

The Use of Picture Exchange Communication System to Reduce Screaming Behavior in a Child with Severe Autism

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Abstract: Using a multiple baseline across subject areas design, the effect of a package intervention consisting of the Picture Exchange Communication System and differential reinforcement of alternative behavior to decrease screaming behavior of a child with autism was examined. Results showed that the intervention decreased the screaming behavior of the participant.

Screaming behavior has been found amongst children with autism spectrum disorder (ASD) and other developmental disorders (Peterson, Bondy, Vincent, & Finnegan, 1995; Scattone, Tingstrom, & Wilczynski, 2006). The extant literature related to the screaming behavior of children with ASD and developmental disorders shows that different methods have been employed to reduce screaming behavior. De Mers, Tincani, Van Norman, and Higgins (2009) conducted a study to reduce problem behaviors without the use of reinforcement. Specifically, using a multiple baseline across participants design, the effect of music therapy on the screaming and hitting behaviors of three young children with challenging behaviors was examined. Results showed that music therapy decreased screaming and had a therapeutic effect on all three participants.

Methods using non-contingent reinforcement have also been used to treat screaming behaviors. In a study illustrating the use of brief functional analysis probe conditions to verify the results of a descriptive assessment, Aikman and Garbutt (2003) implemented an intervention in which the teacher alternated 5-minute periods of academic demands on an 8 year-old child with severe developmental disabilities, with 5-minute periods of free activity during those lessons which in baseline were associated with higher levels of disruptive behavior, including screaming. The intervention reduced screaming behavior to under 50% of baseline levels. Additionally, the effectiveness of the use of differential reinforcement of other behavior (DRO) in decreasing the intervals with screaming of a child with ASD and pervasive developmental disorder was demonstrated in a study using an AB withdrawal design by Galiatsatos and Graff (2003). During baseline, the mean percentage of intervals with screaming was 37%. Over the final 4 weeks of treatment, screaming had decreased to a mean of approximately 9% of intervals.

Although a review of the literature revealed that methods without the use of reinforcement, methods using DRO, and methods using non-contingent reinforcement, have been applied in efforts to reduce screaming behavior in autistic and developmentally delayed children, it failed to produce instances of research where reinforcement in the form of differential reinforcement of alternative behavior (DRA), or edibles, was utilized as part of the study methodology. Theoretically, in DRO, all behavior can be reinforced as long as it is not the behavior that is not being reinforced. Alternatively, DRA offers the advantage that an adaptive behavior can be chosen as the replacement behavior to be displayed as a substitute to a maladaptive behavior. In addition, edibles have been shown to be a powerful reinforcer for normally developing children (Solberg, Hanley, Layer, & Ingvarsson, 2007) and children with developmental disabilities (Todd & Reid, 2006).

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Picture Exchange Communication System

The Picture Exchange Communication System (PECS) (Peterson, Bondy, & Finnegan, 1995) is a form of augmentative and alternative communication (AAC) that uses pictures instead of words to help children communicate. The PECS was designed especially for children with autism who have delays in speech development. The use of the PECS has been found to reduce problem behaviors in children with ASD. For example, the three studies where problem behavior was a dependent variable in a research synthesis of 13 single subject studies (Kai-Chien, 2008) showed that PECS is an effective intervention for positive behavior change. Likewise, a study by Charlop-Christy, Carpenter, Le, LeBlanc, and Kellet (2002) using the PECS and a multiple baseline design across participants where the subjects were three children with ASD resulted in ancillary gains associated with decreases in problem behavior (i.e., tantrums, grabbing, being out of seat, and disruptions). Furthermore, results of a meta-analysis of 13 single subject studies indicate that use of PECS to target problem behaviors reduced or eliminated aggression, tantrums, grabbing, being out of seat, and throwing objects (Hart & Banda, 2010).

