PATTERNS OF SOCIAL INTERACTION DURING GROUP CONTINGENCIES

By

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Group contingencies are distinct from individual contingencies in that the performance of one individual influences the delivery of reinforcement to another. Thus, group contingencies may occasion other, non-programmed contingencies of a cooperative or competitive nature, although this unique feature of group contingencies has rarely been examined. The purpose of this study was to examine the relative effects of competitive and cooperative group contingencies relative to those of individual contingencies, on performance and social interactions. In addition, we examined both behavior acquisition (sorting) and behavior reduction (out-of-seat behavior) because it seemed likely that reinforcement (Experiments 1 & 2) and punishment (Experiment 3) might occasion different types of interactions. Results showed that all contingencies improved performance from baseline across the three experiments, but that the relative efficacy of group contingencies was mixed when applied to behavior acquisition and reduction using reinforcement and punishment. Some differences in the general pattern as well as specific types of social interactions across cooperative and competitive contingencies were noted. The general results highlight the correlation between changes in performance and interactions during different group contingencies.

CHAPTER 1
INTRODUCTION

Definition and Classification of Group Contingencies

Group contingencies refer to contingencies of reinforcement (or punishment) in which common consequences are determined by the behavior of an individual member of the group, a subset of the group, or the behavior of the entire group (Cooper, Heron, & Heward, 2007; Tankersley, 1995). Group contingencies have been classified in several different ways, but are most often described in terms of the structural arrangement, or whose behavior determines the consequences and to whom these consequences are delivered (Litow & Pumroy, 1975; Neumann, 1977). Litow and Pumroy proposed a classification system based on potential variations in response requirement and reinforcement, which yielded three general categories of group contingencies: independent, dependent, and interdependent contingencies. Although their classification system remains prominent in the literature (Tingstrom, Sterling-Turner, & Wilczynski, 2006), it has been expanded to include additional variants in both response requirement and reinforcement allocation.

An independent group contingency is a common contingency applied to the individual behavior of all members of a group simultaneously. Hopkins, Schutte, and Garton (1971) applied an independent group contingency to the handwriting performance of first and second grade students. Each student was allowed to leave his or her seat and enter the playroom contingent on transcribing a passage from the blackboard. Thus, a common reinforcer, entrance into the play area, was applied to the individual behavior (assignment completion) of all group members simultaneously. The contingency resulted in an increase in both the rate and accuracy of letter formation across both classrooms.

The dependent group contingency, as described by Litow and Pumroy (1975), involves consequences delivered to all members of a group based on the behavior a single or subset of individuals. The individual whose behavior determines reinforcement for the group is sometimes referred to as the "hero." Coleman (1970) provided a nice demonstration of the modification of classroom behavior using a dependent contingency. The on-task and disruptive behavior of four elementary students across different classrooms was targeted. A timer signaled the end of each 10-s interval, and the target student earned a piece of candy if (s)he was on-task for that interval. All earned candy was then divided among the class at the end of each session. In this example of a dependent contingency, reinforcement for the entire class was determined by the behavior a single individual who was also the lowest performer in the class.

The individual whose behavior determines reinforcement for the group during dependent contingencies also has included a single, unidentified group member, the best performer, and the worst performer (Litow & Pumroy, 1975; Buckholdt & Wodarski, 1978). Drabman, Spitalnik, and Spitalnik (1974) compared levels of disruptive behavior for the most and least disruptive students in a classroom under independent and several dependent contingencies. Points were earned for the absence of disruptive behavior, which later were exchanged for minutes of free time. Disruptive behavior of all target students (most and least disruptive students) decreased when the amount of free time for the entire group was based on the performance of the least disruptive, most disruptive, or a randomly selected group member.

Phillips, Phillips, Wolf, and Fixen (1973) described another variation of the dependent group contingency, known as the dependent manager contingency. The "manager" delivered points to or removed points from his peers for their completion of assigned work. The manager also earned or lost points based on the number of chores completed by other group members.

This contingency highlights one in which reinforcement is delivered to a single member of the group based on the behavior of the entire group.

In an interdependent group contingency, consequences are delivered to the entire group based on behavior of the entire group. Allen and Iwata (1980) applied such a contingency for participation in a physical education class. Everyone in the class was required to complete a series of exercises before any class member could participate in a game. Exercise participation increased, and the time required to complete the exercises decreased during the group contingency. Heering and Wilder (2006) used an interdependent group contingency to increase on-task behavior in two general education classrooms. The class received a “yes” if all students in a given row were on task during random observations. Observations alternated across different rows throughout the session, and the entire class received reinforcement if on-task behavior was observed across rows for 75% or more of observations. This is an example of an interdependent group contingency in which the behavior of the entire group, although at different periods of time throughout the session, determined reinforcement for the entire group.

As the above examples illustrate, many variations of group contingencies can be derived from the structural components, or whose behavior determines reinforcement for whom. The key feature of group contingencies is that the behaviors of multiple individuals interact. Therefore, group contingencies, by definition, include a social component. The social aspect of group contingencies is likely the result of changes in the relative distribution of reinforcement among group members; that is, whether an increase in the probability of reinforcement for one member of the group increases or decreases the probability of reinforcement for other members. Several authors have proposed classification schemes that emphasize these social, or functional,

characteristics of group contingencies (Buckholdt & Wodarski, 1978; Michaels, 1977; Slavin, 1977).

Buckholdt and Wodarski (1978) described three general categories of contingencies based on the relative effects of performance across individual group members: individualistic, competitive, and cooperative contingencies. The individualistic contingency prescribes consequences based on individual behavior; thus, performance by one member does not influence the probability of reward for another. The performance of one group member affects the chance of reward for other members during both the competitive and cooperative contingencies, although for different reasons. In the competitive contingency, the availability of rewards is limited such that the success (or failure) of one individual in obtaining reinforcement decreases (or increases) the probability of reinforcement for others. By contrast, the interdependent nature of the cooperative contingency results from consequences resulting from performance by the group as a single unit rather than the behavior of individuals in the group.

Michaels (1977) and Slavin (1977) extended previous classification systems to include both the structure of the contingency (individual versus group) as well as the criterion for reinforcement (standard versus relative), although the authors used somewhat different terminology in their descriptions. The interactions between these two components resulted in four general contingencies including individual (independent) contingencies, group cooperative contingencies, individual competitive contingencies, and group competitive contingencies. Individual contingencies are no different than the independent contingency described by Litow and Pumroy (1975) and involve the simultaneous application of a contingency to the behavior of more than one individual such that the probability of reinforcement for one person does not affect the probability of reinforcement for another.

Competitive contingencies involve the distribution of reinforcement based on the relative performance of group members. Gresham and Gresham (1982) used a competitive contingency during which each student in a classroom had the opportunity to earn reinforcement if five or fewer instances of disruption were observed. However, only the individual(s) who emitted the fewest number of disruptions actually received reinforcement. For example, if one subject engaged in three instances of disruption, whereas another student engaged in only two instances of disruption, only the second subject would receive reinforcement.

When competitive contingencies are applied at the group level, the performance of one group is evaluated relative to the performance of other groups. Therefore, as the probability of reinforcement increases for one group, the probability of reinforcement decreases for other groups. By contrast, performance under group cooperative contingencies usually is compared to some standard criterion, and the probability of reinforcement for *all* members of the group increases as the probability of reinforcement for *any* member of the group increases. The Good Behavior Game (GBG), first described by Barrish, Saunders, and Wolfe (1969), may be categorized as either a group competitive or group cooperative contingency, depending on whether the classroom is divided into teams or performs as a single unit, respectively. In the competitive arrangement, instances of problem behavior by any team member result in a tally mark for the whole team, and the team(s) with the fewest tally marks at the end of the session receives reinforcement. In the cooperative arrangement, usually implemented with as single group (classroom), instances of problem behavior by *any* group member would result in a tally mark for the entire class, and reinforcement for all class members would be contingent on receiving fewer than a specified number of tally marks as a group.

Slavin (1977) noted the important point about group reward structures (contingencies) and their effects on behavior. Although group contingencies can be applied in a competitive or cooperative arrangement, the occurrence of competition or cooperation is not guaranteed. Competitive and cooperative contingencies refer simply to descriptions of the allocation of consequences for specified responses. Competition /cooperation, on the other hand, refer to sets of specific responses that may or may not occur during group contingencies. In fact, Slavin declared such social outcomes as, "dependent variable(s) whose occurrence needs to be documented (p. 634)."

Applications of Group Contingencies

Group contingencies produce changes in behavior via programmed consequences, and in this sense are no different than individual contingencies. Therefore, group contingencies lend themselves to the application of a range of independent variables based on both positive and negative reinforcement as well as punishment. In addition, group contingencies have been applied across a variety of dependent variables including skill acquisition and behavior reduction, as well as across a variety of settings and populations.

Most applications of group contingencies to increase behavior have focused on the use of reinforcement-based procedures to improve academic performance. Lloyd, Eberhardt, and Drake (1996) described an example of a common contingency. The experimenters increased performance on Spanish vocabulary quizzes using an independent contingency coupled with group study. Students were given the opportunity to study for the quiz in a small group format, but reinforcement was contingent on individual quiz performance. A small tangible and social praise were delivered to each student who received a score of 90% or above on the quiz. Williamson, Williamson, Watkins, and Hughes (1992) compared the effects of independent and dependent contingencies on performance during an arithmetic estimation task (guessing the

number of items in a jar). The independent contingency was competitive within each class such that a single winner received reinforcement for the correct estimation. During the dependent contingency, a correct guess by any student resulted in reinforcement for the entire class, and more than one class could win each week.

Many examples of the application of interdependent group contingencies to skill acquisition can be found in the literature. A common interdependent contingency applied to behavior acquisition is the cooperative version of the GBG, which involves reinforcement based on the performance of a single team as compared to some standard criterion. Lutzker and White-Blackburn, (1979) used a variation of the GBG, during which either positive reinforcement (candy) or negative reinforcement (early dismissal from work) was contingent on an increase in the number of boards sorted by work teams in a rehabilitative work program.

Another common variation of the interdependent contingency requires all group members to engage in the target response simultaneously. For example, Packard (1970) increased the attentive behavior of elementary students using an interdependent contingency. A light signaled the inattentive behavior of any student in the class, and reinforcement (token) was contingent on the attentive behavior of all students in the class for a specified amount of time. Other experimenters have applied positive reinforcement during interdependent contingencies to increase play skills (Kohler, Strain, Hoyson, & Davis, 1995), homework completion (Olympia, Sheridan, Jenson, & Andrews, 1994), and oral hygiene (Swain, Allard, & Holborn, 1982), as well as negative reinforcement to increase prosocial peer behavior (Skinner, Cashwell, & Skinner, 2000) and vocational performance (McNally, Norusis, Gentz, & McConathy, 1983).

The application of group contingencies using both reinforcement and punishment-based interventions for behavior reduction is also well documented. Several variations of differential

reinforcement have been applied to behavior reduction across different types of group contingences including differential reinforcement of alternative behavior (DRA), differential reinforcement of low rate behavior (DRL), and differential reinforcement of other behavior (DRO). Hermann, DeMontes, Dominguez, Montes, and Hopkins (1973) decreased the occurrence of tardy arrivals to work with an independent DRA contingency. Tardy arrivals decreased when workers earned monetary vouchers for timely arrivals (the alternative behavior) that were paid out at the end of each workweek. Reid, Schuh-Wear, and Brannon (1978) also targeted employee behavior through differential reinforcement. The authors decreased staff absenteeism through an interdependent contingency that involved preferred days off (weekends) for low rates of absenteeism (DRL).

Differential reinforcement of other behavior involves the delivery of reinforcement contingent on the absence of the target response, or the delivery of reinforcement contingent on other behavior. For example, Putnam, Handler, Ramirez-Platt, and Luiselli (2003) used an independent DRO contingency under which students earned lottery tickets contingent on the absence of inappropriate bus riding behavior. Group DRO contingencies have also been applied to stealing (Switzer, Deal, & Bailey 1977) and disruptive classroom behavior (Drabman et al., 1974), as well as interventions for drug addicts (e.g., Kirby, Kerwin, Carpenedo, Rosenwasser, & Gardner, 2008; Liebson, Cohen, & Failace, 1972).

