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Comparing Main and Collateral Effects of Extinction and Differential Reinforcement of Alternative Behavior

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THE FLORIDA STATE UNIVERSITY
COLLEGE OF ARTS AND SCIENCES

COMPARING MAIN AND COLLATERAL EFFECTS OF EXTINCTION
AND DIFFERENTIAL REINFORCEMENT OF ALTERNATIVE BEHAVIOR

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LIST OF ABBREVIATIONS

DNRA.....	Differential Negative Reinforcement of Alternative Behavior
DR.....	Differential Reinforcement
DRA.....	Differential Reinforcement of Alternative Behavior
DRO.....	Differential Reinforcement of Other Behavior
EXT.....	Extinction
FI.....	Fixed Interval
FR.....	Fixed Ratio
FT.....	Fixed Time
NCR.....	Noncontingent Reinforcement
SIB.....	Self-Injurious Behavior
TO.....	Time Out

ABSTRACT

Both extinction (EXT) and differential reinforcement of alternative behavior (DRA) have been used frequently to reduce problem behaviors. The benefits of these interventions have been established yet may be outweighed by the reported negative side effects that result. However, these collateral effects have rarely been measured or reported. This study evaluated the effects and collateral effects of these interventions with inappropriate vocalizations and work refusal. With the four participants whose target behavior was inappropriate vocalizations, DRA produced the most rapid reductions in behavior. For the fifth participant, whose target behavior was work refusal, EXT yielded the quickest reduction. Other behaviors were measured for changes, and showed that the desirable collateral effect of academic engagement tended to be higher during EXT than DRA. No evidence of extinction bursts was present with any participant, although extinction-induced aggression occurred with one participant.

COMPARING MAIN AND COLLATERAL EFFECTS OF EXTINCTION AND DIFFERENTIAL REINFORCEMENT OF ALTERNATIVE BEHAVIOR

Throughout recent and ancient history, humans have broken rules and misbehaved. Liz Lawley defined misbehaving as “behaving in a way that doesn’t please the people around you, particularly ‘the powers that be’ — wherever you may be” (2003). With no shortage of bad behavior, many techniques have been used to modify the behaviors society considers inappropriate. For example, our judicial system typically looks at the topography of these behaviors and determines the amount of consequent punishment. Others, such as in the field of neuroscience, study the brain to determine the areas or chemicals responsible for such behaviors. Finally, behavior analysts look at the contingencies responsible for them and change them to reinforce desired responses and reduce undesirable ones.

Frequently, behavior analysts find themselves in situations with clients who are likely to engage in risky behavior that could endanger themselves or others. Behavior analysts study significant behavior problems because they cause stress and injuries to people. As a result, techniques to quickly analyze the function and treat such individuals are valuable to practitioners. The individualized approach behavior analysts take to treating clients has prevented the creation of an overall “best practice” model from which a practitioner can select a treatment. Instead, behavior analysts are called on to follow the literature and apply the findings on a case-by-case basis.

Researchers have frequently studied those populations that present the most extreme behavior problems since this is where there is the most need and the greatest opportunity to offer relief from pain, stress, and injury. Much research has been done on a variety of reductive strategies, and authors have reviewed several to represent the overall findings (e.g., Fisher & Mazur, 1997; Lennox, Miltenberger, Spengler & Erfanian, 1988; Scotti, Evans, Meyer & Walker, 1991). Such published literature reviews can increase the ability of practitioners to evaluate the pros and cons of a given strategy. This increase in research efficiency can result in improved treatments and quality of life for clients.

EXT is a widely used reductive strategy that can produce rapid problem behavior reductions (Forehand, 1973; Repp, Felce, & Barton, 1988). It is defined as the discontinuation of reinforcement for a previously reinforced response (Ducharme & Van Houten, 1994). One review compared EXT to a variety of other reductive strategies (Scotti, Evans, Meyer & Walker, 1991). The results indicated that EXT was the intervention with the highest percentage of data points that represented zero. EXT is also the only reported well-established treatment for bedtime refusal (Mindell, 1999). Lancioni, O'Reilly and Basili (1999) reviewed those articles that addressed sleep problems with participants with mental retardation. These authors found evidence that conflicted with Mindell (1999), discovering EXT and graduated extinction improved some sleep problems with some, but not all, participants. Tierney and Jackson (1984) reviewed a variety of studies that focused on treating rumination. Of these studies, four employed EXT, and all reported successful results.

Collateral Effects

In this paper side effects, also called collateral effects, were differentiated by their perceived quality of untargeted behavior change. Positive collateral effects were desirable those behavior changes that occurred without direct intervention. Negative side effects were those unwanted behavior changes that occur without direct intervention. Scotti, Evans, Meyer, and Walker (1991) evaluated studies that involved a variety of reductive strategies. They found that only 5% of those that reported collateral effects considered them negative. In contrast, 83% indicated that the collateral changes were desirable. Such changes typically included leisure activities, self-care and social behaviors. In addition, Tierney and Jackson (1984) stated that not all authors reported either positive or negative side effects. Those that did frequently indicated only anecdotal evidence rather than data.

