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ABA in the Special Education Classroom: Promoting On-Task Behavior in an Individual with Autism

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Abstract The present study depicts the utility of including basic behavior-analytic principles and strategies to facilitate on-task behavior in a classroom for individuals with autism. We used a preference assessment and differential reinforcement with a 9-year-old individual with autism in an attempt to decrease physical aggression and elopement and to increase socially appropriate behavior (i.e., on-task behavior). Additionally, we included a token system so as to promote best practices within a classroom. The assessment and intervention lasted a total of five hours over two days. Inclusion of these practices served to decrease the target behavior of physical aggression and elopement by an average of 38.7% and 15.2%, respectively. Average on-task behavior increased from 7.3% during baseline to 73.2% during intervention phases. Furthermore, on-task behavior was highest when the student was given a choice prior to tasks being delivered. Implications of these results to the use of behavior-analytic principles and practices as well as their efficacy within the classroom are discussed.

Keywords Preference assessment, Token system, On-task behavior, Choice-making

1. Introduction

There is an increasing need for effective and efficient teaching practices within our special education classrooms. This fact is due in large part to the increasing pressure by school districts on teacher to facilitate high-performance in its students. Moreover, several states have taken initiative to pursue performance-based salaries for its teachers. Special education teachers' concern with this movement is that it is often the case that they face the challenge of teaching academics, social skills, life skills, etc., but must also address aberrant behavior some students with special needs present. With that, special educators would do well to include empirically-validated, best-practice approaches to assisting in decreasing challenging behavior in order that they may spend more time focusing on the academics portion of their teaching responsibilities.

One such approach is that of Applied Behavior Analysis (ABA). Applied Behavior Analysis is "the science in which tactics derived from the principles of behavior are applied systematically to improve socially significant behavior" (Cooper, Heron, & Heward, 2007, p. 20). With a core focus of "socially significant behavior", ABA has made contributions to various fields and populations such as addiction (e.g., Petry, 2005), health and exercise (e.g., De Luca & Holborn, 1992), language acquisition (e.g., Rehfeldt & Barnes-Holmes, 2009), seatbelt use (e.g., Van Houten, Malenfant, Austin, & Lebbon, 2005), and industrial safety (e.g., Fox, Hopkins, & Anger, 1987).

Arguably the area in which ABA has made an impact is that of education. Ivar Lovaas's (1987) work with individuals with autism put ABA on the map as a viable, empirically-validated approach to teaching skills to individuals with limited repertoires. By breaking down skills into finite steps and reinforcing individual responses (i.e., discrete trial training [DTT]), learners with limited verbal and academic repertoires have acquired a number of skills ranging from labelling objects (e.g., Eikeseth & Hayward, 2009), sorting (Kelly, Green, & Sidman, 1998), math (e.g., Wood, Frank, & Wacker, 1998), among others.

Another tenet of behavior analysis used by teachers, paraprofessionals, social workers, and clinicians alike, is that of teaching socially appropriate replacement behaviors. As previously mentioned, teachers often face the challenge of attempting to address students' problematic behavior before they are able to address academics. Given this notion, and that most teachers aren't equipped with sufficient or appropriate training to address said challenges, the utility of ABA within the classroom becomes even more robust.

A common approach to facilitating socially significant behavior is to use what is known as a token economy. A token economy consists of "three major components: (a) a specified list of target behaviors; (b) tokens or points for emitting target behaviors; and (c) a menu of backup reinforcer items" (Cooper, Heron, & Heward, 2007, p. 560). Token economies have been used in a myriad of environments and contexts including hospitals (e.g., Carton

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& Schweitzer, 1996), after-school programs (e.g., Charlop - Christy & Haymes, 1998), peer-monitoring (e.g., Gable, Arllen, and Henkdrickson, 1994), home-based interventions (e.g., Gresham, 1983) and more specific to the current study, classrooms (e.g., Higgins, Williams, & McLaughlin, 2001).

Higgins and colleagues (2001) found that a token economy facilitated decreases in disruptive behaviors in an individual with a learning disability. The individual was required to exchange earned check marks to access for free time. The authors indicated that a functional relationship was developed between the use of the token economy and the decrease of the disruptive behaviors.