The most common punishment procedure applied to behavior reduction during group contingencies is a response cost procedure, which involves the contingent removal of reinforcement following the occurrence of the target response. Within the context of group contingencies, response cost procedures often consist of the removal of conditioned reinforcers such as tokens or points. Witt and Elliot (1982) reduced inappropriate classroom behavior with

an independent response cost contingency. Students began each session with a fixed number of paper slips on their desk but lost one slip of paper for each occurrence of inappropriate classroom behavior. At the end of the session, remaining slips, if any, were entered into a lottery for the opportunity to earn various reinforcers. Group response costs also have been implement under interdependent contingencies that have targeted inappropriate vocalizations within the classroom (Salend & Lamb, 1986), disruptive behavior (Axelrod, 1973; Fabiano et al., 2008), and cash shortages of store clerks (Marholin & Gray, 1976).

The Relative Efficacy of Group Contingencies

Although the general effectiveness of group contingencies has been extensively demonstrated, comparisons across variations are necessary to establish their relative efficacy (Litow & Pumroy, 1976; Theodore, Bray, & Kehle, 2004). Two-way comparative studies have almost exclusively compared the effectiveness of independent and interdependent contingencies and have reported mixed results. Several studies have reported equal effectiveness between contingencies (Axelrod, 1973; Frankosky & Sulzer-Azaroff, 1978; Shores, Apolloni, & Norman, 1976), whereas other studies have reported superior effects under the interdependent contingency (Lloyd et al., 1996; Long & Williams, 1973; Pigott, Fantuzzo, & Clement, 1985).

Mixed results have also been reported in three-way comparison studies (Alric, Bray, Kehle, Chafouleas, & Theodore, 2007, Gresham & Gresham, 1982; Speltz, Shimamura, & McReynolds, 1982; Theodore et al., 2004; Shapiro & Goldberg, 1986). Alric et al. (2007) conducted a comparison of the effects of independent, interdependent, and dependent group contingencies on the reading fluency of fourth grade elementary students. Similar effects were observed across the three contingencies: reading fluency improved when reinforcement was delivered contingent on individual performance (independent), the performance of a randomly selected student (dependent), or the average performance of the group (interdependent). Thus,

the results of the Alric et al. study replicated the outcomes of previous studies on the relative efficacy of group contingencies in increasing academic performance (Shapiro & Goldberg, 1986; Speltz et al., 1982).

Gresham and Gresham (1982) published one of the first three-way comparative studies on group contingencies applied to behavior reduction. The authors compared the efficacy of independent, interdependent, and dependent group contingencies in reducing disruptive behavior in the classroom. Both the interdependent and dependent contingencies were effective in decreasing disruption, with slightly greater reductions observed under the interdependent contingency. However, the results of this study may be limited by the unique, competitive nature of the independent contingency. The independent contingency is typically set up such that each member of the group who meets some standard criterion receives reinforcement. Gresham and Gresham used a competitive-independent contingency during which only the best performers received reinforcement. Therefore, the results of Gresham and Gresham's study may not extend to comparative studies that employed the more typical independent contingency.

More recently, Theodore et al. (2004) compared the efficacy the three types of group contingencies using a DRL procedure to decrease the disruptive behavior of three students with emotional disorders. During the independent contingency, any student who engaged in five or fewer instances of disruption received reinforcement. The behavior of an unidentified student determined reinforcement for the entire class during the dependent contingency. Reinforcement during the interdependent contingency required on all students to meet the DRL criterion of five or fewer instances of disruption. Although all three contingencies produced noticeable reductions in disruption for all subjects, the dependent contingency produced superior effects for two of the subjects, and the independent contingency produced the greatest effect for the third subject.

In summary, the overall effectiveness of group contingencies has been repeatedly demonstrated; however the relative effectiveness of specific variations of group contingencies is less clear. The mixed results obtained in comparison studies may be the result of a number of variables. First, procedural differences across studies might account for discrepant results obtained (e.g., a dependent group contingency applied in one study may not be comparable to a similar contingency used in another). Michaels (1977) warned against cross-study comparisons due to the vast number of ways group contingencies differ across applications. Second, different results across comparisons may be related to the way in which dependent variables are measured and summarized. Several authors have noted differences in relative effects across individuals within a single study. Similarly, conclusions across studies may differ based on whose behavior is taken into account and at on what level the analysis is conducted. Finally, it could be the case that unidentified variables are responsible, such that discrepant results across similar direct contingencies may be the due to other non-programmed events. For example, discrepant results could be attributed to variability in social interactions across comparison studies. As Slavin (1977) pointed out, although competition and cooperation are not guaranteed to occur within group contingencies, they are possible outcomes. Given the number of variables that may account for the effects of group contingencies, a closer examination of the behavioral mechanisms operating during group contingencies is warranted.

Advantages and Drawbacks of Group Contingencies

Several advantages of group contingencies over individual contingences have been discussed in previous research. The most obvious benefit is simplicity; group contingencies are easier to implement given that the same contingency and reinforcers are applied to the behavior of multiple individuals simultaneously (Alexander, Corbett, & Smigel, 1976; Axelrod, 1973; Gresham & Gresham, 1982; Long & Williams, 1973; Tingstrom et al., 2006). The other potential

advantage of group contingencies is the use of peers as behavior-change agents (Alric et al., 2007; Crouch, Gresham, & Wright, 1985; Litow & Pumroy, 1975). Consequences for the group may occasion as prompts or reminders, as well as consequences such as praise or disapproval. Several studies have included anecdotal reports of such social behavior within group contingencies. For example, Gresham and Gresham (1982) reported that social interactions during an interdependent group contingency included both peer praise for appropriate behavior and reprimands for inappropriate behavior. Similarly, Packard (1970) reported that peer pressure in the form of reminders to pay attention and praise in the form of congratulations was observed during an interdependent group contingency on classroom attending behavior.

One criticism of group contingencies is that some group members may lose reinforcement based on the behavior of others (Gresham & Gresham, 1982; Marholin & Gray, 1976). This criticism has been discussed in terms of skill deficit, in which case some members of the group may not have the skills required to meet the contingency (Litow & Pumroy, 1975), as well as lack of motivation, in which case some group members may be reinforced by sabotage of group reward (Crouch et al., 1985; Kelshaw-Levering, Sterling-Turner, Henry, & Skinner, 2000).

Although the social interaction among group members is considered one of the major advantages of group contingencies, particular interactions, such as negative peer-pressure are also the source of criticism (Harris & Sherman, 1973; Salend & Lamb, 1986; Shores et al., 1976; Tingstrom et al., 2006). The occurrence of negative peer pressure has been reported during group contingencies that applied both reinforcement and punishment procedures. Shores et al. (1976) noted the occurrence of verbal threats during the initial implementation of an interdependent DRA contingency to increase on-task behavior. Similarly, Axelrod (1973) reported that peer pressure in the form of verbal threats was observed during an interdependent response cost

contingency to reduced classroom disruption, whereas no instances of verbal threats were observed during the independent contingency.

Non-programmed Social Contingencies

As suggested by several authors, non-programmed social contingencies may play a critical role in the effectiveness of group contingencies (Cosden & Harring, 1992; Litow & Pumroy, 1975; Tingstrom, et al., 2006). However, few studies to date have systematically examined non-programmed social interactions within group contingencies.

Shores, et al. (1976) measured the frequency of task related and non-task related verbalizations among a group of five boys during independent and interdependent group contingencies for on-task behavior. An increase in task related comments, which included statements regarding schoolwork, the token economy, or other contingencies such as back-up reinforcers, was observed during the interdependent contingency but not the independent contingency. No change in non-task related comments, which included general conversation or unintelligible speech, was observed across conditions. The authors further noted that the type of task-related comments changed throughout the group contingency: More negative comments such as threats were initially observed, whereas comments in the form of prompting and social praise were observed during later sessions.

Frankosky and Sulzer-Azaroff (1978) examined positive and negative social interactions among groups of men with developmental disabilities during independent and interdependent contingencies for block sorting. Data were collected during both the task period itself, and a subsequent snack period to examine potential carryover effects of changes in social interaction observed during the group contingency. The authors reported decreases in negative interactions and increases in positive interactions during both task sessions and subsequent snack periods during the interdependent contingency as compared to the independent contingency. One

limitation of the study was that general discussion among group members was scored as positive interaction; therefore, it is unclear if the increases in positive interactions observed during the group contingency was in the form of task related interactions, such as encouragement or prompting, or if they were simply an increase in unrelated conversation. Furthermore, all groups maximized reinforcement during both the independent and interdependent group contingencies, so the effect of increases in positive social interactions on task performance remains unclear.

Speltz et al. (1982) extended the findings of Frankosky and Sulzer-Azaroff (1978) by examining social interactions under variations of group contingencies for the completion of math worksheets. Social interactions were categorized as positive (encouragement, assistance), negative, or neutral (general conversation). Low levels of negative interactions among peers were observed across all variations of group contingencies, and an increase is positive interactions was observed during the dependent (hero) contingency. A more detailed analysis showed that the increase in positive interactions observed during the dependent contingency was largely directed at the target student. Although results of this study indicated that the most frequent interactions across all contingencies were neutral, different types of contingencies may promote different types of interactions.

Together, these studies provide preliminary data to suggest that the frequency type of social interactions may differ across variations of group contingencies. However, data from additional subjects would be required to support this finding because previous studies that examined social interactions across group contingencies all involved cooperative contingencies. It may be the case that social interactions differ along other dimensions during group contingency procedures. For example, no study has analyzed social interactions across group contingencies targeting increases in responding as compared to contingencies targeting decreases

in responding. It is possible that the proportion of negative to positive interactions would be different across such applications. More specifically, differences in social interactions may exist within the same type of group contingencies across contingencies aimed at behavior augmentation or behavior reduction. In addition, previous research has been limited to examining social interactions under cooperative contingencies, and it seems likely that interactions may differ under cooperative and competitive contingencies.

In summary, although a great deal of research has been conducted on the effects of group contingencies, conclusions about relative effectiveness have been mixed. In addition, it was often unclear how behavior was changed because the unique feature of group contingencies, non-programmed social interactions, has rarely been examined. Thus, the purpose of this study was to examine both performance and social interaction across competitive and cooperative contingencies applied to behavior acquisition and reduction using similar methodology. Experiment 1 examined patterns of interaction under different contingencies of reinforcement for behavior acquisition. Experiments 2 and 3 focused on interactions under contingencies of reinforcement (Experiment 2) and punishment (Experiment 3) for behavior reduction.

CHAPTER 2
GENERAL METHOD

Subjects and Setting

Two groups, consisting of three individuals diagnosed with intellectual disabilities, participated in Experiment 1, 2, and/or 3. Table 2-1 lists information about each subject's age and diagnosis as well as group assignment. Each subject was observed prior to the study to confirm that he/she met the language criterion of a minimum vocal repertoire of two-word utterances (e.g., "help please"). All subjects exceeded this minimum repertoire and communicated using complete sentences. In addition, all subjects were able to follow verbal instructions. Members of each group were classmates at the beginning of the experiment, and therefore, shared a history of social interactions. Formal observations of group interactions were not conducted prior to the start of the experiment.

Sessions were conducted at a special education school in either a classroom that contained typical materials (toys, books, desks, chairs, etc.) or a therapy room equipped with tables, chairs, and materials necessary for each session. All sessions were 7 min in length and were divided into a 5-min task period followed by a 2-min break period. Two to 4 sessions were conducted per day, typically 3 to 5 days per week, based on subject and experimenter availability. Sessions were conducted only on days that all group members were available.

Preference Assessments

Two assessments were conducted prior to the start of each experiment. A paired stimulus (PS) preference assessment (Fisher et al., 1992) was conducted with each subject to identify preferred edibles to be used as reinforcers in subsequent sessions. The subject first sampled each of nine edible items. Subsequently, the therapist presented the items in pairs, and the subject was instructed to pick the preferred one. An approach response was recorded if the subject touched or

pointed to one of the items. The subject was allowed to consume the approached item, and the therapist removed the non-approached item. If the subject did not emit an approach response on a given trial, the therapist removed both items and represented the trial. If still no approach response was emitted, the items were removed, and the next trial was presented. Each edible was paired with every other item, and the position of items was counterbalanced across trials. Preference rankings were calculated following the completion of the assessment based on the percentage of trials on which each item was approached. Only edible items that all group members selected on 75% or more of trials were selected for use as reinforcers.

