

Teaching Appropriate Play to Replace Stereotypy Using a Treatment Package with Students Having Autism

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Abstract

Students with special education needs such as autism tend to have difficulty with appropriate play skills and leisure time skills. A lack of play may lead to inappropriate behaviors such as stereotypy or passivity. When students have a limited community of reinforcers it may be difficult for educators to find motivators that can be used to teach language, social, academics, and other skills. The present study tested a treatment package in a small group format on the on task painting behavior and stereotypy of four boys between 5 and 12 years old having autism. Using a delayed multiple baseline across students experimental design, a functional relationship was demonstrated between an observed increase in on task painting behavior and decrease in stereotypy of all four students as a function of their participation. Limitations of the present study were also discussed.

Keywords

autism, conditioning reinforcers, stereotypy, painting, play

Introduction

Children with special education needs (SEN), including autism, frequently lack functional, age-appropriate play behaviors. Without meaningful play skills, children with SEN may behave inappropriately and be observed to have high rates of self-stimulatory behaviors known as stereotypy (American Psychological Association, 2013). In homes, schools, and in their communities, children are expected to play appropriately. Play behaviors may include independent or solitary, cooperative, and pretend or imaginary play. In fact, play behavior is included in most assessment instruments that are used by professional behavior analysts to

assess young children (Bailey & Wolery, 1989; Partington, 2010; Greer & McCorkle, 2013). The research literature in applied behavior analysis is replete with effective strategies and tactics to remediate inappropriate play behaviors and decrease stereotypy (Koegel, Firestone, Kramme, & Dunlap, 1974; Wahler & Fox, 1980; Greer, Becker, Saxe, & Mirabella, 1985; Nuzzolo-Gomez, Leonard, Ortiz, Rivera, & Greer, 2002). Early research in the field used treatment packages with access to toys, punishment, or conditioning reinforcement strategies.

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Koegel, Firestone, Kramme, & Dunlap (1974) provided one of the earliest applied studies on replacing self-stimulatory behaviors with play behaviors. In their paper, they described procedures that were used with a boy and a girl with autism aged 8 and 6, respectively. Play behaviors were observed in the presence of various toys and recorded along with self-stimulatory responses. The children were punished using reprimands such as “No” and were physically held to suppress or prevent the inappropriate self-stimulatory behaviors. Although the researchers were successful using punishment techniques, the play behaviors were not maintained nor were they generalized to multiple settings.

In an early study by Wahler & Fox (1980), four boys from 5 to 8 years old were given a treatment package consisting of solitary toy play and time out. All of the boys had been observed to be oppositional and aggressive while at home and in school. Behavior contracts were combined with a token economy system. Improvements were observed, however, the effects were variable. In response to the variability observed in all four boys after exposure to the treatment condition, the researchers added the time out condition that did reduce the variability and improve the overall durability of the behavior change. In both Koegel, et al. (1974) and Wahler & Fox (1980), play behaviors were improved albeit the effects of their treatment packages were relatively weak and punishment was used. While punishment strategies can be effective to decrease undesirable behaviors, they tend to have unwanted side-effects such as counter control (Cooper, Heron, & Heward, 2007).

Alternatively, more recent research suggests that strategies based on the principle of positive reinforcement such as conditioning reinforcement or observational learning techniques are preferred. These strategies may be more successful than punishment since they aim to replace undesirable behaviors (passivity

or stereotypy) with more appropriate socially significant behaviors such as play and leisure skills (Cooper, Heron, & Heward, 2007; Nuzzolo-Gomez, Leonard, Ortiz, Rivera, & Greer, 2002).

