The Effect of Group Contingencies on Students' Behavioral Problems in a Classroom

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The Effect of Group Contingencies on Students’
Behavioral Problems in a Classroom

by
Ching Christy Lai

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Thesis Committee:
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Abstract

Inclusion of students with disabilities in regular classrooms has raised wide interest from educators (National Center for Learning Disabilities, 2014). Researchers have studied different contingency systems so that students with disabilities and students that engage in high rates of disruptive behaviors succeed in regular classrooms (Barrish, Saunders, & Wolf, 1969; Donaldson, Vollmer, Krous, Downs, & Berard, 2011; Greenwood, Hops, Delquadri, & Guild, 1974). Of the reinforcement contingencies, group reinforcement contingencies are more commonly used mainly due to their economic feasibility and practicality, and utilization of the peer group to control and enhance classroom behavior (Litoe & Pumroy, 1975). The present study aimed to study the effectiveness of independent and interdependent group contingencies on students’ worksheet responses in a classroom. The present study found that students with ASD (Autism Spectrum Disorder) maintained similarly high worksheet responses across both academic subjects and types of group contingencies. The group contingencies appeared to be equally effective. However, more students preferred the interdependent group contingency for all sessions during the choice conditions for both academic subjects.
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Chapter I: Introduction

Inclusion of students with disabilities in regular classrooms has raised wide interest from educators (National Center for Learning Disabilities, 2014). The Individuals with Disabilities Education Act (IDEA) is the nation’s federal education law that ensures children with disabilities are provided with the necessary and additional educational support by public schools (National Center for Learning Disabilities, 2014). Researchers have studied different contingency systems to facilitate students with disabilities and students that engage in high rates of disruptive behaviors to succeed in regular classrooms (Barrish, Saunders, & Wolf, 1969; Donaldson, Vollmer, Krous, Downs, & Berard, 2011; Greenwood, Hops, Delquadri, & Guild, 1974). The general advantages of an effective reinforcement contingency are to decrease inappropriate behavior, increase peer’s acceptance (Nevin, Johnson, & Johnson, 1982; Speltz, Shimamura, & McReynolds, 1982), and facilitate teachers in teaching (Ling & Barnett, 2013). Of the reinforcement contingencies, group reinforcement contingencies are more commonly used mainly due to their economic feasibility and practicality, and utilization of the peer group to control and enhance classroom behavior (Litoe & Pumroy, 1975).
Chapter II: Literature Review

Group Contingencies

Three group contingencies are commonly used: independent, dependent, and interdependent group contingencies (Cooper, Heron, & Heward, 2007).

**Independent group contingency.** Independent group contingency is a contingency that is presented to all members of a group, with reinforcement delivered based on an individual’s performance (Cooper et al., 2007). Note that all of the individual contingencies included in the following studies refer to individual reinforcement contingency in a group setting, i.e., independent group contingency. For example, the criterion for receiving a reinforcer is to get accurate answers of 80% or above on a vocabulary test. The independent group contingency applies to the entire class. Individuals who meet the criterion get access to the reinforcer.

**Dependent group contingency.** Dependent group contingency is a contingency that is presented to the group, with reinforcement being delivered based on the performance of an individual or a small group (Cooper et al., 2007). For example, the criterion for receiving a candy is to turn in the homework on time. The dependent group contingency applies to all members in the group; however, all members, regardless if they turn in homework on time, get access to the reinforcer only when the target student in the group turns in homework on time.

**Interdependent group contingency.** Interdependent group contingency is an arrangement in which the whole group has to meet the criterion to get access to reinforcement (Cooper et al., 2007). For example, the criterion set for watching a movie as a reinforcer is to go to school on time every day for a month. The interdependent group contingency system
applies to the entire class. To get access to the reinforcer, all students in the class have to go to school on time every day for a month. Comparing to other group contingencies, interdependent group contingency is the most popular group contingency for a number of reasons (Ling & Barnett, 2013). First, it promotes cooperation among the whole class in working together to earn the reinforcement. Second, the procedure requires fewer teachers or assistants to implement and to deliver the reinforcement, compared to other reinforcement contingencies (Skinner, Skinner, & Sterling-Turner, 2002). The current literature review includes studies that were conducted on group contingencies in classroom settings.

**Independent Versus Interdependent Group Contingency**

Herman and Tramontana (1971) studied the effects of instructions and group versus individual reinforcement in modifying disruptive group behavior during rest periods. Six preschool-aged students (four boys and two girls) from a class of nineteen participated in the study. They were referred due to their high rates of disruptive behaviors. A partial interval time-sampling technique with 10-second intervals to observe and 5-second intervals to record was used to measure subjects’ engagement in inappropriate behaviors.

Phase I included the baseline measurement of inappropriate behaviors in both regular classroom and experimental room, followed by token training and token reinforcement (individual contingency and group contingency, respectively) in the experimental room. The baseline condition in regular class represented the regular practice of class activities. Afterwards, the six subjects were randomly assigned into two groups: individual contingency group and group contingency group. Baseline condition of the two groups was then conducted in the experimental room. During the token training and token reinforcement in the experimental room, students were instructed to pick one of the ten toys being shown. Under
the individual contingency, students could earn access to the toy when they filled up their own bins with ping pong balls. The delivery of ping pong balls was based on the display of appropriate behavior, yet no explicit instructions were given by the implementer. The same procedure was applied in the group contingency, except there was only one bin being filled. Students could choose their own toys when they collectively filled their bin.

Phase I results showed that subjects engaged in high number of intervals of inappropriate behaviors during baseline with a mean of 18.1/20 intervals. After the token training and token reinforcement, subjects’ inappropriate behaviors slightly decreased, with high and fluctuating day-to-day variability.

During Phase II, instructions were added to reinforcement in the first condition, followed by a return to baseline in experimental room (with no instructions and reinforcement), instructions only in experimental room, and reinforcement and instructions in the experimental room to examine the effects of instruction on subjects’ inappropriate behaviors.

Results showed that the instructions added to reinforcement condition produced an immediate and significant decrease in students’ inappropriate behaviors. There were no differential effects between the two groups. Instructions without reinforcement produced a slight decrease in inappropriate behavior under the individual contingency; and no change in inappropriate behavior under the group contingency.

Phase III was a generalization phase including: baseline in regular class, reinforcement and instructions in the regular class (with the rest of the class and teacher being present), and return to baseline in regular class. Results showed that during baseline in regular class condition after the termination of intervention in experimental room, students’
number of intervals of inappropriate behaviors increased gradually. When the reinforcement and instructions condition was applied in regular class, the intervention package did not produce as immediate and dramatic decrease in subjects’ inappropriate behaviors as the experimental room. Subjects’ inappropriate behaviors also returned to pre-treatment level during the return to baseline in regular class condition.

There were interesting findings from the study. First, instructions/rules of the reinforcement contingency seemed critical in contributing to the effectiveness of the intervention. In addition, instructions had to be combined with the use of reinforcement to produce meaningful change in inappropriate behaviors. Second, there were no differential effects between the individual contingency group and group contingency group. Third, the difference in results from experimental condition and regular class condition drew our attention to the feasibility of both individual and group contingency in a natural classroom setting. The advantage of having experimental condition prior to regular class condition was to establish reinforcement contingency more effectively and efficiently, yet the disadvantage of that was poor generalization. Instead of moving the group from experimental room into regular class with the presence of the rest of the classmates and teacher, future researchers should consider implementing the entire intervention in regular class, with the subjects only, gradually adding in the rest of the class.