A multiple stimulus without replacement (MSWO) preference assessment (DeLeon & Iwata, 1996) was conducted with each subject to identify high-preferred (HP) leisure items to be used in subsequent conditions. The subject was exposed to eight activity items prior to the assessment. The therapist then presented an array of all items to the subject, who was instructed to choose the preferred one. The subject was allowed access to the selected item for 30s, at which time the therapist removed the item from the array and instructed the subject to choose another item from the remaining array. When all items had been selected or when no item was selected across two presentations, a new trial began with the presentation of all items. Following the completion of two trials, a preference hierarchy was calculated by dividing the number of times each item was selected by the number of times each item was presented in the array. HP activity items were defined as items that were ranked 1st to 3rd in the preference hierarchy.

Response Measurement and Reliability

During the preference assessments, trained observers collected data on the subjects' selections on each trial. A second observer independently recorded each subject's selections on a mean of 76.3% (range, 33.3% to 100%) of trials. Reliability scores were calculated by comparing the observers' records on each trial. An agreement was scored if both observers recorded

selection of the same item. The number of trials with agreements was divided by the total number of trials (agreements plus disagreements) and multiplied by 100. Mean agreement scores across subjects were 99.7% (range, 97.2% to 100%) for edible PS assessments, and 98.6% (range, 93.8% to 100%) for activity MSWO assessments.

All baseline and treatment sessions were videotaped using a RCA handheld video recorder and were scored later for social interactions during group activities. Frequency data were collected across 13 categories of vocal and/or non-vocal social interactions (see Table 2.3 for examples) and were categorized as either positive or negative in tone. The categories of social interactions were derived from those used in previous research (Frankosky & Sulzer-Azaroff, 1978; Speltz et al., 1982) as well as from pilot observations.

Three types of interactions were summarized as *Facilitate performance*: *Offer help* was defined as providing information or providing materials related to the task to another group member, *Explain* was defined as any statement about the current contingency or session, and *Demonstrate/Prompt* was defined as any instruction or demonstration of action directed at another group member. *Perform others work* was scored if one group member completed the work assigned to another group member. *Praise/Encouragement* included both vocal and non-vocal interactions that expressed approval of the current behavior of another group member. *Threaten/Criticize/Complaint* included statements about aversive results for another group member's behavior, negative comments to another member of the group about his/her appearance or behavior, and statements expressing disappointment or annoyance of the current situation. *Seek Help* was divided into two subcategories: *Ask for Information* was defined asking a question about the task or contingency that required a verbal response from another group member, and *Ask for Assistance* was defined as asking for help that required a physical response

from another group member. Both *Self-Instruction*, defined as statements about the current contingency not directed at another group member, and *Tact of Task*, defined as statements about one's own materials or task related behavior not directed at another group member, were scored as subcategories under *Nonspecific task related comment. Sabotage* included misleading or untrue statements /information about the contingency, prompts for other group members to engage in non-task related behavior, and attempts to steal or undo another group member's work. *Non-task related comments* included any statement or question unrelated to the task materials, task behavior, or reinforcers. *Other Problem Behavior* was defined as aggression (hitting, kicking, throwing objects), self-injurious behavior, or destruction to property.

Social interaction data were summarized for each subject and each group as rate of positive and negative interactions per session component (task and break). The specific types of positive and negative interactions were summarized as proportion of total interactions per condition, which was calculated by summing the total number of interactions per condition and dividing the number of positive or negative interactions within a given category by the total number of interactions within that condition.

An independent observer collected data during 30.5% (range, 28.4% to 37%) of all sessions across groups and experiments. Each videotaped session was time stamped, which allowed two observers to independently watch and score the session at different times. Reliability was determined for social interactions by dividing each session into consecutive 10-s intervals, dividing the smaller number of responses by the larger number of responses for each interval, averaging the fractions across all intervals, and multiplying by 100. Mean agreement scores were then calculated across categories for all groups and experiments. Mean agreement was 99.3% (range, 70.8% to 100%). Lower agreement scores usually were the product of

disagreements in tone (positive versus negative) across observers while both observers agreed on the category of the interaction.

General Procedure and Experimental Design

All sessions were 7 min in length and were divided in to continuous 10-s intervals. The first 5 min of each session consisted of a task period, and the last 2 min of each session consisted of a reinforcement, or break, period. An array of HP activity items was present across all task periods but not during the break period that followed each task period. Break periods were conducted following every task period, including task periods in which the subjects did not meet the criteria for reinforcement. The inclusion of the break period allowed for the examination of social interactions following the delivery (or non-delivery) of consequences for performance. Prior to each session, the therapist read a scripted instruction to the group (see Table A-1), prompted all group members to engage in the task, and reviewed the contingency for the behavior of each group member. Following the task period, the therapist instructed all subjects to sit in a predetermined break area, reviewed each subject's performance, counted out the number of edibles earned and/or lost, and delivered reinforcement to the corresponding group members.

The following conditions were evaluated in an ABACADAX reversal design in which (A) was Baseline, (B) the Independent Contingency, (C) the Competitive Contingency, (D) the Cooperative Contingency, and (X) a replication of the most effective contingency, if one was identified. Different colored materials and t-shirts worn by the subjects served as discriminative stimuli (S^D) and corresponded to the contingencies in place across conditions as follows:

Baseline: All subjects were given white t-shirts to wear and white materials.

Independent and Competitive: Each subject was given different colored t-shirt to wear and individual materials that corresponded to each t-shirt color.

Cooperative: All subjects were given orange t-shirts and orange materials.

Table 2-1. Subject characteristics.

Subject	Age	Group	Diagnosis	Experiment
Cal	20	A	Trainable mental handicap, speech/language impaired	1
Tess	19	A	Intellectual Disability, language impaired	1
Diane	21	A	Intellectual Disability	1
Glen	19	B	Orthopedically impaired	2,3
Scott	19	B	Intellectual Disability	2,3
Walt	18	B	Intellectual Disability, speech/language impaired	2,3

Table 2-2. Results of edible and activity preference assessments.

Group (Experiment)	HP edible item	HP activities
A (Exp 1)	Smarties	Paper and markers, Light Bright, beads with string, blocks, Perfection, and piano
B (Exp 2)	Smarties	Paper and markers, blocks, piano, guitar, cars, and sports magazine
B (Exp 3)	Cheese Balls	Paper and markers, blocks, piano, guitar, Light Bright, Perfection game, and clay

Table 2-3. Social interaction categories and examples.

Category		Example	
		Vocal	Non-Vocal
Facilitate Performance	Offer help	"Need help?"	Sharing materials
	Explain	"You get snacks for sorting the."	—
	Demonstrate / Prompt	"Sit down"	Model response, Pointing to materials
Perform others work		—	Sorting into someone else's bin
Praise / Encouragement		"Nice job!" "Keep up the good work!"	Thumbs up, Pat on the back
Threaten / Criticize / Complaint		"Stay in your seat or else!" "Stop that!"	Shake head in disappointment
Seek Help	Ask for information	"What is this?" "What do we earn?"	—
	Ask for assistance	"Help please"	Signing help, holding items up
Nonspecific task-related comment	Self-instruction	"If I sort the silverware I get a snack."	—
	Tact of task	"I did one."	—
Non-task related comments		"I like to swing on the playground" "I hate Mondays"	—
Sabotage other's work		"You don't have to work to get a snack." (Lie)	Stealing materials, Undoing another's work
Other Problem Behavior		Vocal stereotypy	Aggression, disruption

CHAPTER 3
EXPERIMENT 1: REINFORCEMENT OF SKILL ACQUISITION

The purpose of Experiment 1 was to examine the types of performance and social interactions generated by group contingencies applied to behavior acquisition. The effects of the contingencies were evaluated during a categorical sorting task that required the subjects to sort picture cards onto corresponding category cards. Group A (Diane, Cal, and Tess) participated in Experiment 1.

Response Measurement and Reliability

Data were collected on the frequency of correct and incorrect sorting for each subject and were summarized as the frequency of responses per subject and as a group mean per session. Correct and incorrect sorting were scored as product measures after the completion of the 5-min task period. Correct sorting was defined as a single picture on the corresponding category board. Incorrect sorting was defined as a picture on a category board that did not correspond to the category of the picture card.

An independent observer collected data during 51.5% (range, 42% to 60%) of all sessions across subjects. Reliability for the number of pictures sorted correctly and incorrectly was determined by dividing the smaller number of responses scored by the larger number of response scored and multiplying by 100. Mean agreement for cards sorted correctly and incorrectly across subjects was 99.4% (range, 91.4% to 100%) and 99.2% (range, 75% to 100%), respectively.

Procedure

During each session, the subjects were seated at a table with task materials. Sorting materials consisted of 1” by 1” line drawings created with Board Maker © software and 8.5” by 11” category boards labeled with pictures corresponding to each of the five categories: play, work, hospital, holiday, and nature. Three sets of materials consisting of 50 sorting cards (10

cards per category) and five category boards were rotated throughout baseline, independent, and competitive contingencies, and all sets of materials were combined during the cooperative contingency. Individual sets of materials were identical except that the picture cards for each category differed such that when the sets were combined there would be no duplicate pictures with a given category. An array of HP activity items was placed on an adjacent table. Subjects had the opportunity to earn up to 10 pieces of a preferred edible per session for correct sorting.

Baseline. Following the 5-min task period, the therapist counted the number of cards sorted correctly and incorrectly. No edible reinforcement was delivered for correct sorting during baseline. All subjects sat at an empty break table for 2 min following each task period.

Independent. Each subject earned one edible for every 5 pictures sorted correctly (fixed ratio or FR5 schedule). The therapist counted correct and incorrect pictures from each subject's category cards and placed one edible on a plate for every 5 pictures sorted correctly. The therapist stated the number of edibles earned by each subject, and subjects were allowed to consume their earned edibles during the subsequent 2-min break period.

Competitive. The individual in each group who sorted the most pictures correctly earned one edible for every five pictures sorted correctly. In the case of a tie, such that two or more subjects correctly sorted the same number of pictures, the number of earned edibles was divided among the subjects. The therapist counted each subject's work as in the previous condition, stated how many pictures each individual correctly sorted, stated the individual(s) who sorted the most pictures correctly, and delivered the edibles to that or those individual(s).

Cooperative. The group was given a group bin with 150 picture cards (30 per category) and one set of category cards. Each subject earned one edible for every 15 pictures sorted correctly by the group (FR15). For example, if the group correctly sorted 120 pictures correctly,

24 edibles were delivered to the group, eight pieces to each group member. The therapist placed three plates on the table and counted the groups' sorting cards by placing groups of 5 correctly sorted pictures in front of each plate. The therapist placed an edible on each subject's plate every time 5 pictures were placed in front of all plates. The therapist stated and delivered the number of edibles earned by the group and each individual (e.g., "Your group earned fifteen pieces today, so you each get 5 pieces of candy").

Results

Figure 3-1 shows Group A's (Diane, Cal, and Tess) performance on the sorting task. The top panel shows the mean frequency of correct and incorrect sorting for the group across the different contingencies, and the bottom panel shows individual performance by the three group members. All three contingencies resulted in increased levels of correct sorting at the group level. However, somewhat different patterns of responding across the contingencies were observed at the individual level.

Group A sorted during only the first session of the initial baseline condition. A pattern characteristic of acquisition was observed at both the individual and group level during the independent contingency. That is, the frequency correctly sorted cards increased, whereas the frequency of incorrectly sorted cards decreased (although only slightly) across this condition. Sorting was highly variable during the second baseline condition. The competitive contingency resulted in an immediate increase in mean correct sorting to a level slightly higher than that observed during the independent contingency, and mean correct sorting continued to increase slightly across this condition. Similarly, rates of incorrect sorting, low to begin with, decreased gradually during the competitive contingency condition. None of the subjects in Group A sorted during the third baseline condition. Correct sorting increased during the cooperative contingency, although not as high initially as was observed during the competitive contingency. However, by

the fourth session of this condition, responding increased further to levels similar to those observed during the competitive contingency. Near zero levels of incorrect sorting were observed throughout this condition. In summary, all three contingencies—independent, competitive, and cooperative—increased the group's mean frequency of correct sorting above baseline levels. However, the competitive and cooperative contingencies resulted in somewhat superior effects as compared to the effects of the independent contingency.

