the game any way they wanted or they could do anything else they wanted to do. Third, they were told that while they were in that room jellybeans would sometimes fall into the cup and they could eat them then or save them for later. After the instructions were given the instructor left the

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room and did not return until the end of the experimental session. The experimental session was divided into three consecutive experimental conditions, each of which lasted fifteen minutes. In the first condition, the reinforcement condition, every cooperative response was reinforced. This condition was followed by an extinction condition in which cooperative responses were not reinforced. Following this condition, the reinforcement condition was reinstated. Azrin and Lindsley found that cooperative response rates increased when cooperative responses were reinforced and decreased when cooperative responses were not reinforced. In addition, they found that cooperative behavior occurred in the absence of specific instructions regarding the cooperative relationship. Cooperative behavior between children was acquired solely by manipulating the contingency between reinforcing stimuli and the cooperative response.

Another study in which cooperation was acquired without providing instructions regarding the cooperative relation was conducted by Vogler et al. (1970). In that

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study, a shaping procedure was used to teach cooperative behavior to ten pairs of preschool children. The game used in this study closely replicated the game and game requirements used by Azrin et al. (1956). Prior to the start of the experimental session, the children were told "that while they were in this room they might get some M&Ms. They could either eat them at that time or save them for later." The instructor then left the experimental room and did not return until the end of the session. The following shaping steps were used. The children were successively reinforced for approaching the table, sitting at the table, touching the styli, inserting the styli into any of the holes, and finally placing the styli into opposite holes within a specified period of time. Vogler et al. found that cooperative behavior was successfully shaped in five of the ten pairs of children. Again, acquisition of cooperative behavior occurred in the absence of any specific instructions regarding the cooperative relationship. The failure to develop cooperative behavior in the other five pairs of children might be the result of

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the putative reinforcer that was selected. It is not clear that the children had a known history of responding to M&M's as a reinforcer and it was not clear if a preference assessment was conducted prior to the start of the study. It is possible that, for those children, M&Ms were not powerful reinforcers.

In summary, reviewed studies of cooperation in experimental settings had several features in common. First, in all of these studies, the structure of the activities was designed to ensure that two children had to work together to complete the activity. Second, in many of the studies reviewed, the discriminative stimuli for cooperation were embedded in the activity itself. That is, cooperation was acquired in the absence of any verbal instruction to play together. Third, the experimental stimuli were often novel and were not likely to be found in the natural environment of the individual. Although none of the studies reviewed reported generalization data, the use of novel stimuli might have an effect on the generalization of cooperative behavior to other responses,

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stimuli, or settings. For example, it would be interesting to examine the extent to which cooperative behavior acquired in an experimental setting, such as a laboratory, with novel stimuli would generalize to the natural environment, such as a classroom setting.

Summary. In conclusion, studies of cooperation have been conducted in two types of settings: applied and experimental. Studies in applied settings are conducted within the natural environment of the participant. Studies that are conducted in experimental settings occur outside of the natural environment of the participant. In both types of settings, the goal of cooperation is for individuals to work together to complete tasks. Nevertheless, the procedures used to teach cooperation in these two types of settings differ. First, the structure of the tasks in these two types of settings differ. In an applied setting the tasks are structured so that the individuals not only work together to complete a task but are also responsible for their teammates' learning of the task. The contributions of each individual toward

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completion of the task may vary. In contrast, in an experimental setting, the structure of the tasks require that both individuals make a response for a cooperative response to have occurred. Second, cooperation in these two types of settings differ in the stimuli that are used. In an applied setting, the stimuli used for cooperation are commonly found in the natural educational environment of the individual (e.g., social-studies lessons). In contrast, the stimuli used in an experimental setting are often novel stimuli. Third, cooperation procedures in these two types of settings differ with respect to the discriminative stimuli for cooperation. In an applied setting an additional discriminative stimulus for cooperation, typically a verbal instruction from the classroom teacher, was used. Whereas, in an experimental setting the discriminative stimuli for cooperation were typically embedded in the task itself. Lastly, the number of participants needed for cooperative behavior to be scored differ in these two types of settings. In an applied setting, typically the responses of four