Some have reported that side effects have resulted from EXT. Such side effects should be evaluated when determining the overall value of the intervention and results. Some reported negative side effects have included extinction bursts, spontaneous recovery, partial reinforcement effect and extinction-induced aggression (Ducharme & Van Houten, 1994; Harris & Ersner-Hershfield, 1978; Lerman & Iwata, 1996; Lerman, Iwata & Wallace, 1999). Spontaneous recovery is the occurrence of a behavior that

occurs after a passage of time following EXT (Rescorla, 2004). EXT bursts are a temporary increase in occurrence, magnitude or duration of a target behavior. Their presence may be less common than some have assumed (Lerman & Iwata, 1995; Lerman, Iwata & Wallace, 1999; Thompson, Iwata, Hanley, Dozier & Samaha, 2003). Extinction-induced aggression is another reported negative side effect. This is an increase in aggression during EXT when compared to baseline levels. Positive side effects may include reduction of other maladaptive behaviors and increases in prosocial behavior (Ducharme & Van Houten, 1994; Maag, Wolchik, Rutherford, & Parks, 1986; Martin & Foxx, 1973; Sajwaj, Twardosz, & Burke, 1972). Those experimenters who label an intervention as EXT but fail to identify a maintaining variable for the problem behavior should take caution before attempting to conclusively state that EXT occurred. EXT by definition requires the cessation of a maintaining variable, so if one was not identified, one cannot be certain that the maintaining factor is the one that was stopped.

Literature Review

Extinction

Many of the articles reviewed in this section were published several years ago. However, it was believed that their content was still relevant. Mindell (1999) reviewed interventions used for bedtime refusal and night wakings in young children. She stated that well-established interventions are those with at least two high quality between-group design experiments or several single-case design experiments. She reported that EXT is a well-established intervention for such sleep problems. In this case, EXT procedures involve having the parent systematically ignore the child after putting him to bed. The author went on to state that EXT is particularly difficult for parents to perform because the child frequently cries for extended periods. A solution to this problem with sleep disorders is the use of “graduated” extinction. Graduated extinction is considered a “probably efficacious” procedure but the exact protocol has differed in the research. Parents are permitted to check on and comfort their children after increasing periods of time from the last check. The most typical method of increasing the time is to increase

the time between checks by 5 minutes every few nights. This is done regardless of the child's behavior, and seems to work because the child eventually falls asleep between checks. Other methods of "graduated" extinction have been to set a standard number of minutes between checks that is longer than typical but consistent, and finally to decrease the attending time of the check itself.

Many have reported that extinction-induced resurgence occurs, yet very few use data to support these observations (Epstein, 1985). This particular side effect is the occurrence of a previously reinforced response that occurs when a different behavior is extinguished. Epstein (1985) did review some animal studies in which this phenomenon occurred. In one case, rats adjusted the length of their run to match a previously reinforced distance. In another study, pigeons pecked previously reinforced keys although these pecks were not currently being reinforced.

Sajwaj, Twardosz and Burke (1972) used EXT to decrease excessive conversation with his preschool teacher. The teacher ignored the participant's conversation initiations and untargted behavior changes also occurred. These side effects included increases in social initiations toward peers and disruptions, as well as decreases in the use of toys and appropriate behaviors. The authors treated such unexpected behavior changes and observed that these modifications successfully controlled these responses. No attempts were made to determine the function of the excessive conversations. Therefore, it was assumed that attention was the maintaining function for the behavior. Ignoring was the treatment utilized based on this assumption, but this was not definitely EXT. It was therefore possible that EXT did not occur, and this could have resulted in more side effects than a function-based treatment.

Harris and Ersner-Hershfield (1978) reviewed a variety of studies on decreasing disruptive behaviors of psychotic and retarded participants. They found that, at the time of their review, EXT was not extremely helpful in suppressing severely disruptive behaviors. They reported that mixed results had occurred from attempts to use EXT to decrease aggressive behaviors. However, the studies reviewed did not involve the determination of a potential function, so there is, again, a possibility that EXT was not actually occurring.

In a similar manner, Smolev (1971) reviewed techniques to decrease self-injurious behaviors and reported that EXT can be slow to reduce behavior change, so with high frequency self-injurious behaviors, this can cause further injury to a participant. However, the author went on to recommend the use of EXT for such behaviors in those cases in which it is not possible to perform a DR intervention with the replacement of an incompatible response.

Lerman, Iwata and Wallace (1999) analyzed 41 cases in which EXT was used to reduce unwanted behaviors. The data indicated that EXT bursts or increases in aggression occurred in about half of the cases. Interestingly, the authors observed that collateral effects were more likely to occur when EXT alone was the intervention rather than when it was combined with other interventions. This supports the hypothesis that other variables may serve to attenuate the side effects of EXT.

Thompson, Iwata, Hanley, Dozier and Samaha (2003) compared EXT, noncontingent reinforcement and differential reinforcement of other behavior (DRO). They evaluated the reductive speed and amount of the interventions and the side effects associated with each. EXT resulted in the most rapid and complete decrease in responding. An EXT burst occurred with only one participant in this study.

In summary, research on EXT has indicated that the technique can be quite effective, particularly if the function of the unwanted behavior has been previously identified. However, the occurrence of side effects that may result can interfere with the quality of improvement otherwise attributed to the intervention. The frequency of such side effects has not been conclusively determined, as authors frequently fail to report them. More research should be conducted to evaluate their presence and determine whether the cost of these outweighs the benefits.