Long and Williams (1973) examined the comparative effectiveness of group and individually contingent free time with inner-city junior high school students during math and geography classes, using a reversal and multiple baseline design. Eight students (five males and three females) and their teacher from a seventh-grade classroom participated in the study. The students were selected based on their high engagement in disruptive behaviors. The
dependent variables included appropriate behavior, time-off task, and disruptive behavior. A time sampling technique was employed to measure the target behaviors. Only one behavior was measured in each 10-second interval, which was determined by the first occurring behavior. There were seven experimental phases for math periods: Baseline, Structured Lessons I, Group Contingent Free Time, Structured Lessons II, Individually Contingent Free Time, Structured Lessons III, and Points (similar to individually contingent free time condition, but with no exchange value of points), and eight experimental phases for geography periods: Baseline I, Baseline II, Structured Lessons I, Group Contingent Free Time, Structured Lessons II, Individually Contingent Free Time, Structured Lessons II, and Points. There was a one-hour lunchtime between math and geography lessons. The baseline condition was conducted to measure the frequency of target behaviors in usual lessons. No rules were given out explicitly. The experimental phase, structured lessons, referred to the explicit instruction of the classroom rules, without any programmed consequence. The goal of the phase was to test if well-planned lesson activities with rules only were effective in increasing appropriate behaviors. Under the group contingent free time condition, students began with 18 minutes of free time with a deduction of one minute for each rule infraction. Under the individually contingent free time condition, the reinforcer was determined by individual performance through a point accumulation system.

Results showed that students engaged in low levels of appropriate behaviors during the baseline (31% in math lessons and 29% in geography lessons). The structured lesson condition did not produce noteworthy changes in appropriate behaviors, indicating that well-planned lesson activities and rules were not effective in increasing students’ appropriate behaviors. However, after the introduction of group contingent free time (an average of 80%
during math lessons) and individually contingent free time (an average of 76% during math lessons), appropriate behaviors immediately and dramatically increased; when the procedure was withdrawn, a sharp decline was observed in students’ desired behaviors (from a mean of 80% to 50% under group contingent free time condition), showing that the application of group and individual contingency was effective in increasing students’ appropriate behaviors. There was no significant relative effectiveness between individual contingency and interdependent group contingency; however, group contingency increased students’ appropriate behaviors slightly higher than individual contingency.

It was interesting to note that the procedure for earning free time was different between group contingency and individual contingency, with the former using deduction of points/free time and the latter using accumulation of points/free time. Future studies could examine if such variable has an effect on the intervention. In addition, the data collection procedure in the study was a limitation. By only recording the first identifiable behavior of each interval, Long and Williams (1973) may have underestimated some behaviors while overestimating others. Future studies should include data collection on all dependent variables.

Solomon and Tyne (1979) studied the relative effectiveness of individual and interdependent group contingency systems in reducing off-task behaviors during a 35- to 40-minute morning reading period in a first-grade class. A multi-element design (baseline, individual, and interdependent group contingency) was used to compare the effectiveness of the two group contingency systems. Twenty first-graders from the same class in a rural lower middle class school district were recruited as the participants. The dependent variable, off-task behaviors, included four behaviors: physical contact with peer(s), verbal disruption, out-
of seat, and general disturbance. A time sampling interval (15 seconds observing, 5 seconds recording) was used to measure off-task behaviors. A light cuing device, a bare 50-watt light bulb was used to provide immediate feedback on student(s)’ engagement in off-task behaviors across all conditions. The light was activated by the observer when student engaged in any of the off-task behaviors, and remained on as long as one of the students engaged in the target behaviors, and ceased when the behavior(s) stopped. However, students who engaged in off-task behaviors were not identified by the light nor the observer.

Under baseline condition, the lighting device was utilized with no programmed consequence. The difference in terms of the use of the light device between the intervention conditions and the baseline condition was the programmed consequence. Under the interdependent group contingency, all students earned access to the reinforcement, i.e., 15-minutes free time and a choice of unsweetened candy when they turned the light on less than X times in one day. During the interdependent group contingency, the shifting criteria schedule was utilized, from 10 off-tasks per day to four off-tasks per day. Under the individual condition, student(s) who turned the light on less than X times in day could get access to the same reinforcer that was used in the group contingency condition, based on his/her own behavior. During the individual contingency, the shifting criteria schedule changed from six off-tasks per day to two off-tasks per day.

Results showed that all students typically met the reinforcement criteria set for the individual contingency in all sessions, while there was one session when students did not meet the reinforcement criteria set for the group contingency. The data indicated that the students engaged in an average of 0.71 off-task behaviors per minute during the baseline-reversal condition, 0.14 off-task behaviors per minute during the individual contingency, and
0.15 off-task behaviors per minute during the group contingency condition. The study’s results suggested that both contingency systems were equally effective in decreasing students’ off task behaviors, with an 80% reduction in target behaviors in individual condition and a 79% reduction in target behaviors in the group contingency condition when comparing to the baseline condition. There was no difference between the effectiveness of the individual and group contingency.

The use of a lighting device was a convenient procedure for teacher to signal any undesired behaviors, which was likely to be used after the experiment. In addition, it included the advantage of maximizing teaching time and less time on reprimanding. Moreover, the use of shifting criteria was critical in teaching students to understand the reinforcement contingency and shape higher rates of desired behaviors. Future studies should include this procedure in the intervention.

Nevin et al. (1982) studied the effects of group and individual contingencies on academic performance and social relations of students with disabilities. The authors included four studies in the article. All of the studies examined the relative effectiveness of group contingencies, individual contingencies, and no contingencies, using variations of A-B-A designs.

In Study 1, four 6-year-old first graders (two boys and two girls) were the subjects of the study, using an A-B design. All of them were low achieving students with disabilities in a classroom of 23 children. The dependent variable of the study was the mastery of letter names of the alphabet, i.e., the number of accurate responses on a flashcard task. During baseline (individual contingency), students were instructed to study on their own and seek help from the teacher if needed, teacher’s praise was delivered based on individual’s
performance. During the interdependent group contingency condition, students were instructed to study with a randomly assigned group of varying abilities, and to seek help from the group members if needed. Teacher’s praise was delivered based on overall performance of the group. Results showed that the number of accurate responses on flashcard tasks of the target subjects improved significantly under the interdependent group contingency condition, comparing to the individual contingency condition.

In Study 2, an A-B-A reversal design was utilized. Eleven seventh-graders (six boys and five girls) participated in the study. They were all low achievers in math and were generally reported to be disruptive and “not getting along together” in a group. The dependent variables were the percentage of subjects meeting the criteria for math achievement, frequency of good study behaviors (i.e., on-task behaviors), and the social acceptance of isolated subjects. The criteria being set on math achievement was the completion of 150 math problems within the time limit (criterion changing from 15 minutes to 10 minutes). The frequency of good study behaviors was measured by the presence of on- or off-task behavior. The observer observed one subject for a 30-second intervals at one time, until they completed collecting data for the whole class. The same procedure was repeated once this cycle was completed. The social acceptance was measured through questionnaire after the first baseline period and at the end of the group contingency condition. During the baseline condition (individual contingency), subjects were instructed to work on their own and seek help from the teacher if needed; subjects earned points based on their own individual performance of meeting the criteria and demonstration of good study behaviors. The points could be exchanged for free-time activities. During the interdependent group contingency condition, subjects were instructed to work as a group and seek help from
teammates when needed; subjects earned points for their group based on the group’s performance in meeting the criteria and the group’s demonstration of good study behaviors. Everyone in the group under this condition received the same points.