Positive strategies are those that avoid the use of punishment or aversive contingencies to improve appropriate behavior while simultaneously decreasing inappropriate and undesirable behaviors. Empirical studies include: self management used to improve play in three children having SEN (Stahmer & Schreibman, 1992), video modelling used to teach reciprocal play skills (Dauphin, Kinney, & Stromer, 2004; MacDonald, Sacramone, Mansfield, Wiltz, & Ahearn, 2009), and an increase in toy play was demonstrated with toddlers having SEN in an inclusive setting by DiCarlo & Reid (2004). In another study using five adults with developmental disabilities, stereotypy was reduced and effectively replaced through the implementation of a conditioning program that paired toy play with positive reinforcement (Greer, Becker, Saxe, & Mirabella, 1985). Their study was later successfully replicated by Nuzzolo-Gomez, Leonard, Ortiz, Rivera, & Greer (2002) using three preschool students with autism.

One study that focused on using a procedure to teach observational learning was by Leaf, Oppenheim-Leaf, Leaf, Courtemanche, Taubman, McEachin, Sheldon, & Sherman (2012). In their study, Leaf et al., (2012) set out to replicate the findings of Bruzek & Thompson (2007) who found that typically developing preschool children’s preference for playing with stimuli was increased after they observed a peer play with that same stimuli. Leaf et al. (2012) showed that an adult could also function as a model and be used to increase a child’s preference for playing with stimuli after an observation period even when the child has SEN.

Singer-Dudek, Oblak, & Greer (2011) used a conditioning procedure that was successful in establishing books as reinforcers. In their study

using preschool students with SEN, an observation period included target students watching another student who received books as a consequence for correct responses.

Interestingly, the books had not functioned as reinforcers for any of the students prior to the study.

In both studies by Leaf et al. (2012) and Singer-Dudek, Oblak, & Greer (2011), the researchers found that procedures used to condition stimuli as reinforcers were necessary to motivate the students to successfully complete various tasks that were required throughout their school day. Indeed, typically developing children have a relatively wide community of reinforcers which is frequently lacking in students with SEN (Greer & McCorkle, 2003; Greer, 2002). Schools and behavior analysts could successfully apply procedures that condition stimuli as reinforcers for students with SEN. Once conditioned, these new stimuli could provide the student with new motivation that could lead to success in school simply because he would have a wider community of reinforcers that teachers can use to teach language (verbal behavior), social, and other academic responses (Skinner, 1957; Greer & Ross, 2008).

To expand on this notion and its research base, we chose to target painting as a form of appropriate play. One advantage of painting as a play or leisure time skill is that it is an age appropriate behavior for all children and can occur throughout an individual's lifespan. Painting can be done individually or in groups, and can occur in a variety of settings that makes it an appropriate target behavior that may lead to the generalization of behavior change (Stokes & Baer, 1977).

Our review of the research literature for interventions used to teach painting to students

or adults with SEN resulted in the identification of one study by Johnson & Bailey (1977). In their paper, painting was one of six activities made available to 14 adult women with SEN living in a half-way house. Through the use of a token system, the researchers successfully improved a variety of leisure time skills. However, there was no direct instruction or observation of the painting activities, specifically.

The purpose of the present study was to test the effectiveness of a treatment package on the painting behaviors of four students with SEN and to observe any collateral changes to stereotypy. Verbal instructions, modeling, and music were combined into a treatment package in a one-hour small group class format. The students were given the opportunity to paint through regular weekly participation in the program.

Method

Participants

Four children with SEN participated in the study. The students were given the diagnosis of autism by independent evaluators prior to the study. All four participants were selected from the population of a non-profit private school program called The Children's Institute of Hong Kong (TCI). The teachers used Applied Behavior Analysis (ABA) special instruction across all curricula, instructional techniques, teacher training, and behavior management (Greer, 2002). The four participants were selected for this study because they each had a limited play repertoire, and music was observed to function as a reinforcer. Participants A, B, C, and D were 11, 6, 5, and 5 years old, respectively. All four participants were male. Table 1 contains a detailed description of each participant's diagnosis and skill repertoire.