The bottom panel of Figure 3-1 shows the performance data for individual group members. Of the three group members, Tess engaged in the highest frequency of sorting during the independent contingency. Diane and Cal engaged in similar levels of correct sorting during the independent contingency, although Diane's performance was more variable than Cal's. All three of subjects sorted at higher frequencies during the competitive contingency relative to the independent contingency. Diane's sorting increased across this condition, whereas Cal and Tess's frequency of correct sorting was stable. Performance across the three subjects converged during the cooperative contingency as compared to individual performance during both the independent and competitive contingencies: The frequency of Diane's correct sorting was similar to her performance during the competitive contingency, Cal's correct sorting increased relative to his performance during the competitive contingency, and Tess's correct sorting decreased as compared to her performance during the competitive contingency. Thus, although the competitive and cooperative contingencies resulted in similar patterns of responding at the group level, the same was true for only one of the three subject's (Diane) individual performance.

Figure 3-2 shows the rate of positive and negative interactions across the task and break periods for Group A. All types of interactions increased across both the task and break periods during the initial baseline condition. An initial decrease in all interactions occurred with the

implementation of the independent contingency. Positive interactions during the task period then increased before again decreasing to moderate levels. The group engaged in moderate to high, but variable rates of positive interactions during the break period of the independent contingency. Negative interactions remained low during the task period but increased during the break period of the independent condition. During the second baseline condition, positive interactions during the task and break periods were similar to those observed in the initial baseline. Negative interactions were variable during the task period, and initially high rates of negative interactions occurred during the break period followed by a decreasing trend to moderate levels. Positive interactions increased during the task period of the competitive contingency, whereas positive interactions during the break period occurred at moderate levels. Near zero levels of negative interactions occurred during the task period of the competitive contingency, whereas negative interactions remained low during the break period. All interactions increased during both the task and break periods of the third baseline condition; positive interactions increased to moderate rates, and negative interactions remained relatively low. During the cooperative contingency, the group engaged in moderate rates of positive interactions across the task and break periods. Negative interactions throughout the cooperative contingency were low but variable.

Figure 3-3 shows the proportion of positive and negative interactions that occurred across nine different social categories for each condition. Positive, non-task related comments accounted for the largest proportion of interactions across the three baseline conditions, followed by other problem behavior in the form of minor aggression (e.g., throwing shirts, slapping), and positive threats, criticisms, and complaints in the form of teasing. When the independent contingency was in effect, positive and negative threats, criticisms, and complaints accounted for nearly half of all interactions among the group members. As compared to baseline, there was

noticeable decrease in non-task related comments and other problem behavior during the independent contingency, and a slight increase in non-specific task related comments in the form of labeling the categories while sorting. The group engaged in the largest proportion of non-task related comments and the smallest proportion of problem behavior during the competitive contingency. The most significant change in the distribution of social interactions was observed during the cooperative contingency. The largest proportion of task-related, facilitative interactions was observed under the cooperative contingency. More specifically, the group engaged in labeling of the categories, requesting help, and verbal and gestural prompting.

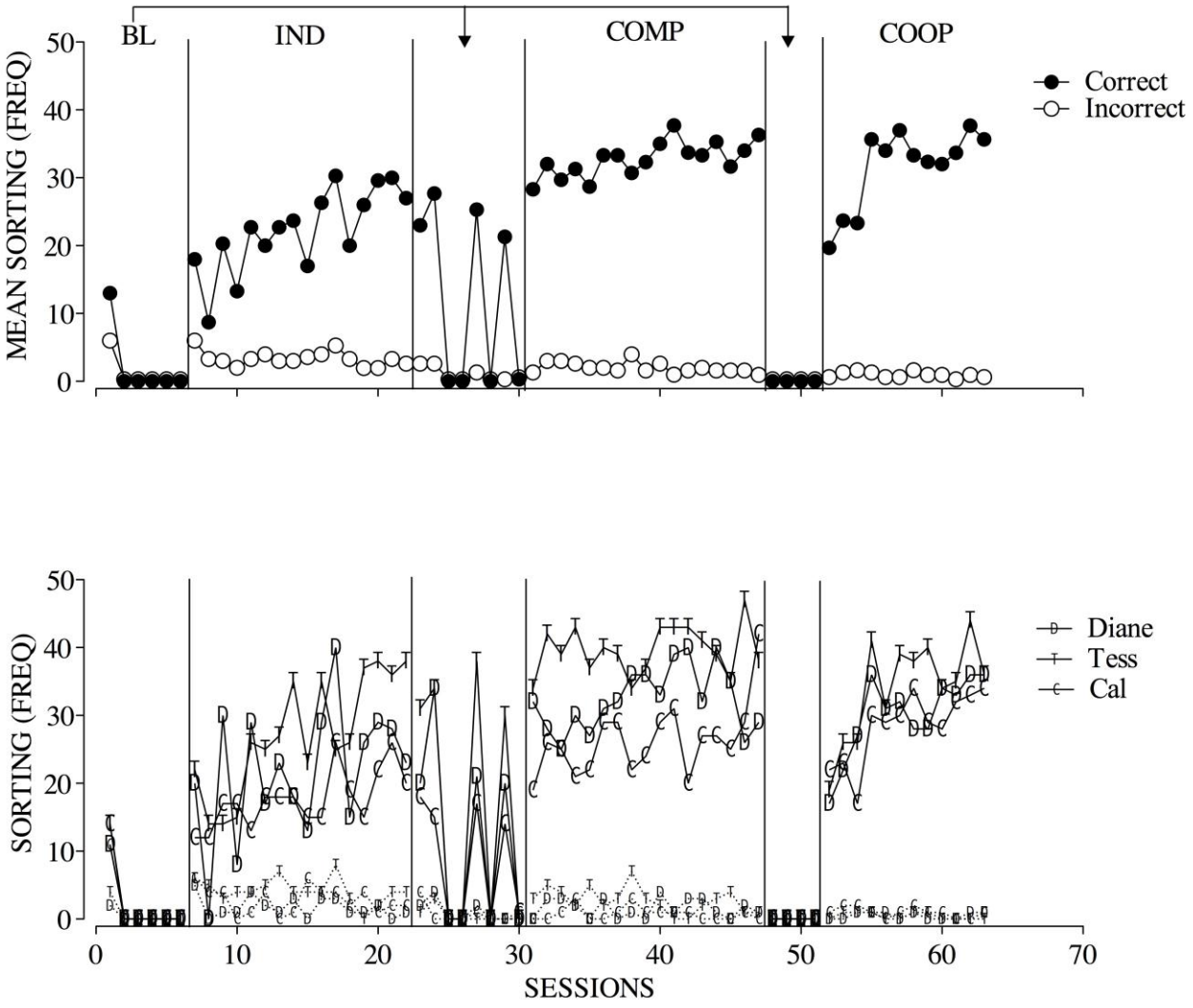

Figure 3-1. Frequency of sorting for Group A (Experiment 1). Mean frequency of correct (closed) and incorrect (open) sorting by the group is shown in the top panel. The frequency of correct (solid) and incorrect (dashed) sorting by individual group members is shown in the bottom panel.

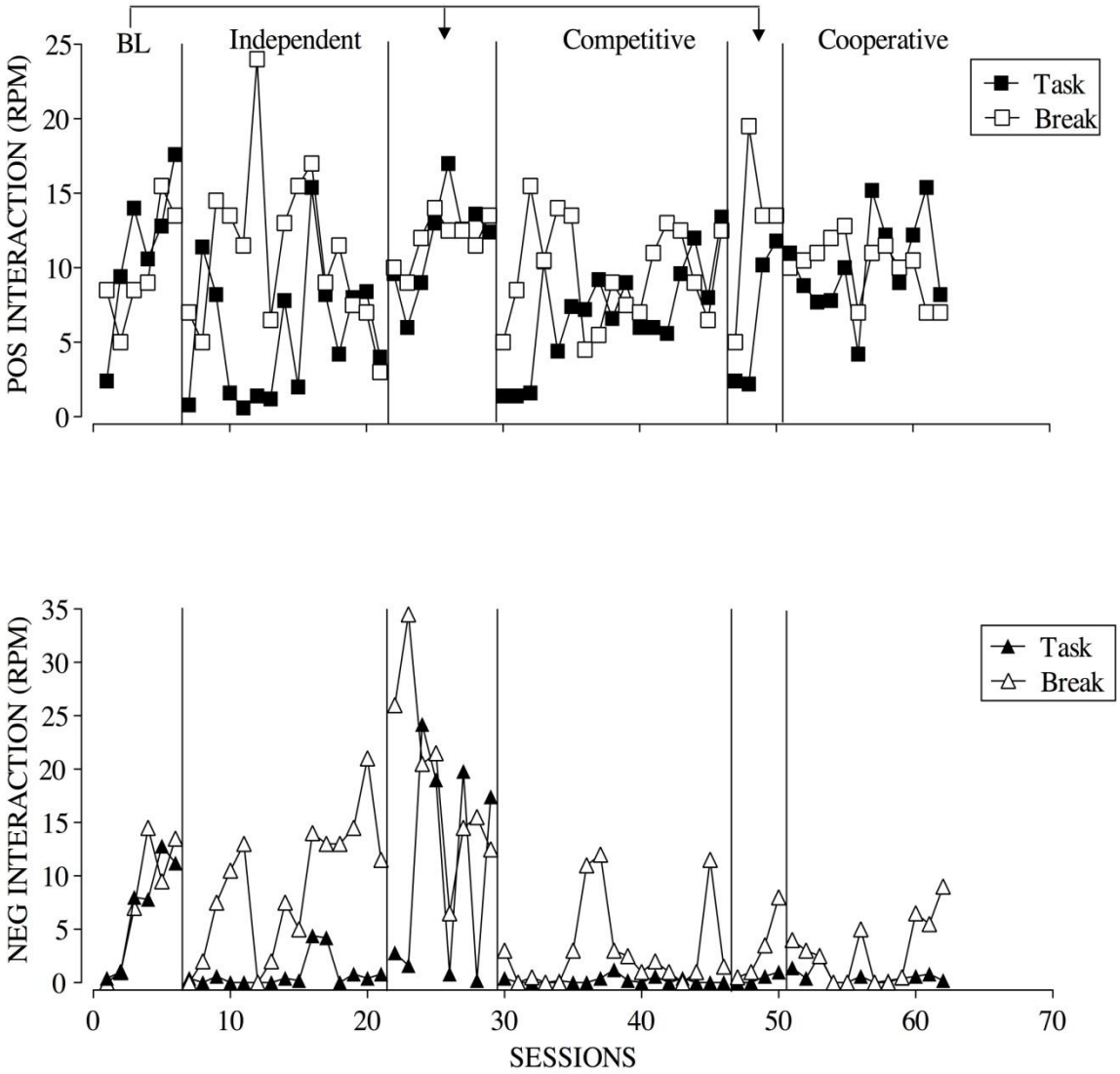

Figure 3-2. Rate of positive and negative interactions across conditions for Group A (Experiment 1).