While PECS has been used effectively to treat tantrums, disruptions, and other functionally similar behaviors, its use for reducing screaming behavior is not documented in the literature. Also, although PECS training procedures include provision of reinforcers for communicative behavior and use of picture icons as a behavior change strategy to increase the frequency of these behaviors, program implementation does not specify using edibles as the only reinforcer. Moreover, examples of studies where edibles were used as the sole reinforcer were not found in the PECS literature.

Multiple Baseline Designs

Multiple baseline designs are among the most frequently used methods in single subject research. The multiple baseline design is one of the more robust designs in terms of demonstrating a functional relationship between the independent and dependent variable(s). There are various examples of studies where the use of a multiple baseline design evidenced a strong relationship between the intervention and target behavior(s). Hargrove, Roetzel, and Hoodin (1989) showed a functional relationship between an intervention involving controlled sequential training of sentences and the prosody of a child with language impairments using a multiple baseline across behaviors design. In the same way, a clear functional relationship was shown between peer support provided by students without disabilities to students with disabilities and positive effects on the academic engagement of the students without disabilities through a multiple baseline design across settings (Cushing & Kennedy, 1997). Cooper (as cited in Richards, Taylor, Ramasamy, & Richards, 1999) summarized advantages of the multiple baseline design, including:

- 1) the withdrawal of an effective treatment is not required to demonstrate the functional relationship between the independent and dependent variables, 2) “the sequential implementation of the independent variable parallels the practice of many teachers”, and 3) “generalization of behavior change is monitored through the design. (p. 154)

It was hypothesized that both tangible and social reinforcement can increase the use of the PECS. Additionally, it was hypothesized that the use of PECS can serve as an adaptive replacement to screaming behavior, and its use reinforced through an edible. Accordingly, the purpose of the current study was to determine whether use of the PECS could reduce the screaming behavior of a ten year-old child with ASD.

Method

Participant and Setting

The participant in this study was a 10 year-old non-verbal boy with ASD. The Developmental Assessment of Young Children (Voress & Maddox, 1998) showed his intellectual ability to be in the developmentally delayed range. The child presented with a significant delay in pragmatic, receptive, and expressive language skills and demonstrated extreme difficulty using words (Checklist of Pragmatic Skills, adapted from Booth, Derickson, & Randolph, 1984). The functional assessment revealed that the participant had basic levels of receptive language, could read and write (on a keyboard) first grade level words, and could recognize sight words.

The setting for this study was the participant's school. Data collection and the application of the independent variable took place in the child's classroom. The participant's educational placement consisted of a self-contained ASD cluster classroom with six other children with ASD.

Dependent Variables and Response Definitions

The dependent variables in this study were the participant's screaming behavior and the choice of the PECS to communicate. Screaming was chosen because it was the behavior reported as most problematic by the classroom teacher and observed to be in need of intervention. During the functional assessment of behavior (see Appendix A), classroom observations were conducted by the researcher. Results confirmed the teachers claim that screaming was the behavior in most need of intervention. The researcher verified with classroom staff that screaming behavior was a relevant target behavior. An occurrence was defined as screaming when it: (a) was loud enough to disrupt activities within the classroom, (b) was done while the subject was in observable frustration/distress, and (c) lasted a minimum of 2 seconds.

The PECS was provided to the participant to be used as an alternative to screaming for communication. An instance of the use of PECS was defined as: (a) pointing to an icon, or (b) picking up an icon and showing it to the researcher, or (c) picking up an icon and handing it to the researcher.

Independent Variable

The independent variable for this study was a combined package intervention consisting of the PECS and differential reinforcement of alternative behavior (DRA). For the purposes of this study, the participant was trained on the first three phases of the use of PECS, as specified by Bondy and Frost (2001): Phase 1-how to communicate; phase 2-distance and persistence, and phase 3-discrimination between symbols. Bondy and Frost (2001) state that Phase 1 is "designed to teach physical behavior that will be considered communicative" (p. 729). Through this phase, students are taught to communicate without using words (i.e., approaching another person [reach towards], engaging in a desired behavior [give a picture] to get a desired outcome). Bondy and Frost (2001) explains that in phase 2 "children are taught to persist in their communicative attempts despite a variety of obstacles or when lesson parameters change slightly...the child will learn to reach farther to get to the hand of the communicative partner or to actually travel to the partner by walking..." (p. 730). In this phase, students are also taught to get their pictures when they need to communicate. Phase 3 of the PECS essentially teaches discrimination between symbols so that messages become specific. Bondy and Frost (2001) specify the use of reinforcers to increase the frequency of the behaviors targeted by each of these three phases. In the current study, DRA was used to encourage a change in the target behavior (screaming). In