Differential Reinforcement

EXT is not the only strategy that can be used to decrease behavior. In a review of research that reduced unwanted behaviors, Lennox, Miltenberger, Spengler and Efanian (1988) reported that differential reinforcement (DR) procedures are among the most frequently used to suppress unwanted behaviors. DR may be used frequently because it does not involve interruptions of ongoing activities, removal of reinforcers already

earned, or necessitate the application of aversive stimuli (Beare, Severson & Brandt, 2004). In part due to these reasons, the guidelines of responsible conduct for behavior analysts requires that for all punished behavior, a desired behavior must also be reinforced (Behavior Analysis Certification Board, 2004).

While DR techniques are frequently used, interventions are not always effective. For example, there is some question to whether DR is effective as an intervention for extremely longstanding and severe problems (Cowdery, Iwata & Pace, 1990). According to Vollmer, Iwata, Smith and Rodgers (1992), some failures of DR may arise from the use of arbitrary reinforcers instead of those that are function-based and nonarbitrary. In this case, arbitrary reinforcers were those utilized in the absence of a functional analysis, or added to the situation that had not previously been present. Additionally, DR may be difficult to use correctly because of its cumbersome nature (Marcus & Vollmer, 1996). It can reportedly produce side effects because of the EXT component and can result in lower than optimal rates of reinforcement. Marcus and Vollmer (1996) suggested ways to attenuate such side effects, such as adding time-based reinforcers to the intervention. Time-based reinforcers would be added to increase the reinforcing value of the environment. In this case, reinforcers are presented after the passage of time, regardless of the presence of any particular response. Finally, failures for DR to work may result from improper implementation of the procedure, such as when a researcher neglects to extinguish the unwanted behavior.

Differential Reinforcement of Alternative Behavior

Rolider and Van Houten (1990) reported that the most appropriate use of DR would be differential reinforcement of alternative behavior (DRA), as behavior analysts first should teach the client functional behaviors. To perform DRA, the reinforcer is no longer delivered for the unwanted behavior, and is instead applied to a specific, alternative response.

DRA with time out. Vollmer, Iwata, Smith and Rodgers (1992) conducted a study that provided support for the use of DRA with people with mental retardation. The authors reinforced compliance to toothbrushing with reinforcers of hugs, slaps on the back, back pats and body shakes. When the problem behavior occurred the participant

was given a 30-second time out (TO), which was reset if the participant engaged in another problem behavior. Visual inspection of the graphic data indicates that the total inappropriate responses per minute decreased during DRA and percent compliance increased. The results reversed during the baseline phases, indicating that the intervention improved the behaviors when compared to baseline.

Lucas (2000) conducted the only DRA study that targeted the behavior of a normally developing participant. The participant was the author's two-year-old son who frequently hit his four-year-old brother. A 3-minute TO was used to decrease this aggressive behavior, while cooperative play was reinforced as the alternative behavior. DRA consisted of praise contingent on cooperative play. The results were promising but the author did not display cooperative play data.

Richman, Berg, Wacker, Stephens, Rankin and Kilroy (1997) contributed to the present body of literature by further modifying the TO aspect of decreasing the unwanted behaviors of their participant. The experimental design introduced a baseline phase during which DRO and TO were measured. The total treatment package occurred next, at which time these were added to DRA and TO with punishment. The punishment component consisted of having the participant perform nonpreferred tasks during TO and appropriate social interactions were the alternative behavior reinforced with adult attention. The total treatment package demonstrated the best effects during all three occurrences.

Beare, Severson and Brandt (2004) caused a decrease in self-injurious thigh slapping and clothing manipulation by removing edible reinforcers from the sight of the participant. This cue signaling TO from tangible reinforcement was novel and not selected by any other authors in the current review. Engagement was the targeted alternative response, and it increased slightly with DRA.

DRA with ignoring and blocking. Richman, Wacker, Asmus and Casey (1998) examined the results of a DRA contingency for behaviors with different maintaining variables. They targeted two different problem behaviors performed by the same individual. According to a functional analysis, the behaviors were maintained by different functions: disruptive behaviors were maintained by escape from demands, while finger picking appeared to be automatically reinforced. Disruptions were reduced by

extinguishing the ability for the participant to escape from demands, while finger picking was blocked. Mand training was introduced, so the participant could perform an appropriate response to request reinforcement. To intervene on the finger picking behavior, the experimenters alternated phases of ignoring and blocking the unwanted response while still providing the DRA as described above. As expected, finger picking increased when it was ignored and decreased during the blocking phases regardless of the presence of the DRA component.

DRA with contingent restraint. According to some, certain clients may require drastic techniques to decrease problem behavior. As one example, Dura (1991) stated that for clients who are blind and have severe or profound mental retardation, punishment is likely a necessary component to the intervention. Sisson, Van Hasselt, and Hersen (1987) reviewed literature on deaf and blind participants with aggressive behaviors, and reported that until that point there were no studies that were successful at eliminating aggressive behaviors without the use of punishment. In the following studies, the experimenters selected different techniques to reduce unwanted behavior rather than determining their functions and changing the maintaining contingency for treatment. Such studies increase the range of DRA research by providing solutions for behaviors that are particularly resistant to change or may be automatically reinforced.

Saloviita (1988) replaced a highly undesirable self-injurious behavior (SIB) with socially acceptable toy-play. The experimenter used a brief physical restraint to decrease SIB and body-rocking. The intervention decreased the unwanted behaviors within the multiple baseline across behaviors design. Toy-play also increased and became less variable throughout the study. The authors transferred the intervention from trainers to direct care staff then collected follow-up data at one month, four months and two years. Two of the three behavior changes seemed to reverse during these follow-ups so it was not clear why the intervention was removed.