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participants are needed for cooperative behavior to be scored. Whereas, in an experimental setting typically the responses of two participants are needed for cooperative behavior to be scored. These differences in procedural descriptions of cooperation between these two types of settings might be due in part to the goals of these procedures. In an applied setting the priority is first to teach the behavior and secondarily to analyze the learning processes involved in cooperation. Whereas, in the experimental setting the primary purpose is to analyze the learning processes involved and secondarily to provide useful behavior change.

Reinforcement Contingencies and the Development of  
Cooperation

One of the most important factors influencing the development of cooperation is the contingent relation between the cooperative response and the consequence (Rosenberg, 1960). A contingent relation exists when a response produces a reinforcer and the absence of that response does not produce a reinforcer (Catania, 1992).

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The result of this contingent relation is an increase in the future probability of the occurrence of the response. Consider an example of a child building a tower with blocks. Every time the child placed a block on the tower he was given a chip. When the child made any other type of response with the blocks (e.g., lined them up on the table) a chip was not delivered. In this example, access to the reinforcer (the chip) was contingent upon the occurrence of the response (the blocks being placed on the tower).

The following section examines the role of reinforcement contingencies in the development of cooperation. First, the use of individual contingencies and group contingencies is discussed. In procedures involving individual contingencies the cooperative responses of each individual are reinforced separately from the responses of his or her partner. In procedures involving group contingencies the responses of two or more individuals are yoked. Second, the parameters of cooperation are discussed in terms of factors affecting the choice to cooperate. These factors include the

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availability of concurrent schedules of reinforcement and differences in reinforcer magnitude within those schedules. Concurrent schedules of reinforcement involve two schedules of reinforcement, each for a different response (i.e., cooperative response and individual response) that operate simultaneously.

Individual Contingencies and Group Contingencies. Some studies of cooperation used individual contingencies to reinforce the cooperative responding of each participant (Cosden et al., 1992; Hake et al., 1973; Hake, Vukelich & Olvera, 1975; Redd, 1969; Shackel, 1976). In these studies, the cooperative responses of each individual were reinforced regardless of the responses made by his or her partner. For example, in a study conducted by Redd (1969) an alternating-treatments-experimental design was used to assess the effects of three different schedules of reinforcement on the acquisition of cooperative behavior of two adolescents boys with mental retardation. The three schedules of reinforcement were: A continuous schedule of reinforcement in which every occurrence of cooperative

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responding was reinforced for each boy. A fixed-interval schedule of reinforcement in which a reinforcer was delivered every 60 seconds and was response independent for each boy. And a mixed schedule of reinforcement in which half of the session reinforcers were delivered contingently upon the occurrence of a cooperative response and other the half of the session reinforcers were delivered response independently using a 60-second fixed-interval schedule for each boy. Each adolescent with retardation participated in a play group with five other boys. It is not clear whether these were typically developing boys. Redd found that the frequency of cooperative responses of each boy with mental retardation was higher when a continuous schedule of reinforcement was used, than when a mixed or fixed-interval schedule was used. Whereas these findings are consistent with the learning literature, several questions arise. First, the definition of a cooperative response is not clear. In this study a cooperative response was defined as the manipulation of a toy while the subject was in physical contact with another child. It is not clear what is meant

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by manipulation of a toy. Did the boys have to complete the same activity? How much did each child need to contribute toward the completion of the activity for the interaction to be scored as cooperative? The requirement of physical contact was also unclear. Would a cooperative response be scored if the boys completed the activity together but were not touching each other? Second, the activities that were used (i.e., balls, trucks, blocks, and a skateboard) might have had an effect on whether cooperative behavior, according to their definition, occurred. For example, if two boys played catch with the ball this would not meet their definition of cooperative behavior because the two boys were not physically touching each other. Third, although individual contingencies were used, it is not clear whether both boys playing cooperatively received reinforcers or only the boy with mental retardation. This might have had an effect on the level of participation of the other boys. The author stated that these other boys rarely initiated play interactions with the boys with mental retardation.