Results of Study 2 showed that no subjects met the criteria for both the multiplication tests and division tests during the baseline condition. However, all subjects were able to meet the criteria for the multiplication tests and division tests by the ninth day and the fourth day of the group-contingency condition of the interdependent group contingency condition, respectively. In terms of the frequency of on-task study behavior, subjects’ target behavior increased from a range of 50-60% to a range of 50-75%, compared to the baseline data. When the group-contingency condition was withdrawn, the students’ academic achievement and the frequency of on-task study behaviors decreased and somewhat returned to the baseline level, suggesting that the group contingency condition was effective in increasing subjects’ academic achievement and on-task study behavior. In terms of social acceptance, in general, subjects were less identified as being rejected by peers after group-contingency period, compared to the baseline period.

In Study 3, five (four boys and one girl) of the 16 ninth graders from a classroom participated in the study. They were selected based on their academic and social limitations. An A-B-A-B design was used to evaluate the relative effectiveness of interdependent group contingencies and individual contingencies on rate of correct responses in daily math work during math period, peer ratings of social acceptability, number of negative social interaction with classmates in social studies class, and achievement in social studies class. During the baseline condition/individual condition, students received token exchange points based on their individual performance; during the group contingency condition, students received
token exchange points based on all students reaching criteria (i.e., no less than seven correct math problem), and the number of correct math problems completed by all students. The group lost its earned points when it failed to meet the criteria. In addition, there were rules during the group contingency condition given out by the teacher: helping a group member who could not complete the math problem correctly was more likely to earn points for the group as a whole; and to use the last five minutes of each math lesson to help a group member who got less accurate math problem answers.

Results showed that the rate of students’ accurate math responding improved significantly in the group contingency condition, with the highest accurate response rate of 42.00, compared to the highest rate of accurate responses (10.00) achieved during the baseline condition. The rate of correct responding decreased significantly during the withdrawal of group contingency and the reintroduction of individual contingency (a daily high of 14.20), and increased significantly when the group contingency was reinstated (a daily high of 155). The results indicated that the interdependent group contingency was more effective in increasing students’ correct responding in math problems.

In terms of peer ratings of the social acceptability of each classmate, the number of negative nominations decreased (from 124 to 43), and the number of positive nominations increased (from 84 to 92) after the group contingency condition. The number of negative social interaction with classmates in social studies class was collected during the second individual contingency and the group contingency conditions. Data showed that 9 in 18 students reported having negative social interaction towards the target students during the second individual contingency condition and 1 in 20 students reporting having negative social interaction towards the target students during the group contingency condition. It showed that
the number of negative social interaction with classmates decreased after the group contingency condition.

An evaluation was conducted in social studies class to examine students’ achievement after the individual contingency and second group contingency conditions. Results suggested that all five students improved academically, and three of the students improved socially.

In Study 4, 22 first graders (15 girls and 7 boys) participated, with the focus on five of the subjects, based on their socially rejected situations in class. The study was conducted to evaluate the effectiveness of individual contingency and interdependent group contingency on student self-esteem, student social relations, and student preference for learning under individual or group contingencies. The school year started off with individual contingency condition/ baseline, followed by a mixture of individual and group contingencies. For the first two months of the school year, the individual contingency was used. During the initial individual contingency condition, students were assigned to do their work individually and to seek help from the teacher if needed. The teacher evaluated the students’ performance based on their individual work. A mixture of individual and group contingencies was introduced after the first two months. The individual contingency was used on easy worksheet tasks, while the group contingency was used on more difficult tasks across different subject areas. During the group contingency condition, students were randomly assigned into small groups and were instructed to check each other’s progress and to provide help to each other. Students were given the same grade based on their overall performance.

Results showed that 19 of the 22 students scored higher on their self-esteem questionnaire with less than six negative responses, compared to baseline with six or more negative responses. All but one of the five students was chosen more often to be part of the
team after the group contingency condition. All students preferred learning under group-contingency condition than individual-contingency condition.

Results from all four studies by Nevin et al. (1982) indicated the effectiveness of interdependent group contingency over individual contingency in improving students’ academic performance and peer acceptance.

There were general limitations in the studies. First, based on the target students’ deficits in social skill area, having them seek help from peers might not be feasible in a natural setting. More descriptions on this procedure under group contingency condition should be provided for the use of replication and evaluation. Second, students’ levels of peer acceptance or dislike reports were mainly done through questionnaires. Since the group contingency condition included the procedure of the teacher giving rules to the entire class, emphasizing on helping students who do not get as much accurate responses, the study purpose might be indirectly disclosed, which potentially affected the subjects in giving preferable scores on target students’ peer acceptability rate.

Lloyd, Eberhardt, and Drake (1996) examined the effects of two teaching variables: (a) the effect of group study on individuals’ performance, and (b) the relative effectiveness of individual and group contingency reinforcement contingencies on students’ Spanish vocabulary quiz performance.

In Experiment 1, an ABAB reversal design was used to evaluate the effect of group study. Twenty-seven students (15 girls, and 12 boys) in the first-year Spanish class participated in the study. The condition of students studying individually with no programmed consequence on their quiz scores was compared to the condition of students studying in groups with reinforcement being delivered based on individual performance. The
dependent variable was the number of accurate words being translated from Spanish to English. The independent variable was the group-study and individual-reward contingency condition. The first phase (A) was a condition of individual study and no reward contingencies. The second phase (B) was a condition of group study and individual contingencies. Tangibles and social reinforcement were provided to any students who achieved nine or more accurate responses for the day’s vocabulary quiz. The conditions were repeated to examine the intervention effect.

Results showed that students’ scores improved to a mean of 87% during the first intervention condition, compared to a mean of 70% during the baseline condition. Students’ scores decreased to a mean of 68% after the first withdrawal of the intervention condition, and increased to a mean of 83% followed by the reintroduction of the intervention condition. In addition, the average range of scores decreased after the intervention was applied, with 8.7 during baseline, 6.1 during the first intervention condition, and 9.5 during the second baseline, and 7.2 during the second intervention phase. Lloyd et al. (1996) showed that the intervention was responsible for the increase in accuracy responses on Spanish quiz scores.

In Experiment 2, Lloyd et al. (1996) studied the comparative effectiveness on improving Spanish quiz score between the individual reinforcement contingency and the interdependent group contingency reinforcement contingency within a group study condition, using an ABCBC reversal design. Seventeen students in a first-year Spanish class were the subjects. The dependent variable was the same as Experiment 1; the independent variables were the individual and interdependent group reinforcement contingency. (A) and (B) conditions were the same as Experiment 1. In the first condition (A), students studied independently with no programmed consequence. In the second condition (B), students
studied in groups and received reinforcement based on individual performance. In the third condition (C), students studied in groups and received reinforcement based on overall performance of the groups. Members of the group with the higher score or the members of both groups who met the mean score of nine or higher earned the reinforcement. Social validation on the preference of group contingencies was also investigated through anonymous surveys.