One practical concern of token economies is whether or not they closely approximate the natural educational environment. Teachers often note that their ability to maintain such a dense reinforcement schedule is limited and their ability to move away from the token economy is challenging given a reliance on the system itself. These sentiments have occasioned research related to structuring token systems in such a fashion that promotes generalization to the natural environment versus conditioning dependency on the token economy.

Robinson, Newby, & Ganzell (1981) used a token system in an effort to increase the reading and vocabulary performance of 18 individuals labelled as "hyperactive" and "unable to remain on-task". All interventions took place within the academic classroom, and results indicated the inclusion of the token system facilitated nine times the number of completed work tasks when compared to that of the baseline phase. Additionally, the token economy served to promote greater academic task completion during standardized exams for those students using the token system than for those who did not. One of the limitations of the study was in the density of reinforcement and fidelity to implementation required to sustain appropriate responding; a limitation that the current research hopes to minimize for special educators when considering intervention options.

Lattal and Neef (1996) conducted a review wherein the efficacy of reinforcement schedules was investigated. The authors noted that one way to more closely approximate the natural environment (and in effect minimize the likelihood of dependency on such a dense schedule of reinforcement) was to include what is known as a progressive schedule of reinforcement. A progressive schedule of reinforcement "systematically thins each successive reinforcement opportunity independent of the participant's behavior" (Cooper, Heron, & Heward, 2007, p. 315). One goal of such an inclusion within an intervention would be to more closely represent the contingencies the individual will contact within the natural environment.

Vollmer, Iwata, Zarcone, Smith, and Mazaleski (1993) proposed that thinning noncontingent reinforcement (NCR) for self-injurious behavior would serve to decrease the problematic behavior. While the results indicated the efficacy of such an inclusion, the intervention was limited in that the provision of reinforcement was contingent on the passage of time, and not on the occurrence of some socially-appropriate behavior. Moreover, an intervention based on time having passed (vs. reinforcement an appropriate behavior) has diminished utility within more naturalistic settings where efficiency is of high regard.

To that end and relative to the current research, Hanley, Iwata, and Thompson (2001) investigated the practicality of a behaviorally-based intervention (i.e., functional communication training) to facilitate socially-appropriate replacement behavior by decreasing the frequency of reinforcement for alternative responses. The participants were individuals with developmental disabilities living in a residential facility, and sessions were conducted in a well controlled therapy room. The results suggested that the inclusion of a progressive schedule of reinforcement served to increase participants' (appropriate) alternative behavior, as well as decrease the target response of self-injurious behavior. Thus, the inclusion of a progressive interval schedule of reinforcement with individuals with limited verbal repertoires and serious behavioral concerns may serve to quickly facilitate appropriate responding and conversely, decrease problematic behavior.

The setting (i.e., a therapy room with only the participant and therapist present) in the Hanley, Iwata, and Thompson (2001) article allowed for significant control of potential extraneous variables (e.g., other clients or environmental distractions). However, experimental control of this level is frequently a challenge to obtain in special education classrooms. Often is the case that staff- to-student ratios are so thin that fidelity to involved interventions is low and teachers are multi-tasking, which further decreases integrity of implementation. This infidelity is compounded by the likelihood that other students receiving special education services also engage in challenging behaviors. In the face of this, as educators are required to spend more time on academic instruction with fewer resources, the utility of a progressive schedule of reinforcement may be significant.

A student's level of engagement in socially appropriate behavior may also be influenced via the inclusion of what is known as a preference assessment, prior to the introduction of an intervention. A preference assessment allows an individual to make choices among and between stimuli, and is used to identify those stimuli that may serve as reinforcers for later interventions. Teachers, practitioners, caregivers, and guardians report that they know (with relative certainty) what their loved one would work for. However, research indicates that these individuals more often than not inaccurately identify a loved one's preferences when they are given a choice among items (Cote, Thompson, Hanley, & McKerchar, 2007).