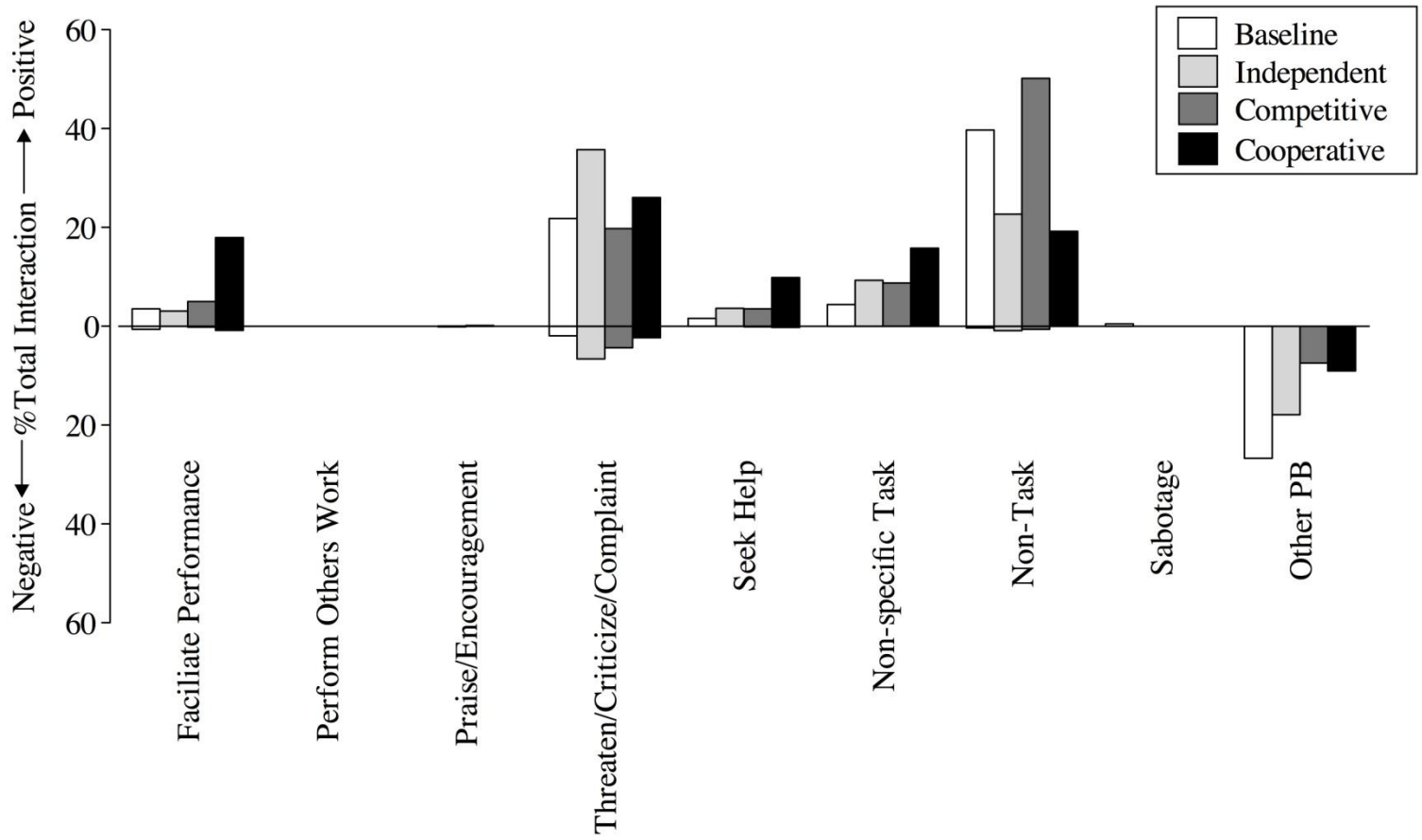

Figure 3-3. Proportion of interactions per social category across conditions for Group A (Experiment 1).

CHAPTER 4
EXPERIMENT 2: REINFORCEMENT FOR BEHAVIOR REDUCTION

The purpose of Experiment 2 was to examine the types of performance and social interactions generated by group contingencies in which reinforcement was used to reduce inappropriate behavior. The effects of the contingencies were evaluated during a DRO procedure applied to out-of-seat behavior. Group B (Walt, Scott, and Glen) participated in Experiment 2.

Response Measurement and Reliability

Data were collected on the frequency of out-of-seat and in-seat behavior of each subject and were summarized as percentage of intervals with out-of-seat behavior per subject and as a group mean per session. Out-of-seat was defined as no part of the subject's buttocks in contact with his/her assigned "X." In-seat was defined as any part of the subject's buttocks in contact with his/her assigned "X."

An independent observer collected data during 40.6% (range, 37% to 45.8%) of all sessions across subjects. Reliability was calculated by dividing the number of intervals in which both observers agreed on the occurrence or non-occurrence of the target behavior by the total number of intervals (agreements plus disagreements), and multiplying by 100. Agreement scores for out-of-seat and in-seat behaviors were 96.2% (range, 80% to 100%) and 96.7% (range, 80% to 100%), respectively.

Procedure

All group members were instructed to sit on one of three "X" marks on the floor. The therapist assigned each subject a specific seat within the task area (left, right, or center), and this position was held constant across conditions. HP activity items were not available to subjects in the designated task area; however, an array of HP items was placed in an adjacent area 5 feet

from the task area. Subjects had the opportunity to earn up to 10 pieces of a preferred edible per session for not engaging in out-of-seat behavior.

Baseline. Following the task period, the therapist reviewed each subject's performance in terms of the number of intervals in which he was out of his seat, but delivered no edible reinforcement for the absence of out-of-seat behavior. All subjects sat with empty plates during the subsequent 2-min break period during baseline.

Independent. Each subject earned one edible for every three, 10-s intervals during which out-of-seat behavior was not observed (FR 3 intervals). The therapist counted the number of intervals for each individual that did not contain out-of-seat behavior, divided this number by three, and delivered the corresponding number of edibles. The therapist stated the number of edibles earned by each subject, and subjects were allowed to consume earned edibles during the subsequent 2-min break period.

Competitive. The subject who did not get out of seat for the largest number of intervals earned one edible for every 3, 10-s intervals for which out-of-seat behavior is not observed (FR3 intervals). The therapist counted the number of intervals for each individual that did not contain out-of-seat behavior, divided this number by three, and delivered the corresponding pieces of edible to the individual who accumulated the largest number of in-seat intervals. In the case of a tie, such that two or more subjects were not out-of-seat for the same number of intervals, the amount of earned edibles was divided among all subjects who met criterion for reinforcement.

Cooperative. All group members earned one edible for every three, 10-s intervals during which out-of- seat behavior was not observed across all group members. That is, all members were required not be out of their seats during an entire 10-s interval for that interval to be counted towards reinforcement. If any one of the three subjects was out of his seat during any

part of an interval, that interval was not counted towards reinforcement. The therapist counted the number of intervals that did not contain any out-of-seat behavior, divided this number by three, and delivered the corresponding number edibles to each member of the group (e.g., “Your group earned 5 edibles, so you each get 5 edibles”).

Results

Figure 4-1 shows Group B’s (Walt, Scott, and Glen) performance data. The top panel shows the mean percentage of intervals of out-of-seat behavior for the group across the different contingencies, and the bottom panel shows the percentage of interval of out-of-seat behavior for individual group members. The cooperative contingency resulted in the lowest percentage of out-of-seat behavior at both the group and individual level.

The group was out of their seats between 60% and 100% of intervals during the initial baseline condition. Out-of-seat behavior remained high for the first two sessions of the independent contingency before dropping to low to moderate levels. Out-of-seat behavior increased to near 100% across the last three sessions of the second baseline condition. Low levels of out-of-seat behavior were observed initially during the competitive contingency. The group’s out-of-seat behavior then became highly variable throughout this condition with several sessions of near zero out-of-seat behavior followed by spikes of high levels of out-of-seat behavior. Out-of-seat behavior increased and continued to be highly variable across the following baseline condition. Out-of seat behavior occurred at moderate levels for the first three sessions of the cooperative contingency; however, near zero levels were then observed across 18 consecutive sessions. We then returned to baseline before replicating the effects of the cooperative contingency. During the final baseline condition, the group’s out-of-seat behavior immediately increased to moderate to high levels. When we reintroduced the cooperative

contingency, the group's out-of-seat behavior immediate decreased to near zero levels and remained low for the next 22 sessions.

The bottom panel of figure 4-1 shows performance at the individual level. Walt and Glen's out-of-seat behavior was somewhat variable during the initial baseline condition, whereas Scott's out-of-seat behavior was high throughout this condition. Individual performance was similar to the group mean during the independent contingency; however, Walt and Scott were out-of-seat more often than Glen during this condition. All three subjects showed an increase in out-of-seat behavior during the second baseline condition; Glen's being the most immediate. All subjects' behavior showed similar effects during the competitive contingency: Low levels of out -of-seat behavior were observed for the majority of sessions, but high levels of out-of-seat behavior also were observed periodically. Scott and Glen engaged in moderate levels of out-of-seat behavior during the initial sessions of the cooperative contingency, whereas Walt's out-of-seat behavior immediately dropped to near zero levels. After the third session, all group members engaged in low levels of out-of-seat behavior with Scott periodically getting out of his seat toward the end of the condition. During the final baseline condition, Scott and Glen's out-of-seat behavior immediately increased to near 100%, whereas Walt's out-of-seat behavior increased across the condition. All group members' out-of-seat behavior immediately decreased to near zero levels during the return to the cooperative contingency and remained low for the remainder of the condition, with the exception of one session during with Scott was out of his seat for approximately 30% of intervals.

Figure 4-2 shows the rate of positive (top panel) and negative (bottom panel) interactions across the task and break periods of Experiment 2 for Group B. Similar patterns in the rate of positive and negative interactions were observed across the first three baseline conditions and the

independent and competitive contingencies. During these conditions, the group engaged in moderate rates of positive interactions and low to moderate rates of negative interactions with more variability in rate of interaction during the break period as compared to the task period. Increasing trends in positive interactions were observed across the cooperative contingency, whereas negative interactions decreased to consistently low levels. Positive interactions returned to previous levels during the final baseline condition. Negative interactions increased slightly during the final baseline condition but were more stable than previous baseline interactions. During the replication of the cooperative contingency positive interactions again increased. Low rates of negative interactions were initially observed, followed by slightly higher rates at the midpoint of this final condition. However, rates of negative interaction once again decreased to consistently low levels by the conclusion of the experiment.

Figure 4-3 shows the proportion of positive and negative interactions that occurred across the nine different social categories during each condition. Positive, non-task related comments accounted for the largest proportion of all baseline interactions, followed by positive and negative threats, criticisms, and complaints. The most frequent topography of the latter category was threats of tattling for stealing items and engaging in varied inappropriate behaviors. The proportion of non-task related comments was lowest during the independent contingency, and an increase in both positive and negative threats, criticism, and complaints occurred during this condition relative to baseline. An interesting finding was that the largest proportion of interactions scored under facilitate performance and seek help were observed during the independent contingency. These interactions often involved asking about or explaining the contingency (earning for not getting out of our seats) as well as the definition of in-seat behavior (bottom touching the “X”). During the competitive contingency, comments related to the task

and threats, criticisms, and complaints were observed at levels similar to those observed during independent contingency, whereas interactions scored as facilitate performance and seek help occurred at levels similar to those observed during baseline. The group engaged in largest proportion of non-task related comments and the smallest proportion of threats, criticisms, and complaints during the cooperative contingency. Non-task related comments often related to daily and weekly activities such as basketball games and cooking class.

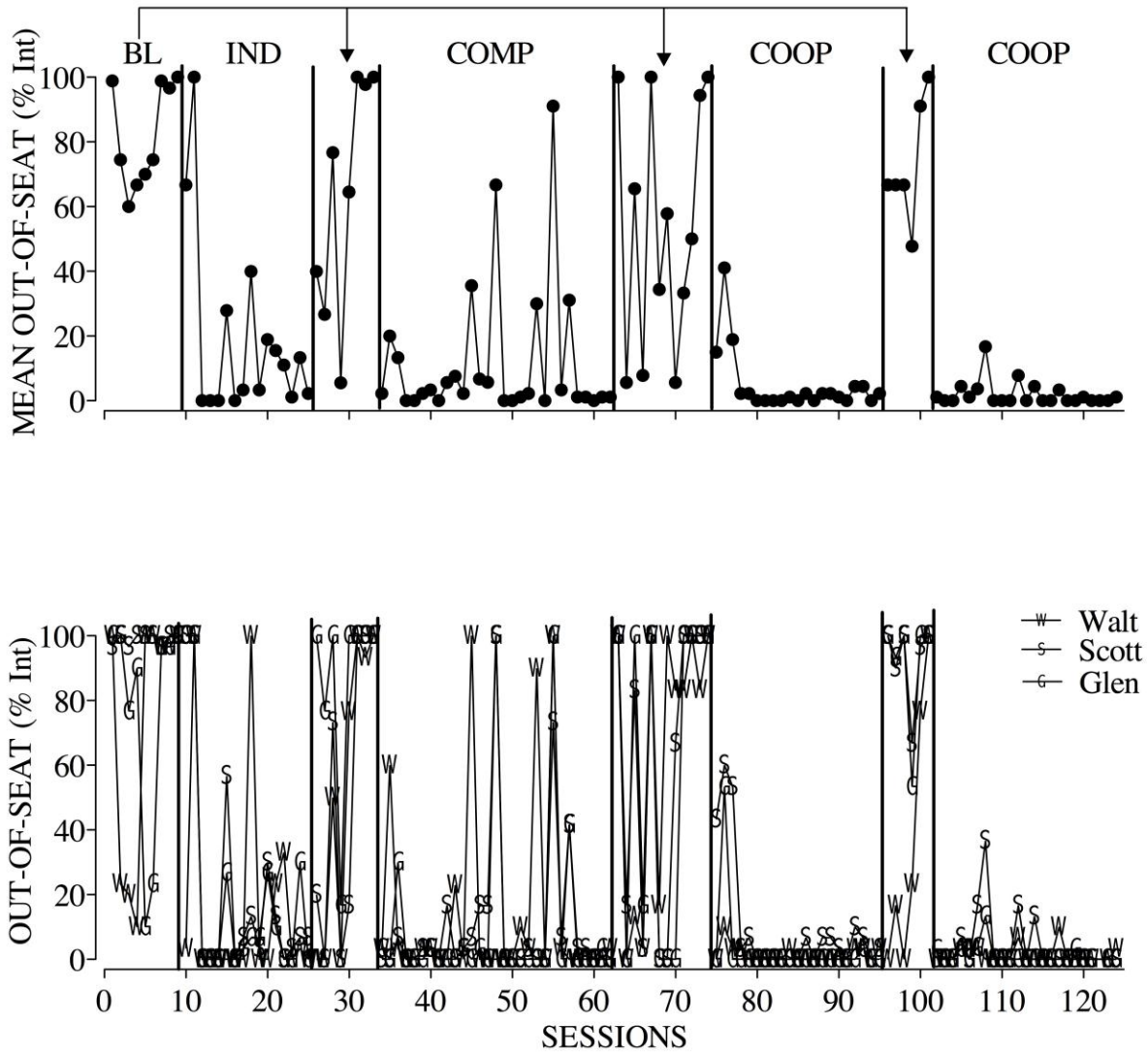

Figure 4-1. Percentage of intervals of out-of-seat behavior for Group B (Experiment 2). The mean percentage of intervals of out-of-seat behavior for the group is shown in the top panel. The percentage of intervals of out-of-seat behavior for individual group members is shown in the bottom panel.