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Lastly, only data on cooperative responding of the boys with mental retardation were reported. It is unclear what effects these reinforcement contingencies had on the cooperative behavior of the other boys that participated in this study.

Another study that used individual contingencies to reinforce cooperative responding was conducted by Hake et al. (1975). In this study the cooperative responding of eight-typically-developing-adolescent boys was assessed using a matching-to-sample procedure. In this procedure, each member of a pair had a matching-to-sample apparatus that consisted of two panels. Pressing a button on one panel produced the sample stimulus (sample panel). The other panel contained the S+ and S- stimuli and buttons for making selections (matching panel). These panels were color coded for each boy (the panels of one boy were brown and the panels of the other boy were green). Each boy was seated in front of a matching panel. The corresponding sample panel was placed next to his partner. The boys could either walk over to their own sample panel and press

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the button to produce the sample stimulus (individual response) or they could remain seated at the table while their partner pressed the button to produce the sample stimulus (cooperative response). Correct matching-to-sample responses of each boy were reinforced with points which were later exchanged for money (one point = one cent). Each boy could earn additional points by making a cooperative response (pressing the sample stimulus button for his partner). Hake et al. found that, for all four pairs of boys, the number of matching-to-sample problems completed cooperatively increased systematically over baseline levels. In fact, by the fourth session of treatment, for all four pairs of boys, all of the matching-to-sample problems presented were completed cooperatively.

In other studies of cooperation, group contingencies were used to reinforce cooperative responses (Ames, 1981; Azrin et al., 1956; Loh, 1966; Lounsbury, 1976; Schmitt & Marwell, 1968). In these studies the coordinated responses of two or more individuals were required to produce a reinforcer. For example, Schmitt and Marwell (1968)

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assessed the effects of the presence and absence of response lights and time-out lights on the cooperative behavior of six pairs of typically-developing-adolescent boys and girls. Each member of the pair was seated in a separate room in front of a panel containing a plunger, a response light, a time-out light, and a counter. When one member of the pair pulled the plunger the response light on their partner's panel was lit for three seconds. A reinforcer was delivered (the counters on each of their panels turned) if the partner pulled his or her plunger within five seconds after the light went out. Reinforcers were not delivered for responses that did not meet this requirement. In other words, a yoked schedule of reinforcement was used. Following the occurrence of a cooperative response a two-second time-out from reinforcement was initiated (the time-out light went out). During this time, responses by either member did not light the response light of the partner and reinforcers were not delivered. At the end of the session, the points earned (final number on the counter) were exchanged for money.

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The cooperative response rates of the pairs were compared under four stimulus conditions. These conditions were: both the response lights and time-out lights were presented; only the time-out light was presented; only the response light was presented; neither light was presented. Schmitt et al. found that the presence of either the response light or the time-out light resulted in high rates of cooperative responses that were similar to the rates of cooperative responding when both lights were presented. When neither light was presented, few cooperative responses occurred. Although the findings demonstrated that high rates of cooperation occurred when either the response lights or the time-out lights were absent, the results did not indicate which stimulus was controlling responding when both were present.

Another study that used a yoked schedule of reinforcement was conducted by Loh (1966). In that study, the acquisition of cooperative behavior in eight pairs of school-aged children was assessed. Each member of the pair was seated in front of a panel that contained a response

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light, a time-out light, a button, and a counter. When one member of the pair pushed the button the response light of his or her partner was lit. If the partner pushed his or her button within a specified period of time a reinforcer was delivered (the counters turned). The author did not specify the duration of the time interval during which responding would produce reinforcement. If the response of one child immediately followed his own response (e.g., one child pushed the button twice before the other child pushed the button) the time-out light was lit for a duration of ten seconds. During the time-out interval cooperative responses were not reinforced. When the counters of each child reached twenty five, the points were exchanged for toys. Loh found that cooperative behavior occurred in all eight pairs of children. In addition, he found that the rate of individual responses (those responses that produced the time-out interval) decreased.