Dunlap et al. (1994) found that offering choice to three students (two 11-yr-olds and one 9-yr-old) with behavioral disorders concerning what academic tasks they worked on facilitated greater task engagement and fewer problem behaviors. Moreover, they found that *not* offering choice further exacerbated behavioral concerns and task engagement remained similar to baseline levels. These findings highlight the importance of teachers providing

choice to students between work tasks when appropriate and the use of preference assessments to increase student engagement prior to intervention.

Given the aforementioned challenges faced by teachers of students who exhibit challenging behavior, the current study had multiple levels of purpose. First, we aimed to highlight the utility and efficacy of a multiple stimulus without replacement preference assessment in the identification and subsequent use of preferences during intervention within a special education classroom. Second, we sought to use those identified preferences to determine if they did in fact serve as reinforcers to more socially appropriate replacement behavior. Third, we wanted to investigate the use of a progressive schedule of reinforcement in a more naturalistic setting than that which was used in the Hanley, Iwata, and Thompson (2001) study, to better approximate a realistic special education classroom schedule of reinforcement. Lastly, we aimed to evoke responding indicative of the value of including student choice into academic schedules.

2. Method

2.1. Participant, Setting, and Equipment

Will was a 9-year-old male student diagnosed with autism spectrum disorder. He had an Individualized Education Program (IEP) that specified 100% of his day would be spent in a self-contained special education elementary classroom in a Midwestern school district. Will had a limited verbal repertoire of about 10 word approximations. In addition to a lack of progress on IEP goals, Will engaged in aberrant behaviors including physical aggression, elopement, and off-task behavior. A functional behavior assessment indicated that these behaviors were most likely maintained by an access to tangible function and escape from academic demands. That is, Will engaged in the aforementioned behavior in an effort to gain access to his preferred items and activities or to get out of engaging in work-related tasks. At the time of assessment, the special education teacher did not have any consistent interventions in place, nor was she actively pursuing resolution to the previously mentioned aberrant behaviors. Sessions were conducted in the self-contained special education classroom during regular school day hours. The equipment needed for the study was a video camera for inter-observer reliability calculations concerning the target responses, materials for the academic tasks, and items or activities for the preference assessment and subsequent intervention phases.

2.2. Data Collection and Measurement

2.2.1. Experimental Design and Inter-Observer Agreement

The experimental design used for the current investigation was a multi-element design (ABCDBCDBCDE) wherein A denotes the baseline phase. During the B phase, we used highly preferred items as identified by the preference assessment. For the C phase, we used items that Will chose as moderately preferred. The D phase indicates the use of those items with low preference. Finally, the E phase denotes that a choice was provided among items.

Inter-Observer Agreement (IOA) was calculated by dividing the total number of agreements by the total number of agreements + disagreements, then multiplying the quotient by 100%. We calculated IOA for 33% of all intervals and determined it to be at 91% agreement.

2.2.2. Dependent Measures

Data was collected using a momentary time sampling method for the target responses of aggression, elopement, and on-task behavior. A momentary time sampling data collection method was chosen as it best approximated what the teacher could realistically do with any fidelity, per her report. Moreover, this data collection method would be the most feasible to maintain by the teacher in the absence of additional support. *Physical Aggression* was operationally defined as any attempt or success at making forceful contact with another individual with any part of the student's body. This included grabbing, biting, hitting and kicking. This did not include tapping on the arm to gain attention. *Elopement* was defined as any instance in which the student left (or attempted to leave) the designated area or activity without permission from an adult. This included leaving the work table, dropping to the floor, or exiting the classroom. This did not include leaving the table to get a drink after asking or being given permission by an adult. *On-task* behavior was counted if the student was complying with a given directive or awaiting instruction. If seated, the student's body (torso, shoulders, and head) were oriented toward the instructor or the materials designated for responding. This included walking to the work area, scanning materials, responding (correctly, incorrectly, or prompted), and remaining seated in a chair until dismissed. This did not include leaving the work area, turning his body away from instructor or materials, or not responding to a directive.