Konarski and Johnson (1989) reported success in a study in which they employed brief contingent restraint for SIB, throwing and stripping. In turn, they increased alternative behaviors with praise. One participant's data were displayed as a multiple baseline across behaviors with one reversal probe, and SIB decreased drastically during the treatment phases. Her stripping behavior also decreased, but the data path was clearly

trending downward prior to the onset of treatment. Finally, her appropriate behavior increased, but unfortunately had been doing so prior to the treatment phase. The behavior of the other participant of this study was assessed in a reversal design was conducted with two follow-up data points. His SIB did not appear particularly different throughout the reversal, but better results were found with appropriate behavior. The effects on throwing, the third behavior, replicated themselves slightly but not to a large extent.

Dura (1991) employed the technique of graduated restraint for aggression with his client. The “play” behaviors of touching toys were reinforced throughout the study. Data were not provided on whether this increased, although the author reported considerable improvement in the participant’s overall behavior improvement by the time of publication. In addition, the author discussed the results of generalization across people and settings that followed the intervention. While punishment techniques may not be as socially acceptable as other interventions, the author was careful to report that he did not endorse the use of punishment except in extreme cases. The use of graduated restraint with a person who causes injuries to others may also be necessary on occasion to decrease harm.

DRA with imperfect implementation. Vollmer, Roane, Ringdahl and Marcus (1999) contributed to the body of DRA research by performing a study in which DRA was imperfectly implemented. This addition increases the support for DRA by indicating it is a treatment that can improve client behaviors without the constant supervision of a behavior analyst. After a functional analysis, the authors used a DRA with varying ratios of reinforcement for each phase. During baseline, aberrant behaviors were constantly reinforced while appropriate alternatives (compliance or mands) were never reinforced. In a reversal design, the experimenters fully implemented a DRA schedule in which the aberrant behaviors were next extinguished and appropriate alternatives were reinforced. Following this, phases with reinforcers delivered at varying ratios of alternative and problem behaviors were conducted. This was meant to parallel a partially implemented DRA schedule, which would be more reasonable to expect of practitioners in applied settings.

Watson, Ray, Turner and Logan (1999) used a novel approach to using DRA. Rather than using experimenters to conduct a functional analysis and administer

treatment, they taught a teacher to do so. This is likely another variation of imperfect implementation, as the teacher had a wide variety of other responsibilities throughout the study and did not have a background in behavior analysis. A DRA contingency with escape EXT was put in effect after a functional analysis. The teacher first implemented this plan, then upon her cessation of employment an aide conducted sessions. Finally, a permanent replacement teacher replaced the aide. Generalization probes were conducted in different settings when the aide was responsible for sessions.

DRA with increasing fixed ratios. Worsdell, Iwata, Hanley, Thompson and Kahng (2000) extended the DRA literature by determining the results of another inconsistent implementation of DRA. The findings were not as promising as Vollmer, Roane, Ringdahl and Marcus (1999), as the ratios did not fade as successfully. Future research with reinforcement ratios should be conducted to yield conclusive results. The authors performed a study to assess the results of inconsistent implementation of the EXT component of DRA while maintaining reinforcement for the alternative behavior on a fixed ratio of 1 (FR 1) schedule. During the intervention, the experimenters utilized reversal designs to demonstrate the effects of functional communication training without EXT, then faded the FR 1 reinforcement schedule to as high as FR 20 for the problem behavior. The FR 1 schedule of reinforcement for one participant was effective to increase appropriate responding and decrease unwanted responding significantly. With another participant, similar results were seen when the schedule reached FR 2 for problem behavior and FR 1 for alternative behavior. The third participant's intervention used a FR 3 was necessary to decrease problem behavior and increase appropriate behavior. With the final two participants, the most notable results were not seen until the problem behavior was reinforced on a FR 20 schedule.

Walsh (1991) assessed the results of a reinforcement fading technique that would make DRA an easier technique for practitioners to perform. He began with a FR of reinforcing every alternative behavior. This was faded to a much more manageable FR 30. During the DRA phase, no response was given when the participant engaged in the stereotyped problem behaviors and task performance was reinforced.

DRA with delayed access to operandum. Roane, Fisher, Sgro, Falcomata and Pabico (2004) attempted to improve the utility of DRA by thinning the reinforcement for

alternative behavior to more practical levels than required by a typical DRA schedule. This was done by delaying access to the operandum needed to exhibit the alternative behavior, a very novel approach. A weakness of this study is that the materials needed to perform the alternative behaviors were not available during baseline. The lack of materials removes any possibility of analyzing the effects of the reversal for one participant's alternative behavior.

Demand fading. Piazza, Moes and Fisher (1996) used demand fading with DRA to improve severe behaviors. They first utilized a functional analysis to determine that the maintaining variable of destructive behavior was escape from demands. Demand fading was used to increase compliance with demands. When the participant performed a required number of trials, the session was ended. As the rate of destructive behavior decreased, the number of demand trials increased. The frequency of destructive responses decreased throughout this intervention, which was termed DRA plus demand fading, compared to baseline and escape EXT phases.

The findings Ringdahl et al. (2002) were consistent with those of Piazza, Moes and Fisher (1996) and the authors went on to actually compare the effects to typical DRA. Ringdahl, et al. (2002) compared the use of DRA with and without instructional fading, while Piazza, Moes and Fisher found utility for just DRA with fading. The finding that DRA with instructional fading results in less problem behaviors than DRA without such fading is beneficial for the participant as well as the entire body of DRA research.