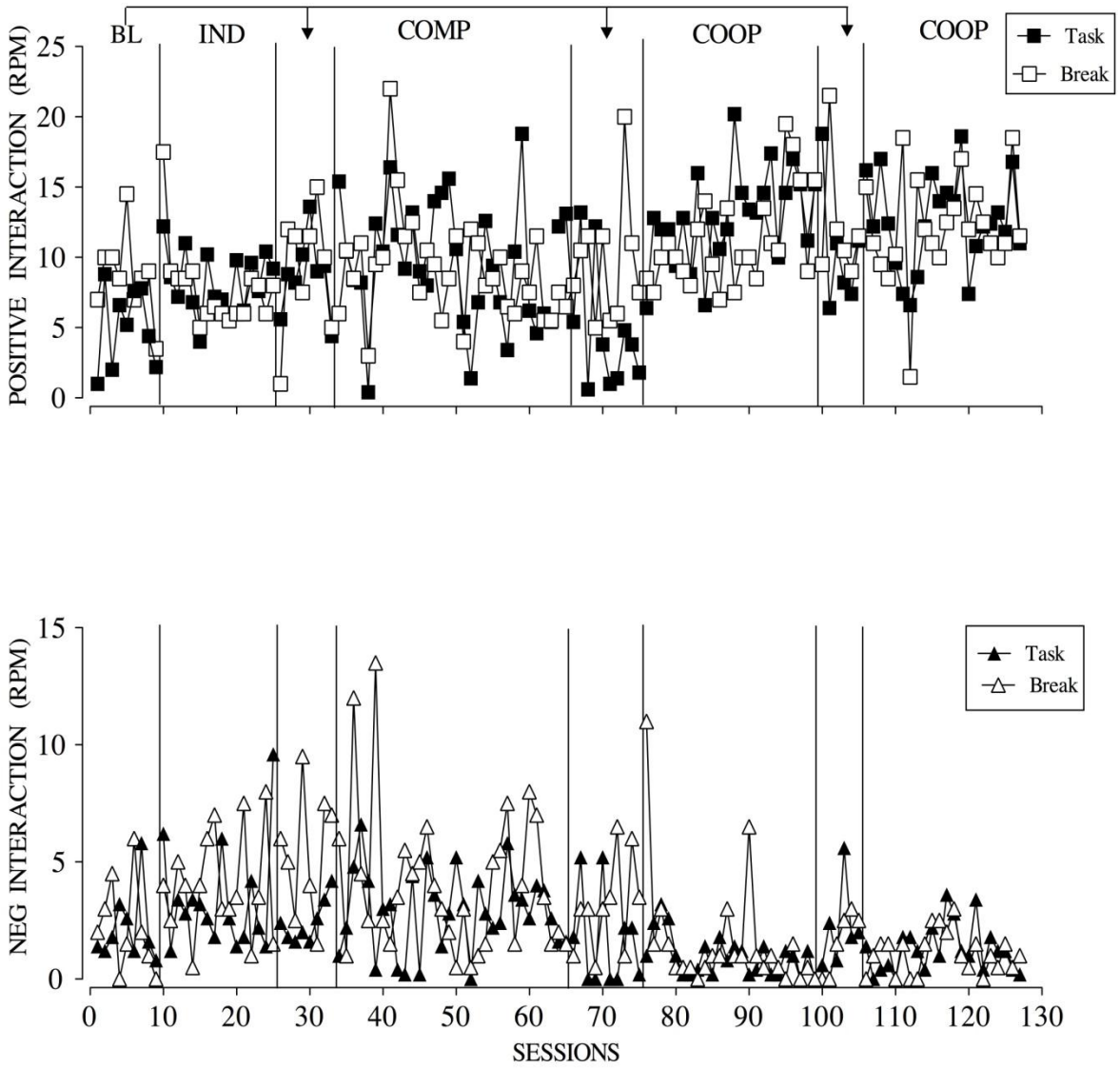

Figure 4-2. Rate of positive and negative interactions across conditions for Group B (Experiment 2).

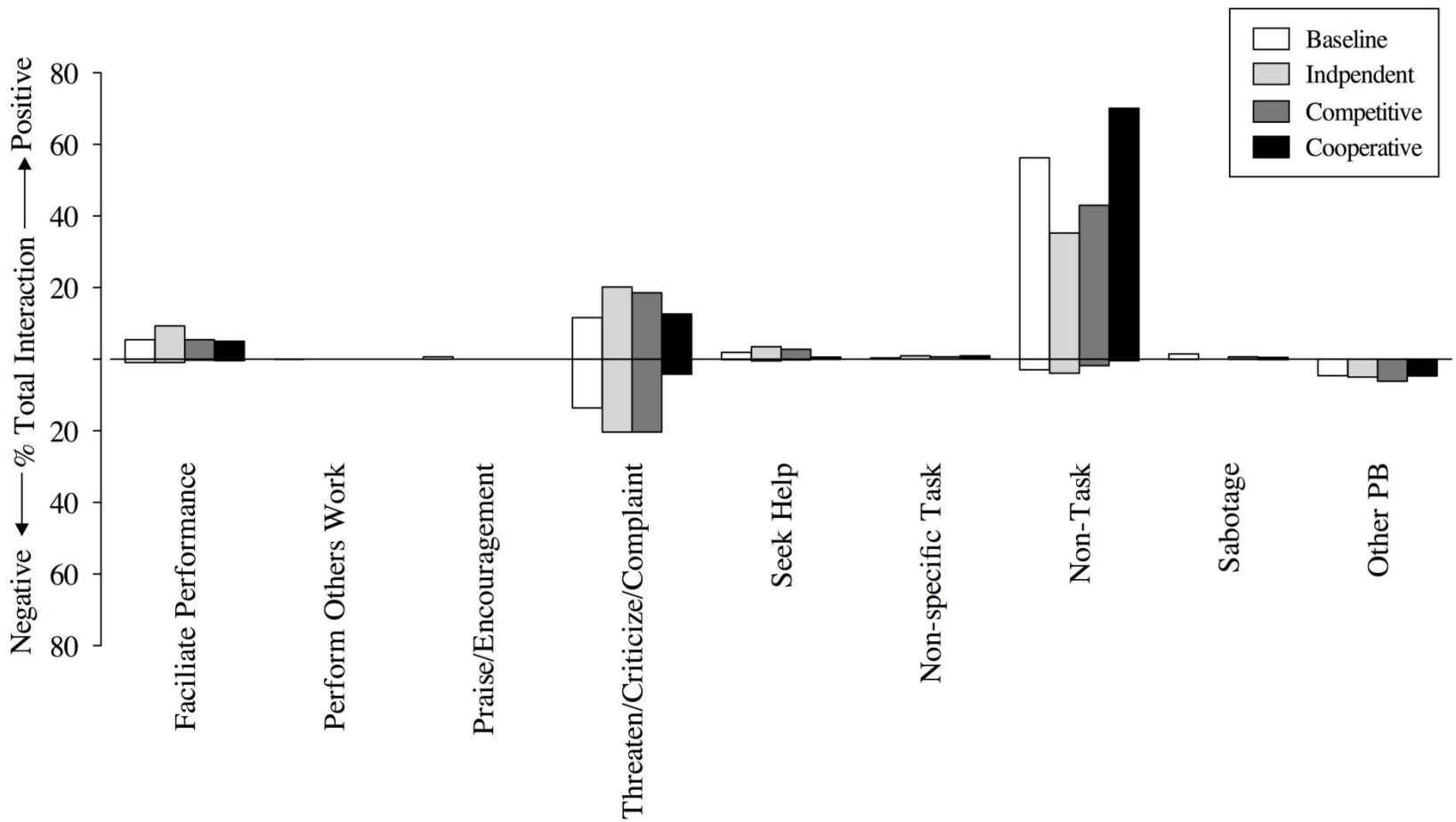

Figure 4-3. Proportion of interactions per social category across conditions for Group B (Experiment 2).

CHAPTER 5
EXPERIMENT 3: PUNISHMENT FOR BEHAVIOR REDUCTION

The purpose of Experiment 3 was to examine the types of performance and social interaction generated by group contingencies in which a response-cost procedure was used to reduce inappropriate (out-of-seat) behavior. Group B (Walt, Scott, and Glen) participated in Experiment 3.

Response Measurement, Reliability, and Procedure

Data were collected on in-seat and out-of-seat behavior as in Experiment 2. An independent observer collected data during 33.3% (range, 32.4% to 35.2%) of all sessions across subjects. Reliability was calculated as described in Experiment 2. Agreement scores across subjects for out-of-seat and in-seat behavior were 96.8% (range, 86.7% to 100%) and 93% (range, 76.7% to 100%), respectively.

The general procedure was identical to Experiment 2. However, subjects began each session with 10 pieces of preferred edibles on their plates, but lost one edible for each interval in which out-of-seat-behavior was recorded (FR1). That is, the therapist removed one piece of edible for each interval during which out-of-seat behavior occurred.

Baseline. This condition was identical to the baseline condition of Experiment 2.

Independent. The therapist counted the number of intervals in which out-of-seat behavior was observed for each subject and removed the number of edibles lost by each subject from their respective plates. The therapist then stated the number of edibles lost by each subject, and subjects were allowed to consume any remaining edibles during the subsequent 2-min break period.

Competitive. Snacks were delivered only to the subject with the fewest number of intervals of out-of-seat behavior. The therapist counted the number of intervals for each

individual that contain out-of-seat behavior and removed one piece of edible for each interval of out-of-seat behavior. The therapist delivered any remaining edibles to the individual with the fewest number of intervals with out-of-seat behavior. In the case of a tie in which an equal number of intervals with out-of-seat behavior was observed for two or more subjects, half or a third of the amount of remaining edible on each subject's plate was delivered.

Cooperative. The therapist placed 10 pieces of edible on each subject's plate at the start of the session as in previous conditions. The therapist counted the number of intervals during which out-of-seat behavior was observed for *any* subject and removed one piece of edible from each subject's plate for each interval during which any out-of-seat behavior was observed. The therapist then stated the number of edibles lost by the group (e.g., "Your group lost five pieces of edible") and delivered any remaining to each member of the group.

Results

Figure 5-1 shows the performance for Group B (Walt, Scott, and Glen) when out-of-seat behavior resulted in loss of reinforcement during Experiment 3. The top panel shows the mean percent intervals of out-of-seat behavior for the group across the different contingencies, and the bottom panel shows the percent intervals of out-of-seat behavior for individual group members. All contingencies – independent, competitive, and cooperative – resulted in near zero levels of out-of-seat behavior.