During the baseline condition (A), the mean quiz score was 67%; during the individual group contingency (B), the mean quiz score increased to 86%; during the interdependent group contingency (C), the mean quiz score was 91%. The first withdrawal of the interdependent group contingency and the replication of the individual group contingency decreased the average quiz score to 81%, and the second replication of interdependent group contingency increased the mean quiz score to 90%. Results from the study showed that the interdependent group contingency produced more improvement on Spanish quiz score than the individual contingency, within a group study condition. Moreover, more than 90% of the students preferred interdependent group contingency than individual group contingency.

The intervention showed significant effectiveness of the interdependent group contingency within a group study context; however, the study measured the mean of correct responses within the groups. The limitation of the procedure could be the failure in identifying if the intervention was effective in improving the Spanish quiz score performance in low achieving students, in particular. Individual’s quiz scores could be further examined.

**Independent Versus Dependent Versus Interdependent Group Contingency**

Speltz et al. (1982) examined the effects of procedural variations in group contingencies on children’s academic and social behaviors. Twelve students (four girls and
eight boys) from a learning disabilities class, ranging from 7- to 10-years-old, participated. They were chosen based on their severe academic deficiencies. The dependent variables were the correct responses completed on arithmetic worksheet problems during a 10-min period; and the social interaction among the participants and the students in class, which were categorized as “positive,” “neutral,” and “negative” interactions based on verbal and/or nonverbal behavior. The presence or absence of social interaction among the participants and the students were measured through a 7-second observe, and 7-second record time sampling data collection method.

The two baseline conditions were introduced in serial order, followed by the counterbalanced presentation of four contingencies. The first baseline condition was conducted to identify four target students who were the lowest performing students; at the same time, it served to identify the highest performing students, who later were assigned to the same group with one of the target students. During the second baseline, students were assigned into four groups of three students, and each group worked alone in an experimental room. The four contingency conditions included individual contingency, all-member group contingency (i.e., interdependent group contingency with the delivery of reinforcement based on average performance of the group), identified responder group contingency (i.e., dependent group contingency with the delivery of reinforcement based on a low performing target student’s performance), and unidentified responder group contingency (with the delivery of reinforcement based on a randomly selected student’s performance). The experimenter posted a sign to signal students the condition they were under. Prior to the start of each condition, task instructions and the target student in each group were announced to students in the group, except for the unidentified responder group contingency. Under the
unidentified responder group contingency, an unidentified responder was randomly selected in each group after the work period had ended. Students’ preference of the contingency condition was also evaluated through the use of a 5-point Likert scale on questionnaires on the final day of each condition.

Results showed that the four target students consistently performed better on arithmetic problems under the group contingency conditions than baseline conditions. Two of the target students performed best during the identified responder group contingency condition, while the other two students performed best during the all-member group contingency condition. One of the subjects performed well under both conditions. There was no significant relative effect for contingencies on the subjects’ mean worksheet scores.

Two of the groups showed consistent increase in positive social interactions under the identified responder group contingency condition. However, there was no significant finding on the increase in positive social interactions under any contingencies, as compared to the baseline condition. Student rating of contingencies showed that students rated the identified responder group contingency the highest, while the individual contingency the lowest.

Speltz et al. (1982) reported that the different contingencies were equally effective on improving students’ mean score on arithmetic worksheets. The major limitation of the study was the measurement of social interaction during group contingencies. Given that students were instructed to help each other, it manipulated the positive social interaction data. Therefore, there was no surprise to see that the positive social interaction increased during the identified responder group contingency. Future studies should evaluate social interaction among students after the work period, instead of during the work period.
Interdependent Group Contingency

Barrish et al. (1969) studied the effectiveness of interdependent group contingency on students’ disruptive behaviors in a classroom. An experimental analysis, which included both reversal and multiple baseline design, was used to study the intervention effect. Twenty-four fourth graders participated in the study, with seven referred by teacher to school principal due to their high levels of disruptive behaviors. The target behaviors were out-of-seat and talking-out behavior. The intervention was carried out during math and reading periods. Students were divided into two teams based on their seating positions. Students were informed to be taking part in a competition between two teams to achieve reinforcement criteria to get access to the “natural” reinforcers, e.g., wear victory tags, put a star by each of its members’ names on the winner’s chart, line up first for lunch, and take part at the end of the day in a 30-min free time during which the team(s) would have special projects etc. Both teams could win at the same time. Whenever a member of the team engaged in a disruptive behavior, a mark was marked under the team; therefore, the individual consequence was shared by all members of the team. The reinforcement criterion were set based on the number of inappropriate behavior being marked during the periods, i.e., either team had fewer mark or either or both teams had five marks or less. There were four corresponding phases: (I) math (baseline), reading (baseline); (II) math (game1), reading (baseline); (III) math (reversal); reading (game); (IV) math (game2); reading (game).

Results showed that after the game was applied in math period, there was a sharp decline in students’ talking-out behavior (from a median interval of 96% to 19%), and out-of-seat behavior (from 82% to 9%), compared to baseline. During the same phase, when reading baseline was conducted, students’ level of talking out loud behavior remained at baseline and
a slightly lower out of seat behavior. The withdrawal of the game showed a significant increase to higher or baseline level of disruptive behaviors, indicating the effectiveness of the game. During the last phase when the game was applied in both periods, both disruptive behaviors declined and remained low. Both teams won in all games, except on three occasions.

The results of the study showed that interdependent group contingency was effective in decreasing students’ disruptive behavior in classroom. It was interesting to find that the use of natural reinforcers was effective enough to decrease students’ disruptive behavior. The advantage of using natural reinforcers was that they were more convenient to prepare and access in a regular classroom setting. Future research directions could include the replication of the procedure in a special needs classroom, and the relative effectiveness of using external/back up reinforcers and natural reinforcers, using the same group contingency system.

Packard (1970) investigated the effect of a group contingency on classroom attention with the use of a reversal design experiment. Four classrooms (kindergarten: 32 children, third grade: 34 children, fifth grade: 25 children, sixth grade: 30 children) from an elementary school, participated. The dependent variable was attention, which could be controlled by various stimuli (verbal, written, teacher etc.) Attention was measured by cumulating the time on a timer. The timer was only engaged when every student was attending. A percentage was calculated by dividing the cumulative time by the total time for the session. The independent variables included instructions only, and instructions + interdependent group contingency, respectively. The experimental conditions included Baseline 1, Baseline 2, Instruction Only 1, Reinforcement 1, Instructions Only 2, Reinforcement 2, and 3. Starting from the second
baseline condition, which was conducted after the first baseline, a light that turned on contingent upon student’s inattentive behavior, was utilized. Teachers explained the rules to the students prior to the start of the experimental condition, and evaluated their behavior at the end of the sessions.

Results showed that during baseline, students demonstrated low rates of attention. During the Baseline 2 condition, where the light was used with no instructions or programmed consequence, no change in participants’ attention was noted. When instructions were given explicitly, a temporary increase in attention was shown in some students and for some classrooms. When instructions and interdependent group contingency was incorporated in the experimental condition, there was an immediate and dramatic increase in students’ attention. The classes gradually reached to a 75-80% level of time attending to teacher’s instructions. Evidence showed that interdependent group contingency with explicit instructions was effective in increasing students’ attention rate.