DRA and schedules of reinforcement. Hanley, Iwata and Thompson (2001) compared ways to reach manageable contingencies and found that thinning reinforcement was the best. They used the results of pairwise functional analyses to create DRA contingencies. The authors then assessed the results of various schedules to determine which would result in the most practical levels of alternative and unwanted behaviors. The unwanted aggressive behaviors decreased as alternative behaviors increased. Alternative behaviors were manual signs or pressing voice output microswitches that requested reinforcement.

The second part of Hanley, Iwata and Thompson's (2001) article compared multiple to mixed schedules of reinforcement. The findings were important because they

suggested the best type of reinforcement schedule to use with DRA. The second and third participants were exposed to these contingencies. The multiple schedule was identical to the above description, and colored cards indicated when reinforcement was available. During the mixed reinforcement schedule, there were times that reinforcement was and was not available, but this was not signaled to the participants. The authors concluded that the multiple schedule was the most effective in terms of decreasing problem behaviors and thinning reinforcement for the alternative behavior.

DRA with time-based reinforcement. Marcus and Vollmer (1996) assessed the improvements of behavior when reinforcers were delivered for the passage of time rather than contingent upon a response. This unique component was added to the DRA intervention. In the study, the authors first determined that SIB resulted in access to the toys or other preferred items. After this, the experimenters delivered toys on a fixed-time (FT) schedule plus provided them as reinforcers for appropriate mands. Then the FT schedule was then faded to alter the establishing operation and support mand training. Marcus and Vollmer (1996) provided an alternative method to make DRA more manageable for practitioners. A DRA plus fixed interval (FI) element was faded to more manageable levels of behavior and reinforcement.

Goh, Iwata and DeLeon (2000) greatly improved the behavior of two participants who engaged in frequent SIB. Their intervention utilized differing rates of FT reinforcement added to DRA. The results further support the assumption that the reinforcement rate can be an important component of DRA. During the FT schedule, reinforcement was provided after the passage of a given amount of time, regardless of the occurrence of the behavior. DRA was also in effect, meaning that mand training occurred and unprompted mands resulted in the preferred reinforcer. The FT ratio was systematically faded (Vollmer, Iwata, Zarcone, Smith & Mazaleski, 1993) by increasing the time between reinforcer deliveries, but the DRA schedule continued to reinforce every alternative response (mands). As the FT schedule was thinned, mand delivery increased considerably for both participants across multiple baselines.

DRA in novel settings. The importance of some studies on DRA was identified primarily as the novel settings in which the intervention was conducted. McCord, Thomson and Iwata (2001) conducted a study during students' transitions, which is an

important part of their day. This involved a unique setting when compared to the frequency of those conducted in treatment rooms. During DRA, participants received preferred foods for appropriate transition behavior. No change was made to decrease self-injurious behavior. The authors found that DRA without the EXT component was not effective. However, when this was added to EXT and response blocking it was more successful. During this phase, the percent of transitions with SIB decreased drastically in comparison to baseline.

Sisson, Hersen and Van Hasselt (1993) conducted a study in their participants' natural environment. They used punishment in the form of overcorrection to decrease stereotypic behavior for one participant and misuse of objects for the other. The participants were required to perform the adaptive behavior three times after behaving in the maladaptive manner. This was added to a DRA contingency in a reversal design and across multiple baselines with another task. The results displayed a significant decrease in target behaviors compared to baseline. The authors also reported indirect effects from their intervention. The graphs representing these untargeted changes demonstrated improvement in the number of tasks completed correctly. They also displayed disruptive behaviors and percentage of intervals on-task, however these results did not consistently vary throughout the intervention.

DRA with novel behaviors. The primary benefit of several DRA studies was the increase in range of target behaviors. Up to this point, most articles targeted SIB or other unwanted behaviors exhibited by persons with mental retardation. The following studies expanded the behaviors frequently targeted for intervention by DRA and demonstrate that DRA is promising for this wider range of behaviors as well.

Woods, Fuqua and Waltz (1997) increased our understanding of DRA by using it to decrease stuttering. DRA was added to a simplified habit reversal technique. DRA plus EXT and simplified habit reversal was the phase in which words per minute most increased with and the percent of words stuttered and words used as avoidance most decreased.

Goh, Iwata and Kahng (1999) found that cigarette pica is a behavior that can be reduced through the proper use of DRA. The authors reported that their participants ate cigarette butts regardless of the antecedents or consequences. The authors designed an

experiment to identify the part of the cigarette that was maintaining the pica. A dense FT ratio occurred, in which participants were given a preferred edible item every 10-seconds for 5-minutes. It was hoped that this would cause satiation to consumption of food or nonedible objects, such as cigarettes. A DRA plus response interruption phase following the NCR phase of their intervention. At this time, cigarette exchanges were taught. A graduated prompt hierarchy was introduced to teach participants to hand cigarettes to the therapist. Response-blocking occurred for the unwanted behavior of ingesting the cigarettes. The intervention was successful for all but one participant. A variety of other techniques were introduced and all resulted in variable and low latencies to pica.