DRA, the subject is reinforced for an adaptive response that is intended to replace a maladaptive target behavior.

Experimental Design

The current study was conducted using a multiple baseline across subject areas design. This design was chosen because: (a) not withdrawing treatment is beneficial to the participant, and to the individuals in the participant's setting, (b) using an across subject area design is more convincing than using only one subject area to demonstrate a functional relationship between the independent and dependent variables, (c) the participant's behavior occurs during content instruction of more than one subject, and (d) it offers the advantages of providing intervention in all subjects of need.

Procedure

All observations, and collection, recording, and reporting of data were performed by the researcher, a graduate student, under the supervision of the professor. The method of recording and reporting behavior for this study was frequency and duration for each occurrence of the dependent variable (screaming) and frequency for each instance of the use of PECS. The researcher concluded that the study's social validity would be increased if only screaming that lasted 2 or more seconds was counted as an occurrence. The reasoning was that screaming of this length or longer would, first, disrupt individuals in the screaming participant's environment, and second, signify that the child was frustrated. Observation periods for baseline and intervention phases consisted of 15 minutes each.

Baseline

Prior to the intervention phase for math, which was the first subject area in which the independent variable was applied in the multiple baseline design, collection of baseline data took place on a daily basis until there was stabilization of data points for each subject area (math, reading, and writing). Data stability was defined as obtaining no more than 10% variation in data points for 3 consecutive days. Proceeding intervention in the math subject area, the independent variable was applied to the next subject area when the participant was screaming at a frequency of 30% of baseline levels for 3 consecutive days (criteria) following intervention. Through the multiple baseline across subject areas design, the independent variable was applied first to math, then reading, and lastly, to writing.

After the introduction of the intervention during the math subject area, baseline data continued to be gathered daily for the subject areas, which remained at baseline condition (reading and writing). Also, intervention conditions were kept in place, and data continued to be gathered daily for subjects for which the participant had reached the 30% of baseline screaming for 3 consecutive days criteria during previous intervention phases.

After collection of baseline data, and before intervention in math, the experimenter conducted an assessment of the participant's ability to recognize the words/phrases chosen for PECS icons to eliminate the confound of not being able use them functionally because of lack of not being able read or recognize them by sight. The functional assessment disclosed which words/phrases best represented the participant's communicative needs during instruction. The words chosen were "I need a break", "bathroom", "sad", "sick", "hungry", "it hurts", "help", "don't like", and "I'm tired". As discussed earlier, the participant had a basic level of receptive vocabulary. In addition, since the functional assessment revealed that the participant was able to decode simple words and had an adequate sight word vocabulary, it was decided that icons with words, as opposed to pictures, were to be used. The experimenter conducted three random trials

that required the participant to point to an icon after instructed to do so (“point to _____”). After the three trials, it was determined that the participant was able to recognize all the word icons.

PECS Training

Once demonstrating the ability to recognize the word icons, and prior to the application of the independent variable during math instruction, the participant was trained on the first three phases of PECS. The experimenter adhered to the training procedure specified by Bondy and Frost (2001), albeit with two adaptations. First, Pediasure (a preferred reinforcer) was used as the sole reinforcer. As touched upon earlier, Bondy and Frost (2001) suggests the use of a variety of reinforcers during PECS training. Pediasure was used to expedite the learning of the PECS before the intervention phases and to create an association between receiving this particular reinforcer and using PECS to communicate, in order to increase the probability that the participant would use the PECS during the intervention phases of the study. During training, the participant was provided Pediasure in a baby bottle to consume for three seconds, as opposed to other reinforcers or social praise, for each instance of successful performance of a training phase requirement. Second, whereas the standard training procedures for the acquisition of the PECS indicate that two separate trainers are required to serve as communicative partner and physical prompter, in this study both roles were taken on by the experimenter. The participant was successfully trained on the three phases. He was able to master each phase’s requirements in an average of fifteen minutes per phase.