2.3. Procedure

2.3.1. Preference Assessment

A multiple stimulus without replacement (MSWO) preference assessment was used, and aligned with the seminal DeLeon and Iwata (1996) article description of this assessment. We used 10 items and activities that were often accessible to the student within the classroom, so as to approximate those preferred items that Will may often choose. The items were placed in a line in front of Will and he was instructed to make a choice. We blocked any attempt to make a selection prior to the instruction being given. He was then allowed to manipulate or engage in the selected activity for 30 s before he then had to return the

selected item. The item was removed from the items from which he could select. Will continued to make choices among the available items until all items had been chosen. Any items not chosen were ranked as the lowest possible selection. This process was carried out 2 additional times so as to get a mean rank for each item. Subsequently, we placed the items into 3 categories: high (i.e., items ranked 1-3), medium (i.e., items ranked 4-6), and low preferences (i.e., items ranked 7-10).

2.3.2. Academic Tasks

Throughout the baseline and intervention phases, Will completed academic tasks that he had previously mastered. These tasks included receptive object labelling, receptive number identification, and receptive letter identification. Per the second author's previous history in working with Will, no single task evoked more (or less) problem behavior than the other; rather, the simple introduction of instructions (and away from preferred activities) most often occasioned problem behavior.

2.3.3. Baseline (A)

During baseline, we assessed Will's engagement in the target responses as the environment existed using a momentary time sampling method. That is, we wanted to determine at what levels target responses were occurring with any already- in-place interventions (or lack thereof in this case). We set sessions at 6 min and the interval was marked "yes" if at the end of the 10-s interval the target response occurred.

2.3.4. High Preference Phase (B)

During this phase, we used items and activities for intervention that Will ranked as being the first and second preferred stimuli, as determined by the preference assessment. These two items were rotated between high preference phases over the course of the intervention. Identical to that of the baseline condition, sessions were 6 min in length, with 10-s intervals. We used a token economy based on differential reinforcement of other behavior (DRO). If, at the end of the interval, Will was engaging in appropriate behavior (i.e., not engaging in aggression or elopement), he would receive a token that the second author would place on his token board. Once he had earned five tokens, he then gained 1-min access to a highly preferred item.

2.3.5. Medium Preference (C)

This phase was identical to the high preference phase other than that Will gained access to fifth and sixth most preferred items contingent on earning five tokens for appropriate behavior.

2.3.6. Low Preference (D)

This phase was identical to the high and medium preference phases other than that Will gained access to ninth and tenth most preferred items contingent on earning five tokens for appropriate behavior.

2.3.7. Choice (E)

During this phase, Will was able to choose the item for which he wanted to work prior to the session. His earning access to the item, like all other sessions, was contingent on earning five tokens. Additionally, during this phase we introduced a progressive interval schedule of reinforcement. We previously used 10-s intervals, but given the consistency with which he was performing and that we wanted to more closely approximate a more naturalistic schedule of reinforcement, we thinned the schedule of reinforcement from 10-, 15-, and finally 30-s for intervals for each of the choice sessions.

3. Results

Table 1 illustrates the results of Will's preference assessment, including percentage the item was chosen when given the opportunity, the relative rank, and the preference level for grouping purposes. Figure 1 depicts the percentage of intervals in which physical aggression occurred over the course of the experiment. From baseline (M = 44%), Will's aggression dropped during intervention to M = 5.3%) physical aggression dropped to zero percent in each of the choice conditions.

Table 1. Will's Preference Assessment Results

Item	Percentage Chosen	Relative Rank	Preference Level
Toy Microphone	100%	1	High
Crackers	33%	2	High
Music	27%	3	High
Pretzels	27%	4	Medium
Scooter Board	20%	5	Medium
Stickers	19%	6	Medium
Play-Doh	13%	7	Low
Toy Story Book	13%	8	Low
Toy Story Figure	13%	9	Low
iPhone Photo	12%	10	Low

Figure 2 shows the results with respect to elopement. While not as significant of a discrepancy from baseline to intervention (i.e., M=17.3% to M = 2.1%), the data indicate a decrease in elopement over the course of the intervention. Similar to the data for physical aggression, data for Will's elopement decreased to zero percent during the final three choice sessions. This finding has implications to the inclusion of choice prior to the presentation of academic demands.