However, the study had some limitations. Since “classroom attention” was controlled by various stimuli (verbal, written, the teacher etc.), the stimuli presented in each classroom posed an effect on students’ attention, which might contribute to the fluctuating and inconsistent trend of change in participants’ attention across different classrooms. More information on the teaching materials used, teaching activity set up and task difficulty should be included in the study for future replication.

Greenwood et al. (1974) compared the effectiveness of three packages of group contingencies: rules, rules + feedback, and rules + feedback + group and individual contingencies, in increasing students’ appropriate behavior in three elementary classrooms during mathematics and reading periods. A multiple baseline design was used to study the
effectiveness of the group contingencies in students’ classroom behavior in a first-grade, second-grade, and third-grade classrooms, respectively. The teachers and students (28 students in first-grade classroom, 20 students in second-grade classroom, and 20 students in third-grade classroom) of the three classrooms participated. The dependent variables were the appropriate classroom behavior and teacher social consequences. The teacher served as the primary observer of classroom behavior. Teacher social consequences was measured based on the accuracy of delivery of contingent positive and negative feedback, by the consultant. There were five conditions in the study: teacher baseline, rules, rules + feedback, package (rules + feedback + group and individual consequences), and a follow up, which was conducted 3 weeks after the termination of intervention. Teachers and students selected the goal together. During the experiment, teacher used a clock light to measure the frequency of appropriate behavior.

During baseline, the mean levels of appropriate behavior in Classroom A, B, and C were 47.0%, 60.1%, and 29.7%, respectively. During the rule condition, there was no change in students’ social appropriate behaviors in all three classrooms. During the rule + feedback condition, two of the three classrooms showed an increase in students’ appropriate classroom behavior. During the “package” condition, all three classrooms showed consistent increase in students’ appropriate classroom behavior. The mean levels of appropriate behaviors were 81.2, 84.6, and 74.2% in classroom A, B, and C, respectively. Similar effects maintained three weeks after the termination of the intervention program in all three classrooms. In terms of teacher social consequences, two of the three teachers consistently provided accurate social consequences; all three teachers consistently provided low to near-zero incorrect social
consequences. Teachers’ accuracy in delivering social consequences increased under
consultant instructional and reinforcement control during the “package” condition.

It is important to note that careful consideration on the feasibility of apparatus used to
measure students’ behavior should be made when the teacher him/herself served as the
primary observer. In the study, teachers stopped using Packard’s (1970) clock-light apparatus
after the intervention program was terminated, showing that the social validity of having the
apparatus for behavior measurement might not be high. At the same time, teacher social
consequences could be refined to improve treatment integrity and treatment effectiveness. For
example, ongoing training that includes instructions of procedure and feedback would be
beneficial in a long run, increasing the maintenance effect of the intervention. The accurate
delivery of contingent positive and negative feedback is important, especially during the
initial phase of the intervention.

Ling and Barnett (2013) did a study on increasing preschool student engagement
during group learning activities, i.e., circle time, by using a group contingency. A combined
delayed multiple baseline and reversal design was used to study the effect of interdependent
group contingency procedure used across two preschool classrooms, morning and afternoon
classrooms. Five students from the morning class and two students from the afternoon class
were selected as the participants of the study. They were selected based on their engagement
in high level of disruptive behaviors during circle time through direct observations and
teacher’s interview. The dependent variables included two student variables, disruptions and
engagement; and three instructional variables, teacher positive attention (T-PA), teacher
negative attention (T-NA), and teacher direct instructions (TDI). A 15-second interval time
sampling was used to measure disruptions, T-PA and T-NA. A momentary time sampling on
every fifth interval was used to measure students’ engagement and TDI. The teacher used a counter to keep track of the number of disruptive behavior during the sessions and evaluated students’ performance at the end of the sessions.

The study started with an initial baseline condition (A1), in which the variables were measured with teacher using the behavior management procedures typically used in managing students’ disruptive behavior; followed by the introduction of training and implementation of interdependent group contingency (B). The group contingency procedure was then withdrawn (A2) and reinstated (B) to evaluate if the procedure contributed to the decrease in disruptive behavior and increase in engagement.

Baseline data showed that the implementation of the interdependent group contingency decreased the percentage of intervals of disruptive behavior immediately (morning class: from a mean of 72.30% during baseline to 28.57% during intervention; afternoon class: from a mean of 46% to 9.04%). The morning class met the criteria for reinforcement during 60% of the intervention sessions, and the afternoon class met the criteria for reinforcement during 100% of the intervention sessions. In terms of engagement, the procedure was effective in increasing and maintaining high and stable rates of students’ engagement in the morning class (from a mean of 67.86% to 94.68%) and afternoon class (from a mean of 76.61% to 98.28%), respectively. In terms of teacher attention, the procedure contributed to the slight increase in positive attention (morning class: from a mean of 14.42% to 16.40%, afternoon class: from a mean of 6.12% to 19.73%) and decrease in negative attention (morning class: from a mean of 30.7% to 12.04%, afternoon class: from a mean of 11.92% to 5.73%). In terms of teacher directed instruction, the procedure was effective in
increasing and maintaining high and stable rate of teaching instructions (morning class: from a mean of 68.6% to 91.3%, afternoon class: from a mean of 95.0% to 95.54%).

In summary, the procedure was effective in decreasing students’ disruptive behaviors, increasing students’ engagement, and teacher directed instructions. However, the study had limitations. Results of the study showed that although the intervention procedure was effective in decreasing disruptive behavior, the rates of disruptive behavior was still high in general during circle time activities; that showed that the procedure might not be achieving the purpose of the study to a certain extent. Procedures or phases of the intervention could be further broken down into smaller steps. For example, start off with the use of interdependent group contingency in a smaller group or including fewer number of students with disruptive behaviors in a group to provide more success rate and attention to the selected students before moving on using the group contingency with the entire class.

Donaldson et al. (2011) evaluated the Good Behavior Game (GBG) in kindergarten classrooms by using a nonconcurrent multiple baseline design across classrooms. The GBG was an interdependent group contingency system that included procedures of dividing the class into teams, creating simple rules, and arranging contingencies for breaking or following those rules (Donaldson et al., 2011). Ninety-eight students from five kindergarten classrooms and five teachers participated in the study. The teachers served as the implementers of the procedure, as well as the observer role. The dependent variables included target responses: out of seat, talking out of turn, and touching another student. The target responses were measured through a computer program designed for frequency data collection in real time. The independent variable, the GBG, was carried out by reminding students of the game rules and reinforcement criterion prior to the start of the game. For every occurrence of one of the
three disruptive behaviors, one hatch mark would be marked on the board, with teachers’ announcing the violation of rule. Whichever team with fewer hatch marks won the game, or both teams won the game if they met the reinforcement criterion. The reinforcement criterion was set at least 80% reduction of disruptive behaviors from baseline.

Results showed that compared to the high level of disruptive behaviors measured during the baseline condition (M=13,5,4,7, and 8 responses per minute in each classroom, respectively), disruptive behaviors decreased in all classrooms after the game was introduced (M= 2,1,1,2, and 1 responses per minute, respectively).