Following PECS training, the experimenter proceeded to apply the independent variable and collect intervention data across the subject areas. The experimenter, immediately before conducting instruction on the current curriculum of focus, made available to the participant for use to communicate a plastic card with velcro strips with the word icons attached to it, by placing the card on the table to his right side. The experimenter sat directly in front of the participant and set an Iphone (attached to his belt) to vibrate once 15 minutes of intervention and data gathering lapsed. Two data sheets on clipboards were placed to the right side of the experimenter on a short table, and out of the view of the participant, to record each occurrence of screaming and instance of use of a PECS icon.

To determine whether screaming behavior qualified as an occurrence, the experimenter placed a stopwatch with time running to his left on another short table out of the view of the participant. During subject instruction, just as was done during training of the three PECS phases, the participant was provided the baby bottle Pediasure reinforcer to consume for 3 seconds for each instance of the use of a word icon. The frequency of screaming and use of PECS was graphed daily for the observations of each subject area. Changes in level, variability, and trend for data points were inspected visually during baseline and intervention phases for screaming behavior, and during intervention phases for use of PECS.

Inter-observer Agreement

Reliability data was collected by an independent observer naive to the experimental condition in effect at the time. The independent observer accompanied the researcher on approximately 30% of the observations and sat out of the participant’s line of vision while recording. Data were recorded simultaneously with the primary observer as to whether or not the child had demonstrated the target behaviors. Inter-observer reliability was calculated by dividing the number of agreements by the sum of the agreements and disagreements and multiplying by 100 and resulted in an inter-observer agreement of 83%.

Visual Analysis

Carr, Halle, Horner, McGee, Odom, and Wolery (2005) state that “visual analysis involves interpretation of the level, trend, and variability of performance occurring during baseline and intervention conditions” (p. 169), and that judgments are also made regarding

- a) the immediacy of effects following the onset and/or withdrawal of the intervention, b) the proportion of data points in adjacent phases that overlap in level, c) the magnitude of changes in the dependent variable, and d) the consistency of data patterns across multiple presentations of intervention and nonintervention conditions. (p. 169)

The information derived from analyses conducted using the above guidelines is used to determine whether a functional relationship exists between the independent and dependent variables.

Results

The participant displayed a high frequency of screaming during baseline conditions. Mean level of screaming occurrences per 15-minute observation were 21, 15, and 26 for math, reading, and writing, respectively. Compared to baseline, visual analyses suggest that the intervention package of PECS and DRA decreased screaming behavior and increased use of the PECS to communicate. Application of the independent variable during math instruction resulted in a decrease in the frequency of screaming to 28% (a mean of 6) of baseline (a mean of 21) in 11 sessions. Likewise, in reading the frequency of screaming was reduced to 31% (a mean of 6) of baseline (a mean of 19), although in a much shorter period of time (three sessions). Furthermore, in writing, the frequency of screaming was reduced to 26% (a mean of 7) of baseline (a mean of 26) in four sessions, a relatively short period of time as well. Visual analyses of Figure 1 reveals that the reduction in screaming to approximately 30% of baseline levels for reading and writing occurred in approximately 32% less time than it occurred for math.