In summary, the use of reinforcement contingencies is an important component in the development of cooperative behavior. Both group-reinforcement contingencies and

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individual-reinforcement contingencies have been used effectively to increase the rate of cooperative responding. Although contingencies may be important for the acquisition of cooperation, in many of the articles on cooperative behavior that were reviewed, descriptions of the cooperative responses and reinforcement contingencies were not clear or were omitted entirely (Ames, 1981; Ashman et al., 1997; Bay-Hinitz et al., 1994; Dugan et al., 1995; Gelb et al., 1988; Johnson et al., 1982; Lounsbury, 1976; Orlick, 1981a; Orlick, 1981b; Shackel, 1976; Smith et al., 1982). Sometimes this made it difficult to identify the dependent and independent variables, and thus to evaluate the effectiveness of the independent variables on the acquisition of cooperation.

Factors Affecting the Choice to Cooperate. The extent to which reinforcement contingencies influence cooperation could further be explored using concurrent schedules of reinforcement. Concurrent schedules of reinforcement involve two schedules of reinforcement that operate simultaneously, each for a different response (i.e.,

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cooperative response and uncooperative response). Several studies of cooperation have used concurrent schedules of reinforcement to evaluate the determinants of choice between uncooperative (individual or competitive) and cooperative responding (Hake, Vukelich & Kaplan, 1973; Schmitt, 1976; Schmitt, 1987; Schmitt & Marwell, 1971a; Schmitt & Marwell, 1971b; Shimoff & Matthews, 1975).

In one such study of concurrent schedules, Schmitt (1976) assessed the effects of reinforcer magnitude on the choice to cooperate or compete in thirty-four female undergraduate students. Each member of a pair was placed in a separate room with a panel containing a plunger, a switch for choosing between cooperative and competitive tasks, a response indicator light, a task indicator light, and two counters, one showing the subject's earnings and the other showing the partner's earnings. At the start of each trial the number of points that could be earned for each type of task was displayed. Each member of the pair then turned the switch to indicate their choice to cooperate or compete. If both members chose to cooperate,

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a cooperative task was presented. If either member chose to compete, a competitive task was presented. At the end of each session, the points on the counters were exchanged for money (one point = one cent). For seven of the pairs an increasing reinforcer sequence was used. In that sequence the magnitude of reinforcement for competitive responding was initially greater than the magnitude of reinforcement for cooperative responding (e.g., six points were delivered for competitive responding and one point was delivered for cooperative responding). If a competitive response was made the magnitude of reinforcement for cooperation was incrementally increased on successive trials until cooperative responding occurred. When cooperative responding occurred the magnitude of reinforcement for cooperative responding was then incrementally decreased until competitive responding occurred. When competitive responding occurred, the magnitude of reinforcement for cooperative responding was again systematically increased. To control for order effects, the remaining ten pairs received a decreasing

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reinforcer sequence. Schmitt found that the choice to cooperate or compete was a function of the magnitude of reinforcement for cooperation and competition. For all participants, choice between cooperative and competitive tasks was manipulated by varying the magnitude of reinforcement. Although the point at which the pairs switched from competitive to cooperative responding and cooperative to competitive responding differed across the pairs, for all pairs cooperative responding occurred when the payoff for cooperation was greater than the payoff for competition. These findings were replicated by Shimoff and Matthews (1975).