In addition to the limitation of not including changes in each individual’s behaviors in the study, future researchers should make adjustments to increase treatment integrity. The treatment integrity averaged 60% across all classrooms, which was not very high. That may explain why disruptive behaviors still maintained after intervention. Although interdependent group contingency was comparatively easier to implement and was less labor intensive, longer training and concurrent feedback should be included in the training phase to maximize the treatment effect.

Ling, Hawkins, and Weber (2011) studied the effects of a class wide interdependent group contingency designed to improve the behavior of an at-risk student during group academic activities with an ABAB withdrawal design. The student participant was an 8-year-old boy, who was referred due to his high levels of off-task behaviors in a first-grade classroom. The dependent variables included engagement (active and passive) and off-task behavior (motor and verbal). A 15-s momentary time sampling technique was used to measure the dependent variables. The intervention included the use of three smiley face stickers. All students, including the target student, had to demonstrate sitting nicely and
attending behaviors to earn each smiley face. Upon the completion of the three smiley faces, the class was reinforced at the end of the group activities. Negative feedback was given to the whole class when inappropriate behavior was observed.

Results showed that student engagement increased from a range of 45.80% to 73% of intervals during baseline to above 80% after the introduction of intervention, and returned to baseline level during the first withdrawal of the intervention. Student engagement increased again after the reinstatement of the procedure, proving that the interdependent group contingency was effective in increasing student engagement. The average of engagement in the target student was 86.70% across both interventions. In terms of off-task behavior, the target student engaged in high rates of off-task behaviors during baseline condition (M=56%). After the first introduction of procedure, off-task behaviors of the target student decreased immediately. The off-task behaviors increased when the system was withdrawn, yet, were lower than the initial baseline. They decreased again after the procedure was reintroduced. The average of student’s off task behaviors was 25% across both interventions.

Although the interdependent group contingency in the study had an immediate effect on the target students’ behavior, the long-term goal of the intervention was a concern. The system required the whole class to earn three smiley faces to get access to the reinforcement. Assuming the system was working smoothly, the reinforcement schedule should be quite dense that the teacher might not be able to spend much time on teaching. Further, when the whole class got frequent access to the only reinforcer, i.e., the beanie dolls, the chance of satiation was quite high. Future studies should include a phase progression. For example, moving on from initially earning three smiley faces to five smiley faces, gradually and systematically delaying the reinforcement upon students’ success in earning the smiley faces.
In addition, the implementers should conduct preference assessments from time to time to maintain the motivation of the class.

All in all, significant evidence showed that a group reinforcement contingency was effective in changing students’ behavior in a classroom setting (Speltz et al., 1982). According to Litoe and Pumroy (1975), 7 out of 14 studies indicated no significant difference in the effectiveness between independent group contingencies (or individual contingency in group setting) and interdependent group contingencies. Interdependent group contingency system in particular, was effective in decreasing students’ inappropriate behaviors in classroom settings (Donaldson et al., 2011). In addition, results showed that it was effective in improving academic performance (Lloyd et al., 1996), appropriate behaviors (Ling et al., 2011), and social acceptance (Nevin et al., 1982) etc.

Greenwood et al. (1979) investigated the social validation on the Program for Academic Survival Skills (PASS), which was an interdependent group contingency system. Results from follow-up questionnaires indicated that an average of 60% of teachers continued using the procedure in a long run. It suggested that the interdependent group contingency had high social validity. Based on the evidence and advantages, interdependent group contingency is a feasible, effective, and preferred procedure in conducting behavior management in a regular classroom setting.
Chapter III: Statement of Purpose

Group reinforcement contingency system has been widely used across classrooms to decrease students’ inappropriate behaviors, and to increase students’ appropriate behaviors (Herman & Tramontana, 1971; Long & Williams, 1973). Evidence shows that an interdependent group contingency is as equally effective as an independent group contingency (Herman & Tramontana, 1971). To date, group reinforcement contingencies have been applied to typically-developing students (Solomon & Tyne, 1979), and students with disabilities (Nevin et al., 1982). The language repertoire of these individuals allowed including instructions/ rules in addition to the reinforcement contingency. In addition, the schedule of reinforcement was sparse, generally at the end of the session. However, these procedures may not be applicable to individuals with ASD due to their social and language impairment (American Psychiatric Association, 2013). No related study with individuals with ASD in mainstream school was located.

The purpose of the study was to evaluate the feasibility and effectiveness of utilizing an interdependent group contingency on changing the behavior of 5-year-olds with ASD in a setting that simulated a regular classroom setting. The procedure was adapted for the children with ASD by teaching them to understand the interdependent group contingency by providing reinforcement contingent on the demonstration of completion of the independent work by all students in the group. Although the children were not in a mainstream classroom, this study might show the potential of using an interdependent group contingency with children with ASD in a regular classroom setting.
Chapter IV: Method

Participants and Setting

The study was conducted at Autism Partnership, Hong Kong, an agency that provides behavioral therapy service for families with children with Autism Spectrum Disorder based on the principles of Applied Behavior Analysis. Six children participated. They ranged from 3- to 6-years-old and were diagnosed with ASD. One of the students dropped out of the study before the choice condition due to termination of service.

They study was conducted in Little Learners, which was a classroom simulated group session that took place from Monday to Friday (1:00 p.m.-3:15 p.m.). The session room was approximately 4m x 7m and contained two desks, fourteen chairs, two shelves of teaching materials (e.g., books, arts and crafts materials, toys), a trash bin, and two carpets (approximately 1m x 2m, and 0.8m x 0.8m, respectively). The intervention was conducted at Busy Bee Corner at the same time every day for approximately 15 minutes in total. During independent work time, the therapist provided a worksheet to the students and asked them to complete it. All children used an individual reinforcement contingency in one-on-one sessions and an independent group contingency in Little Learners. None of the participants experienced the use of interdependent group contingency prior to the intervention. The author and the other therapist at Little Learners was the implementer. All sessions were videotaped and reviewed by the observer later for data collection. A trained therapist, other than the author, also served as an observer.

Materials

A video camera was used to record all baseline and training sessions. Worksheets, as seen in Appendices D and E, were used to measure the percentage of worksheet responses.
The length of each worksheet corresponded with how many responses the student could complete in 5 minutes. A token board, as shown in Appendix C, was used during the interdependent group contingency condition. Reinforcers (i.e., edibles, e.g., candies, chips, and crackers) were used throughout the experimental conditions in the study. A data tracking sheet, as shown in Appendix B, were used to record the percentage of completed worksheet responses of all students.

**Response Measurement and Interobserver Agreement**

*Finish Work* was operationally defined as writing in all the answers for the questions on the worksheet within the 5-minute time limit, regardless of the accuracy of responses. The instructional tasks included a worksheet task (e.g., therapist issued the instruction “Everyone, do your work”). The skills (e.g., counting, tracing line, coloring, etc.) that were required to complete the worksheet were within the students’ repertoire. Data were collected on the number of completed responses of each student. The experimenter kept all worksheets. Data were converted to a percentage by dividing the total number of completed responses by the total number of questions on the worksheet, and then multiplying by 100.