Patel, Piazza, Martinez, Volkert and Santana (2002) conducted a study whose results suggested food refusal is an appropriate problem that DRA can help solve. They utilized what they called an escape EXT condition, during which food refusal did not result in escape from eating. This apparently caused the decrease in unwanted behavior and simultaneous increase in desired behaviors. The authors first attempted to cause this change with just a DRA procedure and it failed. This indicated that the addition of the escape-extinction component was responsible for the improvement, which would therefore imply that escape was the maintaining variable in food refusal. However, without a functional analysis this study could not be considered a function-based treatment. This study indicated that for food refusal, DRA without escape-extinction was a failure. By definition, DRA should have included EXT of the inappropriate behavior. Given this distinction, it appears that the authors would have more correctly termed their phase as reinforcement, not DRA, with DRA only being used to describe occasions when reinforcement was added to the escape-extinction component.

Kahng, Tarbox, and Wilke (2001) also found that DRA can be a valuable intervention for food refusal. However, the specific way it was conducted differed from Patel et al. (2002). In this case, response cost was used to decrease food refusal and increase acceptance. The authors identified strong consequences that overpowered the maintaining variables for food refusal. They conducted a food assessment to determine the probability of his accepting given foods. The low probability foods were used throughout the study. A preference assessment was also performed to identify potential reinforcers. The results of this were audiotapes and books that were supplied at the onset

of a trial. These were removed as a response cost contingent on the problem behavior. Praise was supplied for food acceptance and expelling, gagging and vomiting were ignored.

Najdowski, Wallace, Doney, and Ghezzi (2003) expanded the range of situations targeted with DRA by using it to treat food refusal in the participant's natural environments. The treatment occurred in the child's home as well as a restaurant, indicating socially important improvements. Food refusal is a less common problem than the typical SIB mentioned in most other DRA studies. The authors recruited the mother of the participant to perform the functional analysis and treatment sessions. The mother first introduced baseline, during which the participant was praised for eating nonpreferred foods. After this, a DRA phase was conducted, during which one bite of the nonpreferred food resulted in the termination of the meal and a plate of highly preferred foods. Finally, DNRA was added to escape-extinction and demand fading, during which the number of bites required was increased gradually, and resulted in the termination of the session. This phase yielded the most impressive results, which were maintained during several follow-up visits.

McComas, Wacker and Cooper (1998) found a novel problem and addressed with the use of DRA. They used DRA to increase compliance to the command, "hold still" and did not allow him to escape from the cleaning tasks his mother had to perform for him. The researchers first determined those behaviors he was most and least likely to perform. First, the mother reinforced compliance with DRA with escape-extinction. Noncompliant behaviors were followed with a therapist holding him still so he could not escape. The second condition also incorporated a "high-probability" component, in which a series of 3 to 5 requests to which the participant was likely to comply were presented immediately before the "hold still" command. The results of these conditions demonstrated a considerably higher percent of compliant behaviors with the condition that introduced the high-probability requests first.

Differential Negative Reinforcement of Alternative Behavior

Differential reinforcement of alternative behavior (DNRA) has been conducted less frequently than DRA. DNRA occurs when the alternative response is then reinforced

by the removal of an undesired stimulus. No research reported that it is more difficult to conduct, so it is unclear whether this lack reflects the frequency of behaviors maintained by escape, or another variable. Regardless, DNRA has demonstrated positive effects with similar behaviors and participants with diagnoses as DRA. It is a promising intervention that also needs to display the robust potential by having a larger variety of behaviors, clients and settings proven effective. The studies reviewed in this section used DNRA to improve participant behavior. In DNRA, the reinforcer for the alternative behavior is escape from an undesired condition (negative reinforcement), whereas the reinforcer for the alternative behavior in DRA is a preferred stimulus that is added to the environment (positive reinforcement). While some of the previously described studies indicated that the target behavior was maintained by escape (e.g., Kahng, Tarbox and Wilke, 2001), the reinforcer for the alternative behavior was still an added stimulus. In the DNRA studies, the alternative behavior was reinforced by escape from some aversive stimulus. These studies add to the literature by indicating that DRA is useful for negatively reinforced behaviors as well.

Kahng, Boscoe and Byrne (2003) used DNRA to target food refusal, and found that it was very successful. The authors made an educated guess that the food refusal behaviors their participants exhibited were maintained by avoidance of food consumption. The client had a history of food refusal and consumed all her daily calories through a bottle. The authors manipulated the contingencies and yielded decreased food refusal and increased acceptance. This supported their hypothesis that escape from food consumption maintained her food refusal.

Roberts, Mace and Daggett (1995) identified socially important times to conduct their DNRA intervention. The authors stated that the function of SIB was escape from tasks, determined from descriptive and experimental analyses. Tooth-brushing and bathing conditions were targeted as times during which SIB occurred. Escape from these tasks was used as DNRA and differential negative reinforcement of other behavior to decrease SIB and increase desired tasks. While data on compliance with the task, the alternative behavior, were not graphically displayed, the frequency of SIB demonstrated higher data paths for differential negative reinforcement of other behavior than DNRA.

Therefore, the authors concluded that DNRA, which was contingent on a specific behavior, was more effective at reducing SIB.

Reed, Ringdahl, Wacker, Barretto and Andelman (2005) presented the only DNRA study that utilized differing schedules of reinforcer delivery. They compared the effects of DNRA with lean and dense FT schedules. The results of a functional analysis indicated that escape from task demands maintained property destruction of one participant and aggression and noncompliance with the other. The authors chose to extinguish property destruction and aggression by continuing to present the demands following these unwanted behaviors. Compliance was then reinforced by the removal of task materials for 30-seconds. In different phases, fixed-time escape was added to DNRA with both lean and dense delivery schedules. The authors concluded that the most consistent improvements in appropriate behavior, as well as decreases in unwanted behavior occurred during DNRA.