Group B engaged in high levels of out-of-seat behavior across all four of the baseline conditions. This pattern of responding was somewhat delayed during the third baseline condition; however, near 100% of intervals with out-of-seat behavior was observed across the last four sessions of this condition. Immediate decreases to near zero levels of out-of-seat behavior were observed during all contingencies. In fact, during the independent contingency there was only one session in which out-of-seat behavior was observed, and out-of-seat behavior

was not observed at any point during the cooperative contingency. Although out-seat behavior occurred during several sessions of the competitive contingency, the mean percentage of intervals with out-of-seat behavior never exceeded ten percent during the fist exposure and remained near zero during the second exposure of this condition.

As the bottom panel of figure 5-1 shows, there was some individual variability in performance during the baseline conditions. Walt's performance was highly variable during the first two baselines. During the third baseline, an increasing trend in Walt's out-of-seat behavior was observed, whereas Scott's performance was variable. Individual performance during the competitive conditions shows Walt and Scott were out of their seats more often than Glen, who was only out of his seat during one session of the fist exposure to the competitive condition.

Figure 5-2 shows the rate of positive (top panel) and negative (bottom panel) interactions across the task and break periods of Experiment 3. Similar rates of positive interaction during the task or break period were observed across all baseline and treatment conditions. The group engaged in low to moderate rates of negative interactions during both the task and break periods across all conditions; however, the level of variability differed somewhat across conditions. Variability in negative interactions decreased during the cooperative condition and remained low for the remainder of the experiment.

Figure 5-3 shows the proportion of positive and negative interactions that occurred across the nine different social categories for each condition. Non-task related comments accounted for the largest proportion of interactions across all conditions. A larger proportion of positive and negative threats, criticisms, and complaints occurred during the independent and competitive contingencies relative to baseline and the cooperative contingency. Similar to Experiment 2, the largest proportion of non-specific task related comments occurred during the independent

contingency. An interesting, and somewhat expected, finding was that the largest proportion of sabotage, in the form of removing the seat of another group member or pushing other group members out of their seats, occurred during the competitive contingency. A related finding was that group members often requested help and prompted each other to assist in instances of sabotage during the competitive condition.

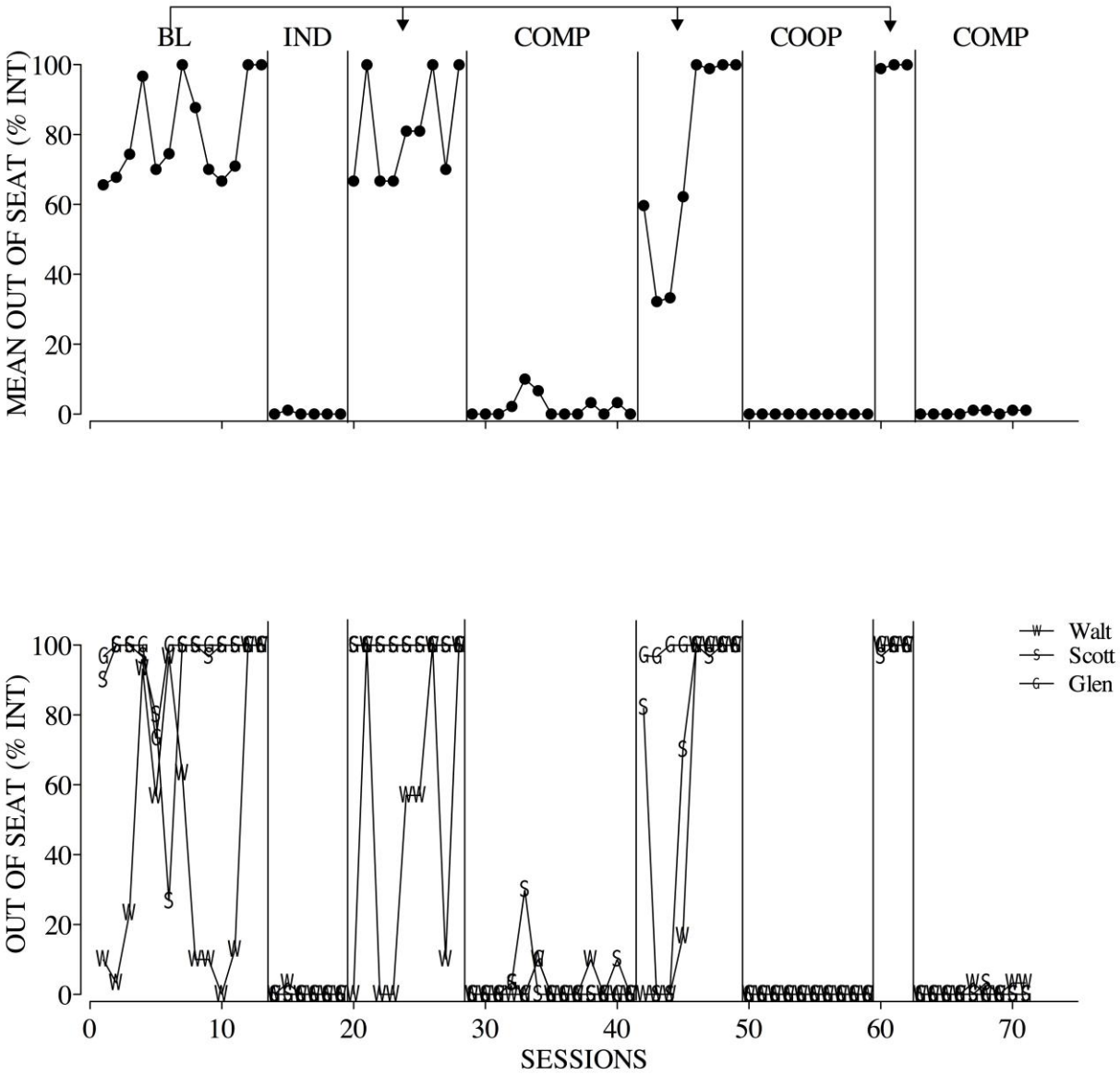

Figure 5-1. Percentage of intervals of out-of-seat behavior across conditions for Group B (Experiment 3). The mean percentage of intervals of out-of-seat behavior for the group is shown in the top panel. The percentage of intervals of out-of-seat behavior for individual group members is shown in the bottom panel.

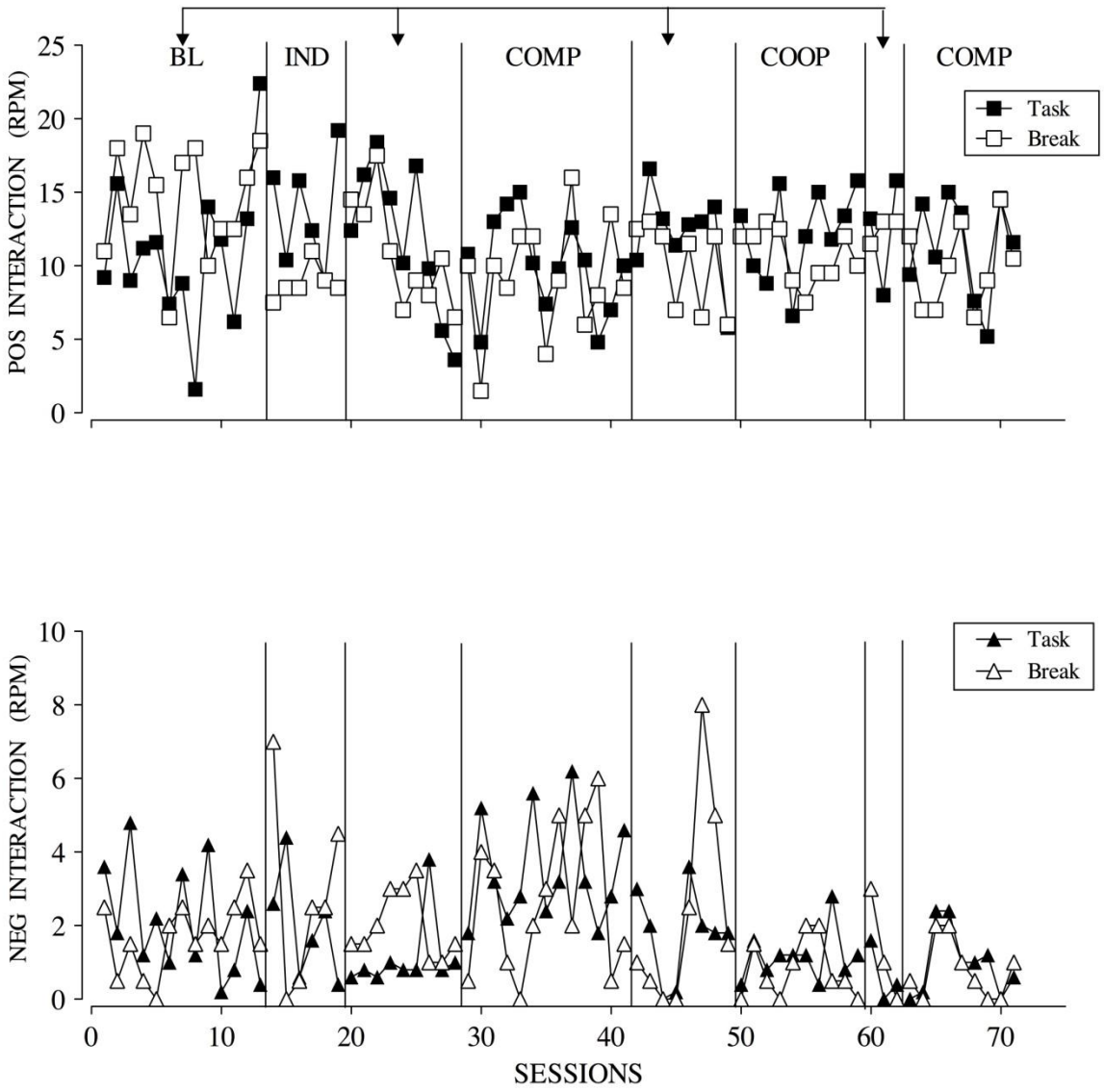

Figure 5-2. Rate of positive and negative social interactions across conditions for Group B (Experiment 3).

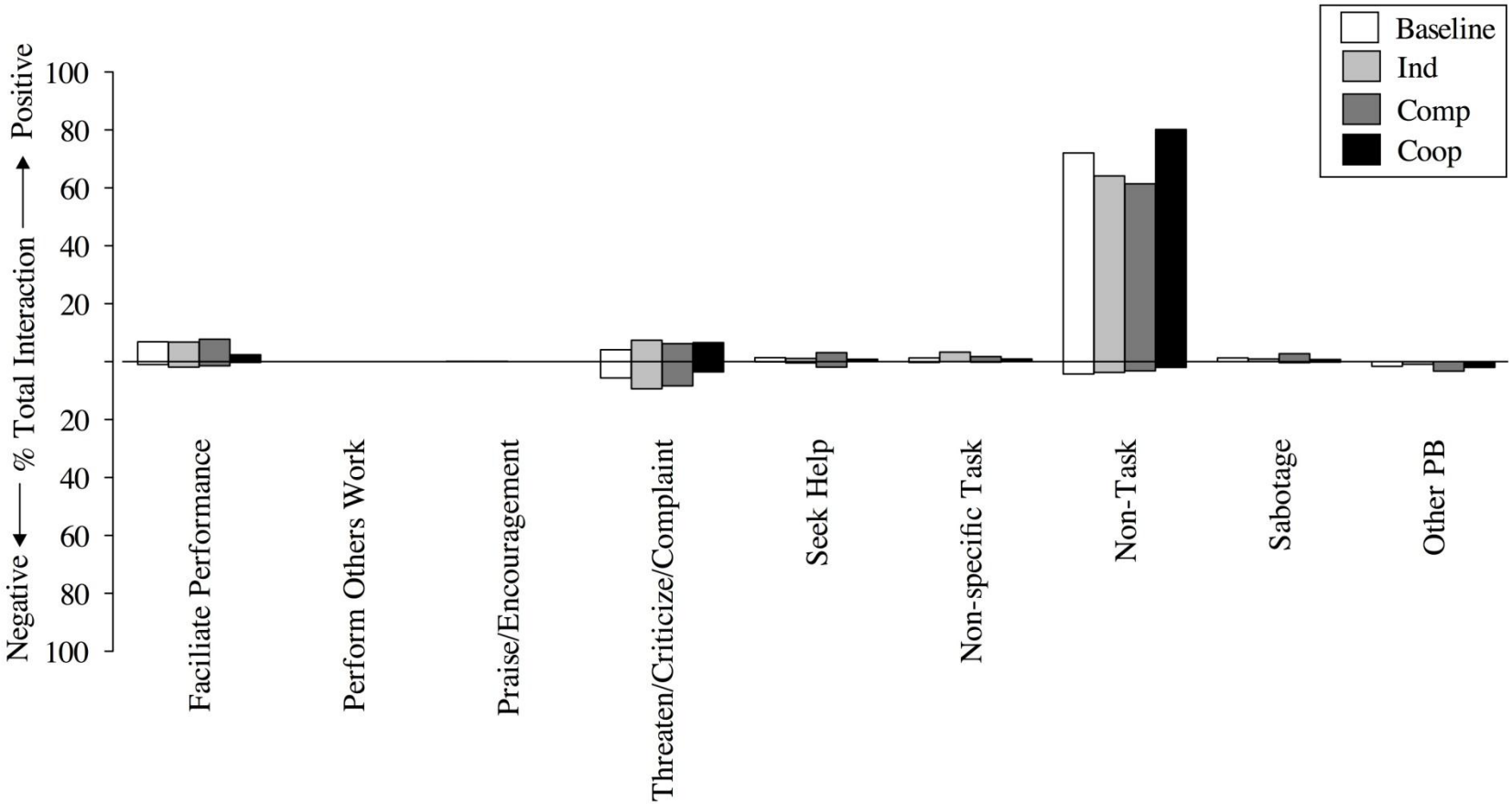

Figure 5-3. Proportion of interactions per social category across conditions for Group B (Experiment 3).