In addition, the average for all team members’ completion of the worksheet was computed. Data were converted into a percentage by dividing the total number of completed responses given by all team members by the total number of all worksheets, and multiplying by 100. For example, in Team 1, Student A completed 5 questions out of 10 questions, Student B completed 10 questions out of 10 questions, and Student C completes 2 questions out of 10 questions. The average in which all team members’ completion on the worksheet task was calculated as 
\[
\frac{(5+10+2)}{(10+10+10)} \times 100 = 56.7\%.
\]
Data on interobserver agreement (IOA) was collected across all phases for 100% of sessions. The IOA was calculated by dividing the agreements on the number of completed responses on the worksheet task by the total number of agreements and disagreements, and multiplying by 100. The mean for interobserver reliability on students’ worksheet responses was 100%.

**Observer Training**

Observers were behavioral therapists employed by the agency. They had a minimum of one-year experience on treatment implementation and treatment data collection. Training consisted of the author providing an informational meeting about the study that included the explanation on the role and commitment of a data collector, the operational definition of the target behavior, the data collection method, and the training process. The author also reviewed the data tracking forms, role played data collection procedures, and calculated the percentage of completed responses with the observers individually. The author allowed time to answer observers’ questions regarding the role of data collector.

The author explained the job duties of being a data collector, followed by elaborating on the operational definition of “finish working” by providing examples for the completed or incompleted responses on the worksheet tasks. The author taught the observers how to use the data collection form. The author provided practice worksheets to the observers and asked them to indicate if responses were complete or incomplete.

The author reviewed and compared the data with the data sheet that the author completed prior to the observer training. To be qualified to serve as an observer of the study, the observer needed to reach a 100% IOA during two consecutive role play sessions, which was calculated by dividing the number of agreements by the total number of agreements and
disagreements, and multiplying by 100. The observer had a maximum of two attempts to pass the training. If the observer did not pass the second attempt, he/she could not participate in the data collection procedure of the study.

**Design Elements and Experimental Conditions**

A counterbalanced design was used to evaluate the effectiveness of independent group contingency and interdependent group contingency on increasing the target responses of individuals with autism in a classroom setting. The same group of students worked on both conditions, the Language Arts worksheet condition and the Mathematics worksheet condition. There were two sessions every day: students worked on a language worksheet task after they came into the classroom and completed their school routine, and students worked on a mathematics worksheet task during the second half of the school day, which was at least 1 hour apart from the first language worksheet task. The study consisted of four experimental conditions for each academic subject. The conditions for the Language Arts worksheet included Independent group contingency, Interdependent group contingency, Best treatment, and Choice Condition. The conditions for the Mathematics worksheet were counterbalanced: Interdependent group contingency, Interdependent group contingency, Best treatment, and Choice condition.

**Pre-assessment**

Prior to the study, a pre-assessment was conducted to show that the skills that were required to complete the worksheet task were within the participants’ repertoire. The pre-assessment was carried out by the implementer working with each student individually. The implementer asked the student to complete a worksheet, in which the skill required was within the student’s mastered learning curriculum (e.g., colors, matching, counting). The
implementer provided a verbal praise for every question that the student completed correctly and a choice of edible when the five minutes ended. If a student verbally said “I don’t know” or made any requests for seeking help, the implementer removed that worksheet immediately, and moved on to the next worksheet. The implementer worked on a second attempt on another kind of worksheet with the students who could complete the worksheet. For example, if Student A was not able to do a counting worksheet on the first attempt, the implementer would work on a coloring worksheet with the student on the second attempt. The procedure ended when there was at least one kind of worksheet being identified as the mastered independent work for Language Arts and Mathematics respectively. One worksheet was used for each academic subject. The number of questions that each student needed to work on were approximately the same. Pre-assessment information were used to determine the length of worksheets. In addition, the time limit for both academic subjects was the same, i.e., 5 minutes.

**Independent Group Contingency**

The same independent group contingency procedure that the Little Learners have been using was used during this condition. The teacher gave out the worksheets to the students, and gave the instruction, “Everyone, do your worksheet. If you finish your worksheet by the time I say “Time’s up,” you get a treat.” When time was up, the teacher held onto a box that contained 6 choices of edibles and announced the end of the worksheet task. The choices of edibles were selected based on the reinforcement sampling procedure used by Autism Partnership Hong Kong. The teacher then evaluated with each student. The student got access to a choice of the edibles based on their own performance on completing the worksheet. If a student could not complete the worksheet, the teacher provided mild
feedback, telling the student that since he/she did not finish the worksheet, he/she did not get a treat or he/she would need to try harder next time. The experimental condition was implemented until stable data points were collected. Data were collected on the number of completed questions of each student and the average of the group.

**Interdependent Group Contingency**

During the interdependent group contingency condition, a token board, as seen in Appendix C, was used. The teacher gave out the worksheets to the students, and announced that “Everyone, do your worksheet. If all of you finish your worksheets by the time I say “Time’s up,” everyone gets a treat.” The teacher clarified with the students by asking if the students were able to get a treat when there was only one friend finishing the worksheet and emphasized again on “All students need to finish their work”. When time was up, the teacher used a token board to evaluate with the students. The teacher put the student’s picture on the token board if he/she completed the worksheet. All students’ faces needed to be on the token board for the whole group to get a treat from the teacher. When one or more students did not complete the worksheet, the teacher informed the students by saying that “Not everyone finished their worksheet, I cannot give out the treat for you guys. Remember the whole group needs to finish to get a treat.” The experimental condition was conducted until stable data points or an increasing trend was identified. Data were collected on the percentage of completed questions of each student and the average of the group.

**Best Treatment**

Followed by the previous group contingency, the experimenter implemented the group contingency that resulted in the best performance by the students.
Choice Condition

The study ended with the choice condition, in which students were asked to choose one of the two group contingencies, independent or interdependent group contingency, before performing the worksheet task. The contingency implemented was decided by the preference made by the majority of the students. The implementer asked the student one by one outside the classroom and prior to each worksheet task if he or she wanted to work on his/her own or work with friends on candy jar (i.e., the group tokens) for the (academic subject) worksheet work. If half of the students chose the independent group contingency, while the other half choose the interdependent group contingency, the experimenter drew the contingency from a bag in front of all students, which contained two slips that represent the two contingencies. The implementer announced the group contingency that would be used prior to each worksheet task under the choice condition.
Chapter V: Results

Language Arts Worksheet

Figures 1 and 2 show the results for individual students for Language Arts and Mathematics worksheet respectively. Figure 3 (top panel) shows the mean percentage of completed worksheet responses for Language Arts and Mathematics worksheet across conditions. The first condition for Language Arts (independent) and Mathematics (interdependent) was carried out for 13 sessions each. Each of the remaining conditions consisted of 5 sessions.

During the Language Arts independent group contingency, the mean percentage of students’ worksheet responses was 93.4% (range 61.9% to 100%) with responses increasing to 100% during the fourth session and remaining above 90% for all remaining sessions (mean of last 10 sessions =98.7%). The interdependent group contingency was introduced after the independent group contingency. The average percentage of students’ completed worksheet responses for the interdependent group contingency was 100%.

Based on the data, the best treatment condition was the interdependent group contingency for the Language Arts worksheet. The average percentage of students’ completed worksheet responses for the best treatment condition was 100%.