Lastly, Figure 3 illustrates the percentage of intervals in which Will remained on-task. It is in this analysis that we find what is quite possibly our most promising finding. From a baseline percentage of M = 7.3%, Will's on-task

behavior increased to M = 72.1% with the introduction of intervention. The highest point at which on-task behavior was seen was in the three final choice sessions, wherein Will's on-task behavior rose to 92%, 100%, and 84%, respectively. Yet again, the provision of choice prior to presentation of academic demands in addition to the development of a positive contingency facilitated on-task behavior.

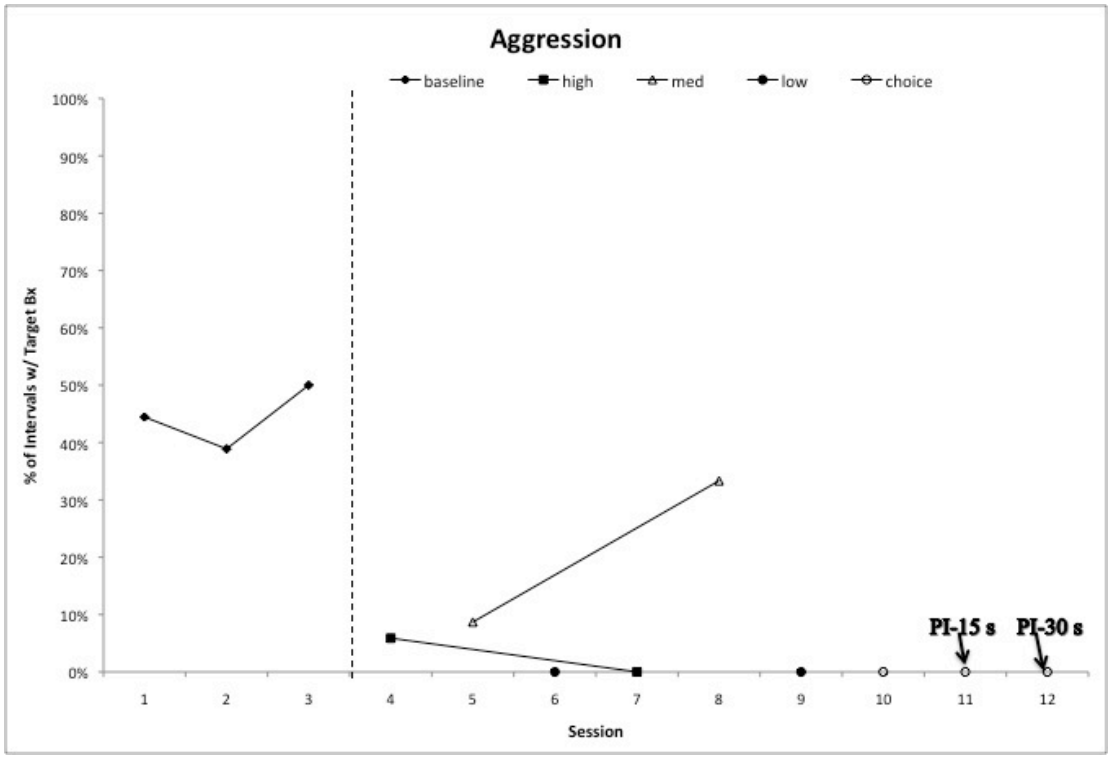

Figure 1. The percentage of intervals in which Will engaged in physical aggression