Upon provision of the PECS word icons on the first intervention session, the participant began using them to communicate. Through visual inspection of Figure 1 it was determined that during the first eight intervention sessions in math the mean use of word icons per session was ten. However, the mean use of word icons per session for the last ten sessions was fifteen. In other words, for approximately the first half of the sessions use of PECS took place at sixty six percent of what it occurred for the second half of the sessions conducted. The same analyses for reading and writing (Figure 1) revealed a pattern with less variability in the use of use of PECS throughout all intervention sessions. For reading, the mean use of word icons per intervention session for the first four sessions was twenty two, and for the last three sessions it was twenty four. In writing, the participant used the PECS at a frequency of twenty instances per session for the first two sessions and for the last two sessions. Although approximately half of the interventions during the application of the independent variable to math were required for the participant to increase use of PECS, acceptable levels of use did begin from the first implementation session nevertheless. For reading and writing use of the word icons was consistent and stable across all intervention sessions.

Discussion

The purpose of the study was to evaluate the effects of a package intervention consisting of the PECS and DRA on the screaming behavior of a child with ASD in a classroom setting. It was found that the intervention had a positive effect on the screaming behavior of the participant across the math, reading, and writing subject areas. After the independent variable was applied, decreases in screaming behavior and increases in the use of PECS were observed upon visual analyses of data. The results suggest that the PECS/DRA intervention used to decrease screaming behavior and increase the use of PECS was effective for the participant in this study.

The participant was chosen to enter the study because he was reported to display screaming behavior across subject areas in the classroom setting. Functional analysis reveals that the participant's frequent and intense screaming of long duration was a signal of frustration and that it disrupted individuals in the classroom. Therefore, intervening on the target behavior was a socially valid undertaking. Although the study had a high degree of social validity and practical application, generalizability was compromised due to the fact that there was only one participant and one interventionist, which suggests the need for future replications with larger groups of students and/or more than one interventionist. Future research could be conducted using alternate designs, like for example, multiple-baseline across subjects (participants) and across settings. In an across setting design, or a replicated across subject areas design, the participant could be instructed by a different interventionist in each setting (subject area) so that each setting (subject area) is independent of the other.

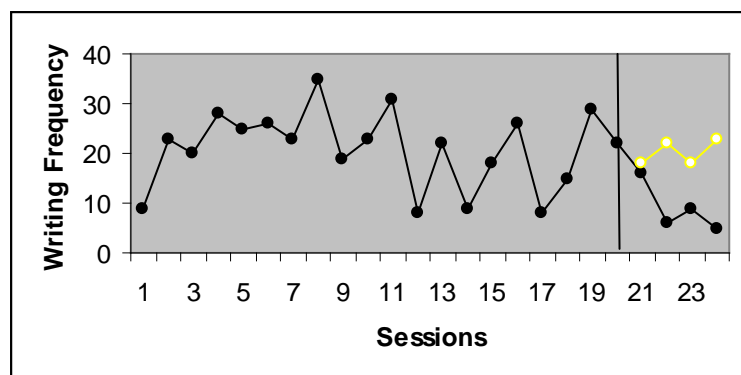
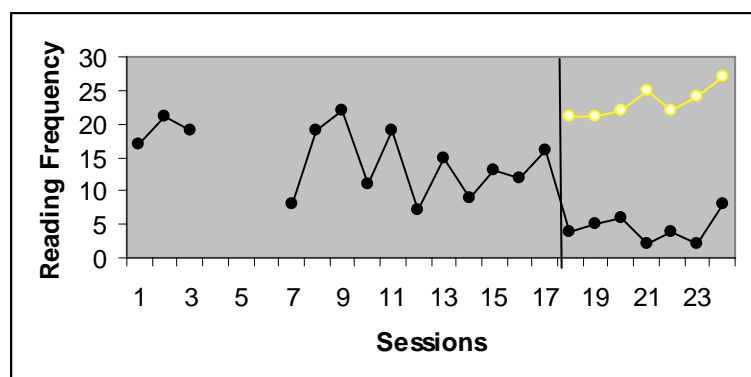
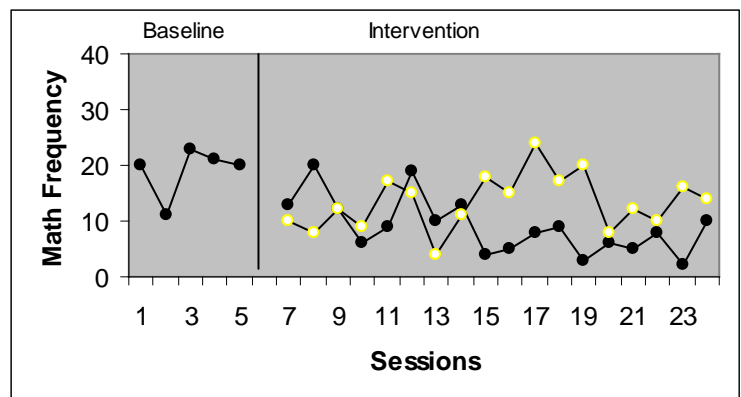
The participant's screaming behavior decreased, and use of the PECS increased, almost immediately when intervention began in the subjects of reading and writing. This was not the case in math, the first subject where the independent variable was applied. Some of the immediate decrease/increase in the dependent variables could be attributed to carryover effects between the subject areas as a function of the multiple baseline design. Efforts were made to minimize threats to internal validity by instructing the teacher and support staff not to use the PECS while the study was being conducted, for example. However, given the nature of the setting, it can be assumed that there was some degree of external influence (i.e., history effects and covariance) on the results of the study.