Table 1
Description of the Four Student Participants

Student	Age/Gender	Diagnosis	Verbal Behavior Milestones Verbal Behavior Analysis (Greer & Ross, 2008)
A	11/Male	Autism	Mands/Tacts Listener/Speaker Intraverbal behavior Reader/ <u>Writer</u>
B	6/Male	Autism	Mands/Tacts Listener/Speaker Intraverbal behavior Emergent Reader/Writer
C	5/Male	Autism	Emergent listener/speaker Mands/Tacts Intraverbal behavior Emergent Reader/Writer
D	5/Male	Autism	Emergent listener/speaker Emergent Mands/Tacts

Setting and Materials

All sessions were conducted in a large room in the school the children attended. The room was 8m by 7m in area, and 2.5m floor to ceiling. For each session, eight easels were placed around the room. The easels were positioned in the rectangular room about one meter apart (see Figure 1). The easels were 1m tall and 44cm wide. Buckets filled with water were placed on top of a stool next to each easel. A paintbrush was placed into each bucket. Water was provided in the bucket so that the students could wash their paintbrush if they wanted to change the color they were using. On top of each bucket was a paint pallet which contained about one tablespoon of acrylic paint in four colors, white

and the three primary colors: red, yellow, and blue. A piece of paper measuring 40cm by 51cm was clipped on to each easel at the beginning of each session.

Dependent Variable

The primary dependent variable was the percentage of time the participant was engaging in painting behavior. A list of target behaviors, that were counted as on task painting and off task painting, is presented in Table 2. Two independent observers recorded whether the participants were engaging in painting behavior on a data sheet. Only one student was recorded at any given time.



Figure 1. Photograph of the instructional setting

Procedure

A delayed multiple baseline experimental design across students with a repeated reversal component was implemented across participants to evaluate the effects of the treatment package on the length of time a participant engaged in painting and their stereotypy. Two baselines and two treatment conditions were used. Subsequently, two maintenance probe sessions were observed. Data were collected across all baseline, treatment and maintenance conditions.

During baseline conditions, the student was present in the room with the materials, his teacher, one or two other students, and one or two of the researchers. The participant was not given any vocal instructions or prompts to paint. Music was not played during the baseline session. The teacher and observers remained in the corner of the room visible to the participant. Other than greeting the participant and handing the paintbrush to the participant, the instructor

had minimal to no interaction with the participant. The session began when his teacher positioned the participant in front of the easel and paper. The baseline sessions were 15 minutes in duration. Baseline was conducted to measure the amount of time that the student was on task (painting) or off task (stereotypy or passivity). Baseline sessions and other treatment sessions were conducted for 15 minutes once every one to two weeks. Treatment sessions were led by the instructor.

Treatment Package

During the treatment phase, each participant, along with five or six other students were placed in the instructional room with the materials and one to two of the researchers along with the class instructor. Each student also had an accompanying ABA teacher. The instructor began each session by playing music and instructing the students to perform three simple

gross motor activities (e.g. show their hands, jumping jacks, waving hands in the air). Next, the instructor would ask a student to name a color and to name the secondary color that resulted in mixing two primary colors. Following that, the instructor would instruct and model the object that was targeted for painting on that lesson. Various objects were targeted made up of simple shapes throughout the treatment conditions (i.e. an animal, Christmas tree, buildings). For example, the instructor would say “Ok class, today let’s paint a Christmas tree.” The instructor would then model how the object should be painted and would describe the simple steps required to paint the object. For example, the instructor would say “Let’s draw three triangles and one rectangle at the bottom.” Last, the instructor would state the rule “No music no painting” and ask the students to state the only rule of the lesson. This was the sixth and final instruction (learn unit) provided to the students. Then, the instructor would instruct the students to begin painting. The short lesson prior to the painting time resulted in a few opportunities to respond (learn units) per session per student. The number of learn units totaled six for each student in each session (Albers & Greer, 1991; Greer, 2002; Greer & Ross, 2008). Verbal praise was provided as consequence for correct learn units (responses) and a simple correction was provided for incorrect responses by the ABA teachers. No prompts were provided for any of the six learn units presented.