Another study that used concurrent schedules of reinforcement to evaluate choice to cooperate was conducted by Schmitt & Marwell (1971a). In that study the authors evaluated the effects of taking money from a partner on the choice to cooperate in four pairs of college students. Each member of a pair was placed in a separate room that contained a panel with a plunger, a switch for choosing between cooperative and competitive tasks, a button for

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taking money from the partner (take button), a response indicator light, a task indicator light, and two counters, one showing the subject's earnings and the other showing the partner's earnings. Two schedules of reinforcement were used (one for cooperative responding and one for individual responding). Cooperative responding produced a higher magnitude of reinforcement (three cents per cooperative response) than individual responding (two cents per individual response). At the start of a trial each member turned the switch to indicate their choice to cooperate or compete. If both members chose to cooperate, a cooperative task was presented. If either member chose to compete, a competitive task was presented. A light on both their panels indicated the task that would be presented based on both their selections. A cooperative task involved coordinated pulls on the plunger from both members of the pair to complete a sequence. An individual task involved consecutive pulls on the plunger by each individual separately to complete a sequence. The counters of each member of the pair were advanced following

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completion of each sequence. At the end of each session, points on the counters were exchanged for money (one point = one cent). During the baseline session, the take button was not available. As would be expected, the pair engaged in a high rate of cooperative responding. During the treatment session, the take button was presented. This button could be activated only when both members chose to cooperate. When one member pressed the take button a dollar was transferred from the partner's counter to his or her counter. Schmitt and Marwell found that the risk of loss disrupted cooperation. All four pairs showed a substantial decrease in cooperative responding when the taking response was available. These findings indicate that differences in the magnitude of reinforcement for cooperative and individual responding were not enough to maintain cooperative responding when the possibility of reinforcer loss was presented. The pairs could have responded cooperatively and not used the take button. It would be interesting to know whether these same results would occur if the difference in the reinforcement

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schedules was greater (e.g., if ten points were delivered for cooperative responding and two points were delivered for individual responding).

Summary. The contingent relation between the occurrence of a cooperative response and the delivery of a reinforcer can be a critical component in the acquisition of cooperation. Two different types of contingent relations have been used in the development of cooperation. The first type of contingent relation reviewed was an individual contingency. In an individual contingency the cooperative responding of each individual is reinforced. With this type of contingency it is possible for one member of a pair to earn more reinforcers than his or her partner. For example, if the cooperative task is completion of a puzzle, it is possible that one child could have earned six reinforcers for putting six puzzle pieces into the puzzle frame and the other child could have earned four reinforcers for putting four puzzle pieces into the puzzle frame. Nevertheless, if the difference in the distribution of reinforcers between the pair was sufficiently large, cooperation would not

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occur (Shimoff et al., 1975). A second type of contingent relation reviewed was group contingencies. In a group contingency the coordinated responses of two or more individuals were required to produce a reinforcer. In this type of contingency, access to reinforcement is contingent upon the responses of all members of the group reaching a specified performance criterion. This might result in a more equitable distribution of responding between the members of the group. Whereas both types of contingent relations were effective in increasing cooperative responding, from the studies that were reviewed it was not clear whether one type produces faster acquisition of cooperation than the other.

To evaluate preference to cooperate over alternative responses (e.g., competitive responses or individual responses) concurrent schedules of reinforcement have been used. The choice to cooperate was directly related to differences in the magnitude of reinforcement in the concurrent schedules. When cooperative responding produced a greater magnitude of reinforcement than alternative

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responding, cooperation increased. Cooperative responding, however, decreased when the potential risk of losing reinforcers during cooperative tasks was presented.

Conclusion

In conclusion, cooperation procedures have had a positive impact on the academic performance (Ashman & Gillies, 1997; Cosden & Haring, 1992; Dugan, Kamps, Leonard, Watkins, Rheinberger & Stackhaus, 1995), social behavior (Bay-Hinitz, Peterson & Quilitch, 1994; Quilitch & Risley, 1973; Vogler, Masters & Morill, 1970), and integration (Ames, 1981; Gelb & Jacobson, 1988; Johnson & Johnson, 1982; Sharan, 1980; Smith, Johnson & Johnson, 1982) of typically developing individuals and individuals with developmental disabilities. Nevertheless, in many of the articles on cooperation that were reviewed, descriptions of the cooperative responses and reinforcement contingencies were not clear or were omitted entirely.