This study's scope was limited to observing the effects of the PECS and DRA on reducing screaming and increasing functional communication through an adaptive replacement behavior. It did not focus beyond the participant simply using the word icons to express his needs, and did not address possible additional actions associated with each word icon. For example, although there was a word icon depicting "I need a break", whether the participant could go take a break or for how long was beyond the boundaries of this study. Replications of the current study could add, to the intervention package, other consequences and contingencies on top of the simple provision of the Pediture reinforcer for the use of the word icons. In the above example, upon presentation of the "I need a break" icon, the participant could be provided with Pediture and progressively be taught rules related to taking a break appropriately and for an adequate amount of time. Another component that could be considered for inclusion in the intervention could be the fading of Pediture consumption for the use of PECS through a fixed ratio schedule where the number of responses required for reinforcement is gradually increased. This single-subject design has a few inherent limitations. Nevertheless, it lends support to the effectiveness of the PECS combined with DRO as an intervention to reduce screaming behavior.

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Black Line = Screaming
White Line = Use of PECS

Figure 1. Data from the multiple baseline across subject areas study.

APPENDIX A

Functional Behavioral Assessment: Part 1 (Description)

Date: 10-5-11

Student Name: BM ID:

DOB: 9-23-01 Case Manager:

Data Sources: Observation | Teacher Interview |

Description of Behavior (No. 1):

BM displays screaming out behavior in the classroom, in academically and cognitively demanding activities (i.e., teacher-facilitated math, reading and writing lessons).

Setting(s) in which behavior occurs:

The subject's classroom.

Frequency:

Screams intermittently for intervals of 10 minutes. When in screaming "mode", screams out every 20 seconds.

Intensity (Consequences of problem behavior on student, peers, instructional environment):

Loud and intense. Disrupts the general instructional environment and lessons. Affects peer focus on tasks.

Duration:

4 seconds/occurrence (until needs are met or gets desired consequence).

Describe Previous Interventions:

None

Educational impact:

1) Longer to finish tasks, and 2) Maintains non-verbal status.

Part 2 (Function)

Function of Behavior (No. 1): Specify hypothesized function for each area checked below.

Reinforcement (Identify environmental triggers and payoffs that play a role in organizing and directing problem behavior):

Antecedents: Getting liquid on body or clothes; presentation of a non-preferred task; hunger.

Consequences: Changing clothes; engaged time decreased; getting food.

Physiological/Constitutional (Identify physiological and/or personality characteristics; developmental disabilities, temperament; that play a part in organizing and directing problem behavior): Developmental delay (autism); language deficits.

Communicate need (Identify what the student is trying to say through the problem behavior):

Attempting to communicate wants and needs (see "antecedents" and "consequences" above).