Various music was played throughout the session except when the instructor would pause the music for 5-10 seconds and instruct the students to pause painting, and then resume once the music was played again. The pausing of the music would happen one to two times during each 15-minute session. Music played consisted of a range of about three genres including: children’s nursery rhymes, pop music, and electronic dance music.

After the brief model and six instructional learn units were presented in each of the instructional sessions, the students were observed for their on task and off task behaviors. Data were collected for 15 minutes of each session using a 10-second whole interval recording procedure resulting in a total of 90 10-second intervals. Researchers used a special wearable brand of accurate digital timers called *Invisible Clock ® II* and began to count from when the participants were instructed to begin to paint and the music was turned on until 90 intervals had been observed and recorded. On task intervals were scored as a “+” on a data sheet and off task intervals were scored as a minus “-“ on the same data sheet. Data was not collected during when the music was paused by the instructor.

Maintenance

For each of the four participants, a maintenance probe was conducted one month and two months after the last treatment session. Each of these two maintenance phases were identical to the treatment phase.

Inter-observer Agreement

Inter-observer agreement (IOA) was collected by having two independent observers (the researchers) collect data simultaneously during 57%, 40%, 35% and 67% of the total number of sessions in the study for participants A, B, C, and D, respectively. All of the authors of the study served as data collectors. IOA was calculated by dividing agreements by agreements plus disagreements and then multiplying the quotient by 100. The result was expressed as a percentage. Mean and range agreement scores were 93% with a range of (83%, 100%) for participant A, 96% with a range of (90%, 100%) for participant B, 95% with a range of (81%, 100%) for participant C, and 97% with a range of (94%, 100%) for participant D.

Table 2

Dependent variables counted as on task or off task painting behavior using a whole interval recording procedure with 10 second intervals

Behaviors counted as on task painting behavior

1. The participant moved the paintbrush in any direction on the paper with the brush coming into contact with the paper
2. The participant dipped the paintbrush into the paint on the paint pallet
3. The participant dipped the paintbrush in the water bucket provided
4. The participant squeezed paint onto the paint pallet from the plastic paint bottles
5. The participant walked towards the bench that contained the plastic paint bottles
6. The participant walked towards their easel from the bench that contained the plastic paint bottles

Behaviors counted as off task painting behavior

1. The participant was observed to have stereotypy (e.g. hand flapping, posturing, palilalia, rocking, pacing)
 2. The participant was observed to be passive or simply stand in front of their easel without painting
 3. The participant was not observed to have behaviors consistent with the six definitions of on task behavior
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Results

Student A's on task painting behavior averaged 13% of the recording interval, (range, 10% - 18%) across the four sessions during Baseline 1. During Treatment 1, painting behavior was increased from an average of 13% in Baseline 1 to 51% (range, 44% - 56%) without any overlapping data points. In Baseline 2, painting behavior decreased from 53% in the last session of Treatment 1 to 0% in the first session of Baseline 2, with an average of 8%, (range, 0% - 19%). Painting behavior increased dramatically from 0% in the last session of Baseline 2 to 79% in the first session of Treatment 2 with an average of 53%, (range, 36% - 79%) in Treatment 2. During the one-month probe, student A's on task painting behavior maintained at a percentage within the range of Treatment 1 and 2, at 54%, which follows with a slight decrease in the two-month probe, at 43%.

Student B's on task painting behavior increased significantly from an average of 4% (range, 0%-12%) in Baseline 1 to an average of 44% (range, 6% - 67%) in Treatment 1. It follows with a decrease of on task painting behavior to an average of 9% (range, 0% - 21%) in Baseline 2. In Treatment 2, on task painting behavior was again increased significantly to an average of 49% (range, 21 - 63). The One-month and Two-month probes show more increase in on task painting behaviors with 84% at the One-month probe and 94% at the Two-month probe.

For student C, on task painting behavior was increased from an average of 1% (range, 0% - 3%) during Baseline 1 to an average of 37% (range, 12% - 60%) in Treatment 2. During Baseline 2, an

average of 21% (range, 0% - 51%) on task painting behavior was observed. It follows with an increase during Treatment 2 to an average of 45% (range, 38% - 63%). Both one-month and two-month probes shows on task painting behaviors that maintained at a stable percentage as in Treatment 2 (One-month probe: 32%, Two-month probe: 52%).