Attenuation Techniques

Several studies described above offered models for decreasing some unwanted side effects of DRA. For example, delayed access to the operandum decreases the rate of alternative behavior. Altering schedules of reinforcement and demand fading may decrease the likelihood of negative collateral effects that may result because of the extinction component of the intervention.

One study identified a way to attenuate specifically emotional behavior and aggression, which were collateral effects of differential reinforcement of other behavior (Vollmer, Iwata, Zarcone, Smith & Mazaleski, 1993; DRO). They compared the effects and side effects of DRO and noncontingent reinforcement (NCR) with three adult females. NCR is the delivery of a reinforcing stimulus after the passage of a given amount of time, regardless of the behavior that is occurring. Time-based reinforcement is another, more appropriate, term used to describe this. In this case, NCR resulted in less cumulative responses and less response bursting than DRO. These data indicate that NCR may be an appropriate attenuation technique. Therefore, it may successfully decrease side effects resulting from other interventions, such as DRA and EXT.

Vollmer, et al. (1998) conducted a study in which they determined that fixed-time (FT) schedules attenuate collateral effects of EXT. The three participants engaged in aggression, disruption, self-injury and tantrums. The authors compared the effects of EXT alone to EXT paired with FT and found that aggression was higher during EXT alone for one participant. For another, aggression, disruptions and tantrums were all more frequent during EXT alone. The authors also reported that an extinction burst was also evident, which contradicts the findings of others (Lerman & Iwata, 1995/1996). Vollmer, et al. declared that the differing findings result from their studies intervention being EXT alone, whereas Lerman and Iwata included studies in which EXT was added to another intervention.

If collateral effects occur enough to influence the interventions experimenters select, they should be consistently measured. Currently, most authors do not include information on side effects, and those that do primarily list only anecdotal descriptions of their occurrences (Vollmer, Iwata, Zarcone, Smith & Mazaleski, 1993). Descriptions without data do not allow other researchers to evaluate the findings of results with an accurate understanding of the collateral effects previous authors have found. Without a measurable change, one can also not compare the effects a researcher finds with one intervention to the levels found with a different intervention. If researchers report measurements of collateral effects, even if they do not intervene upon them, it would allow readers to make better conclusions about interventions and offer a more thorough background from which to plan future systematic interventions on collateral effects.

To summarize, EXT and DRA have both been successful at reducing unwanted behaviors. The most likely function of the behavior must be determined to conclude that either intervention actually occurred. Both interventions have reportedly resulted in both positive and negative collateral effects, but such untargeted changes have rarely been quantified. DRA tends to be more socially acceptable because of the reinforcement component as well as the likelihood that this reinforcement may attenuate collateral effects found with extinction alone. The only literature comparing EXT to DRO found that extinction produced more rapid and complete behavior reductions. Extinction has not been compared to DRA in this capacity, but it should be. It is necessary to learn which intervention would result in the fastest and most complete behavior reductions with the

least collateral effects prior to selecting DRA just because it is more socially acceptable or may cause least collateral effects. If extinction actually reduces behavior more rapidly or causes less collateral effects, these findings could increase the social acceptance of the intervention because extinction may increase the quality of life for clients sooner, or on more dimensions. In addition, behavior analysis is a field in which contributors purport to use data driven approaches. Very little data have been supported the use of DRA over EXT or evaluated collateral effects of the interventions. Therefore, it is impossible to select one intervention over the other based on collateral effects or reduction speed.

Purpose of Present Study

The purpose of Experiment 1 was to conduct a functional analysis to identify the most likely maintaining variable for all participants. The purpose of Experiment 2 was to compare the use of DRA to EXT for each participant. Collateral, as well as targeted effects were measured to determine which resulted in the most positive and least negative changes. In Experiment 2, when unwanted side effects did not diminish by the end of the best intervention, they were targeted to assess attenuation techniques. The same participants and setting were used throughout both experiments.

Elementary school students who exhibited problem behaviors were targeted for the study. For Experiment 1, a functional analysis was conducted to isolate the most likely maintaining variable of the unwanted responses. Following this, Experiment 2 occurred in which EXT and DRA were compared independently to baseline to determine which yielded the most rapid reductions and least negative side effects. After one condition of each, the best intervention was determined and replicated. When negative side effects still occurred during the replication, attenuation techniques were used to reduce them. The overall purpose of the study was to compare main and collateral effects of EXT to DRA. The specific research questions addressed in this study were:

- Does EXT or DRA result in the fastest behavior reduction?
- Does EXT or DRA result in the least behavior variability?
- Does EXT or DRA result in the least negative collateral effects?
- Does EXT or DRA result in the most positive collateral effects?

- Is one attenuation method better than another?

METHOD

Participants and Setting

The participants and settings were the same for both experiments. Participants were recruited from local elementary schools. They were referred to the primary investigator by teachers, administration, or one school's intervention team. The intervention team was comprised of a variety of regular and special education teachers, a social worker, school psychologist, behavior analyst and either the principal or assistant principal of the school. The behavior analyst for the referring intervention team was the primary investigator of this study. All participants exhibited problem behaviors that yielded a relatively conclusive functional analysis. Participants were excluded if the functional analysis indicated that the problem behavior was maintained by automatic reinforcement. Thirteen students began the study and 5 completed both experiments. Of the 8 who did not complete the study, one left school during DRA and did not return, one was too aggressive for the experimenters to continue the functional analysis, three had scheduling conflicts that interfered with adequate session time, two did not engage in an adequate amount of problem behavior during the functional analysis, and one engaged in very high rates without differentiation between demand and attention conditions.