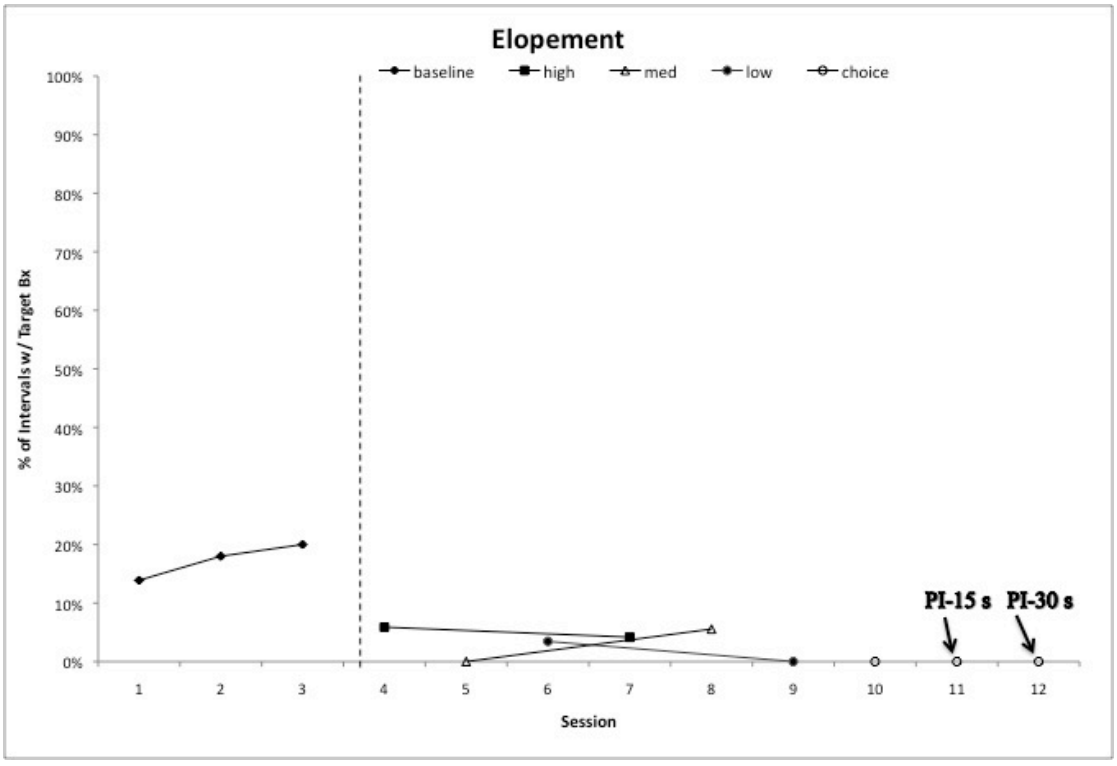

Figure 2. The percentage of intervals in which Will engaged in elopement

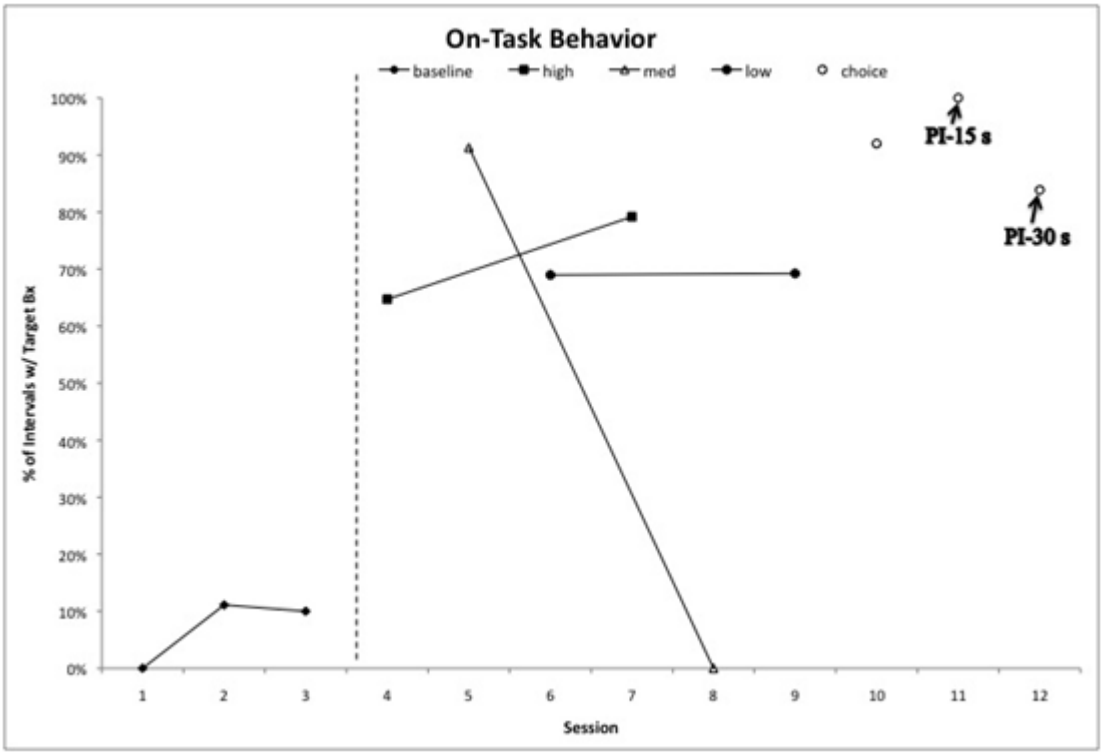

Figure 3. Percentage of intervals in which Will engaged in physical aggression

4. Conclusions

The results of the present investigation confirm the proposed hypothesis that inclusion of basic behavior-analytic practices to a student's schedule would both decrease challenging behaviors and increase socially significant replacement behavior. While there were no interventions in place to mediate problematic behavior within the classroom during baseline, the mere inclusion of a pre-intervention preference assessment, a token economy, and choice within Will's schedule served to facilitate appropriate classroom behavior and decrease challenging behavior.

Quite possibly the largest upside to the intervention was in the efficacy with which it was implemented. The entire intervention lasted only 5 hours over the course of two days (i.e., 2.5 hours per day) and served to promote socially appropriate replacement behavior in the form of in-seat and more importantly, on-task behavior. Moreover, the second author (without the support of any other implementers) conducted the entire intervention. Thus, for a classroom in which staffing ratios were fairly dense, we are optimistic that these results would generalize across students, behaviors, and classrooms.

Another positive outcome to the study was in the clear identification of reinforcers for Will's behavior that could then be used in subsequent academic or work-related activities. As previously mentioned, Will's preferences were identified by the special education teacher, but were not being used with any fidelity so as to reinforce appropriate behavior. The preference assessment not only provided data to suggest 10 items that could be used as potential reinforcers, but also that these items had varying levels of preference. Will's "ranking" of these items could then be used contingent on the difficulty of the work being presented to him, wherein the high preferred items would be used for more difficult tasks and the low preferred items/activities could be used, for example, during maintenance of previously mastered tasks.