CHAPTER 6
DISCUSSION

The general purpose of this study was to examine not only the types of performance produced by independent, competitive, and cooperative group contingencies but also the patterns of social interaction among group members. We extended previous research by examining positive and negative interactions across specific types of social interactions including both facilitative and suppressive categories. The combination of the three experiments attempted to highlight differences in performance and social interaction across variations of group contingencies that applied reinforcement and punishment procedures to behavior acquisition and behavior reduction.

Group performance during Experiment 1 was consistent with previous research that has demonstrated the superiority of group over individual (independent) contingencies in their application to behavior acquisition (Frankosky & Sulzer-Azaroff, 1978; Speltz et al., 1982). At the group level, both the competitive and cooperative contingencies produced higher frequencies of correct sorting as compared to sorting during the independent contingency. One possible explanation for the difference in performance across the independent and group contingencies might be a sequence effect. Subjects' performance on the sorting task might have improved over time under any one type of reinforcement contingency. To examine this possibility, future research might include replications of each contingency within a single group.

The current study extended previous research by including analyses of performance for each member of the group, which allowed the examination of changes in individual performance across conditions. The group members in Experiment 1 showed somewhat different patterns of performance across conditions: One subject (Diane) performed at similar levels across the competitive and cooperative contingencies, another subject (Tess) performed best under the

competitive contingency, and the third subject (Cal) performed best under the cooperative contingency. An interesting note is that the three subjects also showed different patterns of responding during the independent contingency, with Tess performing at the highest level, Diane performing at moderate levels, and Cal performing at the lowest level of the three subjects. An interesting idea for future research might be to determine whether responding during the independent contingency is predictive of patterns of responding during subsequent group contingencies.

Several interesting patterns of social interactions were observed during Experiment 1. Although no difference in the rate of positive interactions was observed across contingencies, the distribution of positive interactions across topographies varied across contingencies. Diane and Cal emitted non-specific task related comments in the form describing task materials and seeking help by asking for information about the task materials across all contingencies. Both Diane and Cal requested help from Tess across contingencies; however, Tess was more likely to reciprocate Diane's requests during the competitive contingency, whereas she reciprocated both group members' requests during the cooperative contingency. In addition, all three subjects were more likely to prompt one another and to ask for and provide assistance with the sorting task during the cooperative contingency. Our findings are consisted with those of McCarty, Griffin, Apolloni, and Shores (1977) who reported an increase in student's prompting and assistance correlated with an increase in performance on math worksheets during an interdependent group contingency.

In summary, the patterns of interaction among group members seemed to correspond to the different patterns of responding across contingencies. The increasing trend in Diane's performance during the competitive contingency might have been facilitated, at least in part, by

information provided by Tess, whereas Cal's performance during this contingency might have been hindered by the lack of responses to his requests for information. Similarly, the convergence of individual performances during the cooperative contingency co-varied with relative contributions in term of offering and receiving assistance in completing different components of the task.

The results of Experiment 2 further support the superiority of group contingencies over individual contingencies. Although the competitive contingency produced superior results to the independent contingency, out-of-seat behavior was consistently lower during the cooperative contingency relative to the competitive contingency. Therefore, the cooperative contingency was determined to be the most effective contingency in reducing out-of-seat behavior via differential reinforcement. Furthermore, these results were consistent across the performance of each individual group member.

One reason for the difference in the relative efficacy of the competitive contingency across Experiments 1 and 2 might be that the momentary probability of reinforcement for each group member was more salient during Experiment 2. That is, the time spent out-of-seat was more easily observed by the subjects relative to the frequency of correctly sorted cards. Patterns of responding at the individual level during Experiment 2 support this hypothesis: When a group member was out of his seat in a given session, he was generally out of his seat for the majority of that session.

Changes in the rate of positive and negative interactions during Experiment 2 corresponded to group performance. That is, the highest rates of positive interactions and the lowest rates of negative interactions among group members were observed during the cooperative contingency, replicating the findings reported by Frankosky and Sulzer-Azaroff

(1978). In contrast to the patterns of interaction observed during Experiment 1, similar rates of positive and negative interactions were observed during task and subsequent break periods of Experiment 2. This difference might be explained by differences in task structures across the two studies: Engagement with the sorting task (Experiment 1) likely required attention to the task materials and therefore may have decreased the opportunity for interactions among group members. On the other hand, not getting out of one's seat (Experiment 2) is likely to increase the opportunity of interaction due to close proximity. In fact, non-task related comments accounted for the largest proportion of interactions across all conditions.

Unlike the results of Experiment 1, increases in facilitative interactions were not observed during the cooperative contingency of Experiment 2. This difference might be explained by the behaviors targeted across the experiments: Skill acquisition in Experiment 1 vs. behavior reduction in Experiment 2. Individual group members required assistance to correctly sort during the cooperative contingency of Experiment 1, where as no assistance was required to stay in one's seat during the cooperative contingency of Experiment 2. The largest proportion of non-task related comments and the smallest proportion of threats, criticisms, and complaints were observed during the cooperative contingency. It seems likely that these changes in the distribution of interactions were a direct product of the cooperative nature of contingency. Threats, criticisms, and complaints directed at other group members might produce social avoidance that includes out-of-seat behavior, which would in turn decrease the probability of reinforcement for all group members.

Group performance during Experiment 3 extended the findings of Axelrod (1973), who reported that both independent and interdependent response cost procedures were effective in decreasing classroom disruptions. We found that all contingencies – independent, competitive,

and cooperative – were equally effective in reducing out-of-seat behavior. Individual performance in Experiment 3 was similar to that in Experiment 2. No difference in the rate of positive or negative interactions were found across contingencies, and the levels of interaction were consistent across both the task and break periods. Similar to the results of Experiment 2, non-task related comments again accounted for the largest proportion of interactions across all conditions of Experiment 3.

We reintroduced the competitive contingency at the end of the experiment to examine performance under this contingency following a history with the cooperative contingency. Although out-of-seat behavior was low across both exposures to the competitive contingency, performance was suppressed to a greater degree following the cooperative contingency. Differences in performance during the two exposures to the competitive contingency were correlated to changes in the interactions among group members. During both exposures to the competitive contingency, Glen attempted to sabotage other group members by pushing them off of their seats and attempting to remove their seats. In addition, Glen often solicited help from another group member to sabotage the performance of the third member. Instances of these behaviors were more frequent during the initial exposure to the competitive contingency. Although Glen continued to engage in sabotage during the second exposure to the competitive contingency, the other group members were more likely to actively resist sabotage directed at them and to ignore Glen's requests for help in sabotaging other group members.

Together, the three experiments highlight correlations between changes in performance and changes in interactions among group members during different group contingencies. Although it is the contingencies of reinforcement (or punishment) that directly influence performance, corresponding changes in social interactions may also be observed when applying

contingencies to group behavior. In the current study, differences in cooperative and competitive interactions were evident across group contingencies applied to behavior acquisition and behavior reduction and, to a lesser degree, reinforcement and punishment procedures applied to behavior reduction. Future research might attempt to isolate the effects of social interactions during group contingencies. One way to further examine the effects of social interactions on performance during group contingencies might involve the inclusion of a confederate group member to introduce different types of interactions across contingencies.

Detailed analyses of both performance and social interactions are critical to the understanding of how these two behaviors interact across different types of group contingencies. Although previous research has demonstrated changes in the overall rate of positive and negative interactions across different contingencies (Frankosky & Sulzer-Azaroff, 1987; Shores et al., 1976; Speltz et al. 1982), no study to date has reported on the specific types of interactions observed across types of group contingencies. The inclusion of such information is helpful because it is possible for the level of interaction to remain consistent across contingencies while the distribution in the type of interactions may change, as seen in Experiment 1. Although the current studies provide a preliminary analysis of the relation between performance and social interactions during independent, competitive, and cooperative group contingencies, future research should continue to examine the relation between these two variables within group contexts.

APPENDIX
PRESESSION INSTRUCTIONS

Table A-1. Scripted instructions across conditions and experiments.

Condition	Experiment: Instruction
Baseline	1: "You can sort the pictures if you want, but you will not earn a snack for sorting the pictures."
	2: "Do not get out of your seat. You will not earn anything for not getting out of your seat."
	3: "Do not get out of your seat. You will not lose anything if you get out of your seat."
Independent	1: "You will each earn a snack for sorting the pictures onto your own cards; the color of your cards match the color of your shirt."
	2: "You will each earn a snack for NOT getting out of your seat. Your seat is marked with an "X" that matches the color of your shirt."
	3: "You can each earn a snack for NOT getting out of your seat. But you will lose one piece of snack if you are out of your seat or do NOT return to your seat. Your seat is marked with an "X" that matches the color of your shirt."
Competitive	1: "ONLY the person that sorts the most pictures will earn a snack today; the color of your cards match the color of your shirt."
	2: "ONLY the person with the most intervals of NOT getting out of their seat will earn a snack today."
	3: "ONLY the person with the fewest intervals of out-of-seat behavior will earn a snack today."
Cooperative	1: "Your group will earn a snack for sorting the pictures onto the cards. Everyone in your group will earn the same amount of snack."
	2: "Your group will earn a snack for NOT getting out of your seats. Everyone in your group will earn the same amount of snack for not getting out of your seats."
	3: "Your group can earn a snack for NOT getting out of your seats. But everyone in your group will lose the same amount of snack for getting out of your seats or not returning to your seats."

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BIOGRAPHICAL SKETCH

Jill Harper first studied behavior analysis at the University of New Hampshire where she received her B.S. in Family Studies and B.A. in Psychology in 2003. She then entered the Masters of Science in Applied Behavior Analysis (MABA) program through Northeastern University under the supervision of Dr. Jason Bourret. While working toward her master's degree Jill held several clinical positions at the New England Center for Children (NECC), a private, educational facility that serves individuals with Autism and other developmental disabilities. Jill entered Dr. Brian Iwata's lab at the University of Florida (UF) in the fall of 2007. Jill participated in a variety of research and clinical activities while at UF. She worked on an array of research projects that involved topics ranging from the assessment and treatment of severe problem behavior to skill acquisition. While at UF, Jill provided behavioral services to individuals with various developmental diagnoses such as autism, mental retardation, and Prader-Willi syndrome, across a residential treatment facility and a public, special education school. Additionally, Jill engaged in several different teaching activities including serving as a teaching assistant for an introductory psychology course and a behavior analysis lab course, as well as instructing an introductory behavior analysis course. Jill has recently accepted a position as Assistant Director of Clinical Services, Research, and Training at Melmark New England. She hopes to also begin teaching courses in behavior analysis at an affiliate university.