Student D was observed to have zero on task painting behavior during Baseline 1. It follows with a dramatic

increase to an average of 78% (range, 69% - 89%) on-task painting behavior during Treatment 1. In Baseline 2, painting behavior decreased sharply back to 0%. Treatment 2 shows a significant increase to 44%. Percentage of on task painting behaviors in both the One-month and Two-month probes were within the range in Treatment 2 (One-month probe: 52%, Two-month probe: 48%). The results of the study are shown in table format (Table 3) and using a visual graphic display (Figure 2).

Table 3

Results of the study for each of the four participants across each of the six experimental conditions as mean percentage of on task painting behavior and range of percentage of on task painting behavior

	Baseline	Treatment Package	Baseline 2	Treatment Package 2	1-month probe	2-month probe
Student A						
Mean	13%	51%	8%	53%	54%	43%
Range	(10%, 18%)	(44%, 56%)	(0%, 19%)	(36%, 79%)	---	---
Student B						
Mean	4%	44%	9%	49%	84%	94%
Range	(10%, 12%)	(6%, 67%)	(0%, 21%)	(21%, 63%)	---	---
Student C						
Mean	1%	37%	21%	45%	32%	53%
Range	(0%, 3%)	(12%, 60%)	(0%, 51%)	(38%, 63%)	---	---
Student D						
Mean	0%	78%	0%	44%	52%	48%
Range	(0%, 0%)	(69%, 89%)	(0%, 0%)	(31%, 64%)	---	---