Definitions of cooperation should include two major elements: a description of the cooperative response and a description of the reinforcement contingencies (Schmitt,

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1998). Included in this definition should be a description of the distribution of responding among the members of the group. For example, does the activity require that all members of the group make some response or can the activity be completed by some members of the group? If all members of the group are not required to make a response, it is possible that one member of the group could receive reinforcers noncontingently. This might have an adverse effect on group performance during that activity. If responding by all members of the group are required to produce reinforcement then coordination of responding must be described. For example, does responding by group members have to take place in particular order or in response to a stimulus (e.g., response indicator lights)? Including these elements in the description of cooperative behavior would allow the consumer of that research to better evaluate the effectiveness of the cooperation procedures.

Differences in procedural descriptions of cooperation between applied settings and experimental settings might be

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due, in part, to the goal of the research in those settings. The study of cooperation in applied settings typically focused on teaching cooperative behavior (Ashman & Gillies, 1997; Bay-Hinitz, Peterson & Quilitch, 1994; Dugan, Kamps, Leonard, Watkins, Rheinberger & Stackhaus, 1995; Johnson & Johnson, 1982; Orlick, 1981a; Orlick, 1981b; Quilitch & Risley, 1973; Sharan, 1980; Slavin, 1995; Smith, Johnson & Johnson, 1982). In this type of setting, typically groups of four individuals participated in the cooperative activity and the stimuli that were used were familiar to that setting (e.g., academic lessons or games). Cooperation procedures were designed to ensure that all members of the group learn the activity. Nevertheless, there was insufficient information to determine the extent to which these cooperative procedures created a dependent relation between the responses of the participants. Evaluations of the effectiveness of these procedures were often based on outcome measures, such as, improvements in test scores.

In contrast, the study of cooperation in experimental

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settings typically focused on the learning processes involved in the acquisition of cooperation (Azrin & Lindsley, 1956; Gelb & Jacobson, 1988; Loh, 1966; Lounsbury & Bell, 1976; Schmitt & Marwell, 1968; Shackel, 1976; Smith, Johnson & Johnson, 1982; Vogler, Masters & Morill, 1970). In this type of setting, typically groups of two individuals participated in the cooperative activity and the stimuli that were used were often novel (not likely to be found in the natural environment). Cooperation procedures were designed to create a dependent relation between the responses of the two individuals. Evaluations of the effectiveness of these procedures were often based on systematic changes in the rate of cooperative responding.

Some studies of cooperation investigated the preference for cooperative responding when reinforcement for alternative responses (individual or competitive) was available (Hake, Vukelich & Kaplan, 1973; Schmitt, 1976; Schmitt, 1987; Schmitt & Marwell, 1971a; Schmitt & Marwell, 1971b; Shimoff & Matthews, 1975). Using concurrent

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schedules of reinforcement, the effects of differences in the magnitude of reinforcement for cooperative responding and the potential risk of loss of reinforcers for cooperative responding on the choice to cooperate were evaluated. In these studies, cooperative contingencies were typically in effect only when they were chosen by both subjects. If either subject chose the alternative contingency, it was presented to both subjects. Nevertheless, the researchers could have provided other choice contingencies. For example, cooperative contingencies could be in effect unless both subjects chose the alternative contingency. Another possible choice contingency might be one in which the choice of one subject could determine the conditions for both subjects. Researchers might want to further explore these choice contingencies.

Another area that researchers might want to further explore is the area of generalization of cooperative responding. This might include generalization of cooperative responding from trained settings to untrained

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settings, or generalization of cooperative responding from training stimuli to untrained stimuli. The extent to which generalization is influenced by the type of activity used in training (e.g., novel versus familiar) might also be explored.

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## Appendix E (continued)

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