Interestingly however, there was no clear discrepancy in performance with respect to the level of target behaviors when using items with differing preference levels. There are a number of reasons why this may have occurred. The first is that the percentages of target responses for both aggression and elopement decreased, irrespective of the item's preference level, so much so that further decreases were statistically improbable. A second possible reason for the sharp decline in aberrant behavior (and an inverse increase in on-task behavior) was the mere inclusion of preferred items within Will's schedule. That is, the reinforcing efficacy of being able to work for something preferred, in general, was so powerful that it may have overshadowed any discrepancies that we may have expected between the three preference levels for items and activities. Said another way, the environment may have been so impoverished of reinforcement that access to preferred items, regardless of their preference rank, served to evoke appropriate behavior (i.e., act as reinforcers).

Another interesting finding from the present study was the maintenance of appropriate responding (i.e., on-task behavior, limited physical aggression and elopement) given the institution of the progressive interval schedule of

reinforcement within the choice phase. Given the time constraints we were unable to thin the schedule of reinforcement beyond the 30-s interval. However, we hypothesize that we would have been able to continue with the thinning progression to even longer intervals without seeing response characteristics indicative of ratio strain.

An additional limitation to the current study was that it only involved one student. In order to show generality of the findings, future research would do well to include additional participants, include behavior with different identified functions, incorporate the intervention across environments, among other modifications to the experimental design. We cannot rule out the possibility of practice effects, given that the sessions were separated only by 3 minutes. Nevertheless, we feel the social validity of the intervention as well as its results and implications outweigh any concerns regarding experimental design weaknesses.

In summary, the inclusion of a preference assessment, token economy, and choice served to increase a student with autism's socially appropriate classroom behavior and indirectly decrease challenging behavior often faced by special education teachers. Moreover, the results indicate that the schedule of reinforcement can be systematically thinned in order to more closely approximate reinforcement at the degree to which it occurs the natural environment. Lastly, the inclusion of choice within an individual's routine or schedule may serve to occasion greater engagement in school related activities for individuals with autism and related developmental disabilities.

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