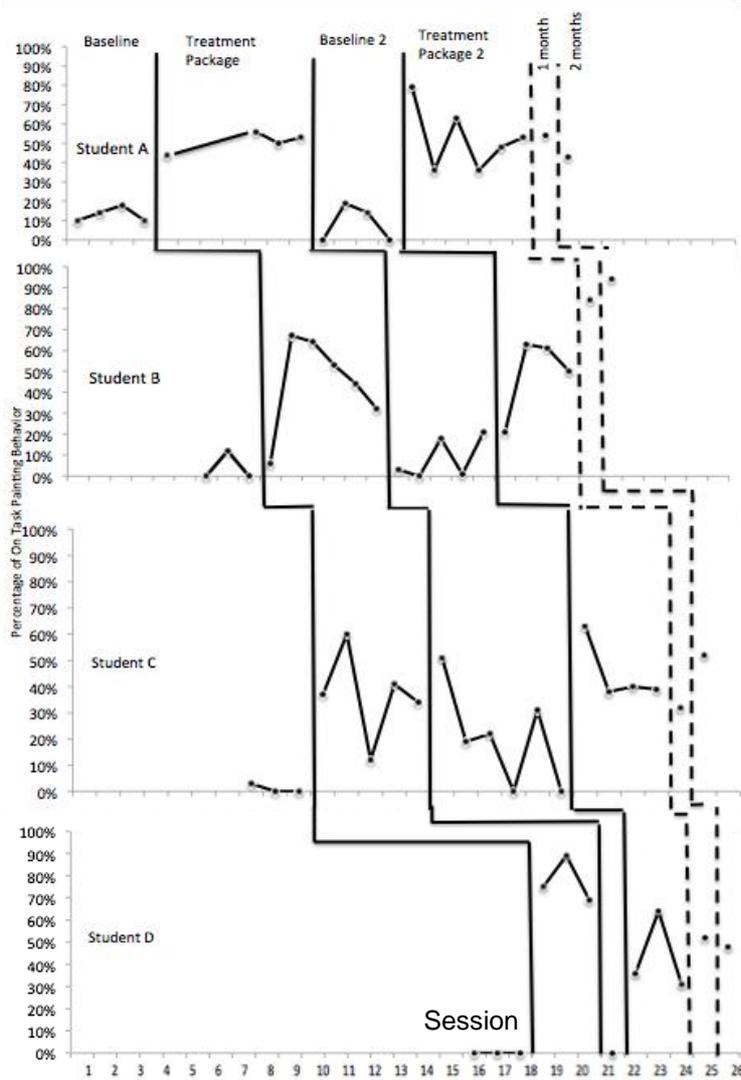


Figure 2. Delayed multiple baseline experimental design with repeated reversal component and maintenance probes across Students A, B, C, and D. Conditions include baseline, treatment package, baseline 2, treatment package 2, a 1-month maintenance probe, and a 2-month maintenance probe. The dependent variable included on task painting behavior in each 15-minute session using a 10 second whole interval recording procedure.

Discussion

The results of the study showed that the participants all made educationally significant gains in their on-task painting behaviors as a function of the treatment package. Stereotypy and passivity were also significantly reduced. After very low, or as in the case of Student D, no

on task behaviors, all students made immediate improvement in their on task behaviors except for student B who was observed to have one session in the treatment 1 condition that overlapped with the baseline 1 condition.

In the baseline 2 condition, a return to baseline conditions was tested and all four

students were observed to have lower or even zero on task painting behaviors when the treatment package was removed. Student C's return to baseline condition was also observed although it was less pronounced and there was more overlap across the treatment 1 and baseline 2 conditions. This could have been due to the observed variability in responding by this student across the study or other interfering variables that were not known by the experimenters such as private events or setting events. Another potential variable that may have influenced Student C's variability is that the class was scheduled every other week. The overall duration of time that the data were collected could have affected the stability of Student C's on task painting behaviors. This time variable may have also attributed to the overlap observed across Student B's conditions.

Similar results were observed in two of the previous studies where stimuli were conditioned and subsequent decreases in stereotypy and or passivity were observed in the participants. In Greer et al. (1985) toy play was conditioned as a reinforcing activity which resulted in the dramatic reduction in stereotypy in adults with SEN. In a partial replication study, Nuzzolo-Gomez et al. (2002) showed that after a conditioning procedure using books and toys, preschoolers with SEN were also observed to have fewer occurrences of stereotypy and or passivity. We conclude that the treatment package functioned to condition the painting behavior as a reinforcing activity in our four students that subsequently was responsible for the observed reduction in stereotypy and or passivity. On task behaviors that were measured were *idemnotic* or absolute measurements so although there were no *direct* measures of off task behavior, if the students were not on task, they were *ex post facto* off task (Johnson & Pennypacker, 1993).

Limitations

The instructor could not be available on a daily or weekly basis.

School holidays and vacations interrupted

the ability of the class to be held on a weekly or otherwise more consistent basis. As stated above, this could have resulted in some of the variability and overlap in conditions for Students B & C, respectively. Also, we do not know precisely *what* about the treatment package may have resulted in the painting behavior becoming conditioned as a reinforcer. Was it the modeling, the social group piece, or the music? We suspect that music functioned to condition the painting behaviors since it had already been identified as a reinforcer and was a prerequisite for inclusion into the study. Music was also played almost continuously and was therefore in complete contact with the target painting behavior. Modeling (observational learning) or other reinforcers must be present in order for a new stimulus or activity to be conditioned (paired) as demonstrated by the above-mentioned research literature findings. Further testing to isolate the true controlling variable can be done to test this hypothesis. To test for the controlling variable, the treatment package components could be applied separately to test their effects on the on task painting behavior of students. Furthermore, more qualitative aspects of painting can be assessed, which our study did not attempt to measure.

The present study adds to the research using positive behavior interventions in the treatment of inappropriate and stereotypic behaviors in students with SEN. Even after weeks without the intervention, when the treatment package was reintroduced, on task behaviors in the same range as those in the treatment condition were observed across all four students. These results are educationally significant and further research may be done to identify exactly what variable or variables were responsible for the improvement in our students on task painting behaviors and decreases in their stereotypy and or passivity behaviors.

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