After the best treatment condition, one participant (Student 1) dropped out with five students remaining in the study. During the choice condition, the number of students who chose the interdependent group contingency was 5, 4, 4, 3, and 4. The interdependent group contingency was used during all five sessions under the choice condition, with the average percentage of completed worksheet responses at 100%.
Mathematics Worksheet

During the Mathematics interdependent group contingency, the mean percentage of students’ worksheet responses was 87.3% (range 48.3% to 100%) with responses increasing to 100% and stable during the seventh session and remaining above 80% for all remaining sessions (mean of last seven sessions = 97.1%). The independent group contingency was introduced after the interdependent group contingency. The average percentage of students’ completed worksheet responses for the independent group contingency was 96.8% (range 84.2% to 100%).

Based on the data, the best treatment condition was the independent group contingency for the Mathematics worksheet. The average percentage of students’ completed worksheet responses for the best treatment condition was 96.1% (range 83.3% to 100%).

The remaining five students continued to participate during the choice condition. During the choice condition, the number of students who chose the interdependent group contingency was 4, 3, 3, 4, and 4. The interdependent group contingency was used during all five sessions under the choice condition, with the average percentage of completed worksheet responses at 100%.

In summary, the group contingencies appeared to be equally effective. In general, students’ average percentage of completed worksheet responses under both conditions were quite high. However, results from the choice condition showed that the majority of the students preferred the interdependent group contingency over the independent group contingency.
Chapter VI: Discussion

The purpose of the study was to evaluate the effectiveness of group contingencies on students’ completed worksheet responses. Both reinforcement contingencies alone (i.e., without concurrent positive/ negative feedback on correctness of responses, and presentation of the task again upon negative feedback, which was the common practice in Little Learners) were effective in maintaining high average percentage of worksheet responses.

Prior to the study, students had been using the independent group contingency, which may explain its shorter time in obtaining stable points on their worksheet responses. On the contrary, the interdependent group contingency was novel to all. An additional five sessions were needed for the students to understand the interdependent group contingency during the initial Mathematics worksheet condition as compared to the independent group contingency during the Language Arts worksheet. At the same time, for students who understood the interdependent group contingency sooner than others, crying was observed upon the implementer’s announcement of not earning the reinforcers. Data showed that after the students understood the interdependent contingency, it took fewer sessions for the experimenter to collect stable data points, e.g., during the implementation of interdependent group contingency for the second experimental condition for the Language Arts worksheet.

The data showed that most students preferred the interdependent group contingency over the independent group contingency. In addition, it was interesting to note that some of the students tried to help the students who were comparatively slower in completing the worksheet. Students went to their peers’ seats and made comments including, “Go go go! Faster, faster!” There were a few attempts where one of the students tried to do the work for another student. However, the implementer stopped him by telling him that each student
needed to complete his own work. He changed his strategy by telling the answers to his peers and cheering for the other students. In addition, during the interdependent group contingency, it was observed that some students stood up and looked at others’ worksheets and commented “(Student 1) finished! (Student 2) finished!” and encouraged those who had not finished. Future studies could include the measurement of both positive and negative social interaction in addition to worksheet responses.

Despite the high average percentage of students’ completed worksheet responses, there were limitations. Firstly, due to students’ individual difference on cognitive level and fine motor skills, the worksheet types, which all students had the repertoire to complete were limited to only a few (i.e., tracing words, coloring for Language Arts worksheet, and counting, coloring, cutting and pasting for Mathematics worksheet). That might contribute to higher completed responses for some of the students due to the easier level of work. Future research could choose a population with a similar cognitive level, so the group can all work on the same sets of slightly harder worksheets. Alternatively, the experimenter could choose a novel type of worksheet for all students. A one-to-one teaching phase could be included. When all students master the skill to complete a certain type of worksheet, the group contingencies could be applied to evaluate students’ performance when completing novel worksheets.

Secondly, the number of worksheet responses required of each student was different. The number of worksheet responses required was estimated by the number of worksheet responses that the student completed during the pre-assessment phase. The number of worksheet responses was slightly more than the number that was observed during the pre-assessment phase. An alternative method for response measurement for future direction could
include a rule, like completing a certain number of worksheet responses to get access to the reinforcement. Moreover, one of the students had not mastered writing or tracing skills prior to the study. Therefore, the student attempted all worksheet responses by sticking the answers, which had Velcro sticker at the back, onto the laminated worksheet. These problems could be addressed if the population has similar repertoires.

As mentioned earlier, since students were exposed to the independent group contingency prior to the study, future studies could consider choosing a population, who had not been exposed to either of the group contingencies.

For generalization and maintenance purposes, the interdependent group contingency could be applied to different tasks within the group session. Ideally, the more often the interdependent group contingency can be used across segments, the less labor is required and the less intrusive the teaching facilitation will be, particularly in a classroom with students with special needs. Therefore, generalizing the use of the interdependent group reinforcement contingency across different target behaviors and different segments throughout the session may show meaningful results on the effectiveness of the reinforcement contingency itself.

In addition, due to students’ previous exposure (except for student 6) to the independent group contingency prior to the study on the target behaviour (i.e., finish work on worksheet task), the percentage of completed worksheet responses was quite high. Future research could examine choosing a target behavior, in which the baseline data may be quite low, to show more significant results on the effectiveness of both reinforcement contingencies.

The present study was conducted in a simulated classroom with students with ASD. The procedure could be replicated in the future to evaluate the effectiveness and preferences
of the two group contingencies with children with ASD and typically developing students in a mainstream classroom.

In conclusion, there were no major differences between the independent and interdependent group contingency, although acquisition under the interdependent group contingency took slightly longer. The major advantage of using the interdependent group contingency included the lower demand of labor, since the therapist did not need to monitor each student or provide concurrent feedback. Future research could collect data on choice of procedure for the implementer. It was a feasible reinforcement contingency to be applied in a group setting and might have a higher chance in helping students transition to learn in a natural group setting, i.e., mainstream classroom. In addition, the awareness to other’s work and the spontaneous commenting in helping and encouraging peers were an additional benefit of the study.
References


Appendix A: Figures

Best treatment:

Independent group contingency

Interdependent group contingency

Interdependent group contingency

Student 1

Best treatment:

Independent group contingency

Interdependent group contingency

Interdependent group contingency

Student 2
Figure 1. Percentage of completed Language Arts worksheet responses over participants and experimental conditions.
Figure 2. Percentage of completed Mathematics worksheet responses over participants and experimental conditions.
Figure 3. Average percentage of completed worksheet responses over academic subjects and experimental conditions.
Appendix B: Data Collection Form

Procedure: Please collect data on the number of completed questions in each student. Please put down (number of completed questions/total questions) on the box. Start a new column for every day.

Operational definition of “finish work:” Student writes the answer for the question on the worksheet task within the 5-minute time limit, regardless of the accuracy of response.

**Language Arts**

**Experimental condition:** Independent/Interdependent

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<td>Student 4:</td>
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**Mathematics**

**Experimental condition:** Independent/Interdependent

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Appendix C: Token Board for Interdependent Group Contingency
Appendix D: Example of Language Arts Worksheet

Name: ______________________  Date: ______________________

[Image of four cards: a cat, a rainbow, a pair of socks, and an apple]
Appendix E: Example of Mathematics Worksheet