The study was held in two elementary schools in the southeastern United States. The study was reviewed and approved by both the university and school district's institution review boards. Both schools were located in lower socio-economic areas in the same school district. At one school, where all final participants except Jacob attended, the treatment room was an empty office that held a desk, a table, file cabinet, one window and one bathroom. At the school Jacob attended, most functional analysis sessions occurred in the media center and the other sessions were run in a classroom utilized for in-school-suspension. The number of people in that room varied between 1 and 8, including staff and experimenters. After the best intervention was identified, parental

consent was obtained for the classroom teacher to learn the intervention and utilize it with the student. Upon receiving this consent, the plan was also placed in the student's cumulative record folder for use the following school year.

At the beginning of the study, Albert was eight-years old. He was Caucasian and lived with his paternal grandparents. He was enrolled in third grade and received exceptional student education services for being gifted. Albert had never been retained and was in danger of failing because his problem behaviors interfered with his work completion. He was referred to the school's intervention team for disruptive behavior that interfered with the other student's ability to learn. Observations prior to the start of the functional analysis indicated that Albert spent most of his time talking to other students. When he was not speaking to them, he made faces, folded papers into different shapes, and played with small inanimate objects. He rarely followed directions on assignments, although the majority of the time he did attempt some part of the work. His regular education teacher reported that he was the worst behaved student in the class and was a major distraction to the other students. Once per week, Albert spent the day at an alternative learning facility for gifted students. The teacher there reported that he was in danger of being dropped from the program because of his behavior.

Kelly was a six-year old African American enrolled in kindergarten. She lived with guardians and their son. She had never been retained and was diagnosed with attention deficit hyperactivity disorder and language-impairment. She received daily exceptional student education for speech, math, reading and writing. She spent two hours in regular education and was referred to the intervention team for her noncompliant behavior. During the course of the study she was evaluated for an emotional handicap but was not diagnosed with such. Classroom observations indicated that Kelly rarely followed directions made by staff. It appeared that as soon as a rule was given, she would attempt to do the opposite. For example, when told to join the group on the carpet, she might have locked herself in the bathroom. Because she was in kindergarten, the classrooms she was taught in had many manipulative items within a child's reach. Therefore, while refusing to join the class, she frequently gained access to tangible items.

Miguel was a five-year old Multiracial male enrolled in kindergarten. He lived with both his parents and had no siblings. He had never been retained and was diagnosed

with developmental delays. He received exceptional student education for all subjects but spent two hours each day in regular education. He was referred by his regular education teacher for noncompliant behavior and physical aggression. In the classroom it was noted that Miguel was compliant and engaged in academic assignments when he worked with a small group of two or three students and sat next to a teacher. However, when Miguel was engaged in a larger group than this he frequently eloped from the group or became engaged in a physical altercation with students. When redirected or corrected, Miguel frequently responded in a physically inappropriate way. He hit, spit at, pinched and scratched others. He was academically below grade level and was retained at the end of the school year.

Alex was a seven-year old first grade Caucasian male enrolled in first grade. He lived with his paternal grandparents and no other children. He had never been retained and had no diagnosis. He was referred by the intervention team for noncompliant and aggressive behavior. During the course of the study he was suspended for ten days for punching his teacher in the eye. During classroom observations, he was seen throwing a chair at a staff member. He frequently spoke out of turn and did not engage in academic work without several prompts. He was academically below grade level and was retained at the end of the school year.

Jacob was an eight-year old African American male enrolled in second grade. He had never been retained and had no diagnosis at the start of the study. He lived with his mother and was frequently absent. He was referred by his teacher for noncompliant and bullying behavior. He reportedly had a history of lying when confronted about his behaviors and refused to complete work without extra prompts and a high staff ratio. Jacob was observed talking through class instructions and refusing to walk in line with his class. During the course of the study, Jacob was diagnosed with an emotional handicap and moved from a full-time regular education class to a full-time behavior class.

Data Collection

A video camera was used to record behavior for all sessions in both experiments. These videos were reviewed after each session, and trained observers recorded the

presence or absence of all pertinent variables. A fifteen-second partial interval observation system was used to measure the target and unwanted behaviors, and whole intervals were used to measure engagement. For physical aggression and property destruction, the rate was recorded in addition to intervals. When unexpected behaviors occurred, they were added to the data sheets. Several variables were rare or were later judged to be of little interest so they were eliminated at the end of the study. A maximum of 5 remained for each participant. Appendix A shows a copy of the data sheet.

Dependent Variables

The same dependent and collateral variables were measured throughout both experiments. During those experiments that a behavior did not occur, a graph is not displayed for that participant.

Inappropriate Vocalizations. Use of the mouth and vocal chords to form words or noises that were not necessary for completing an assignment. During the play condition, participants were permitted to speak about anything but the following topographies were considered inappropriate: screaming, crying, shouting, threatening or swearing. This was the target behavior for Albert, Kelly, Alex and Miguel.

Work Refusal. Five or more seconds spent doing anything except working on the assigned activity. This was the target behavior for Jacob and typical examples of activities he engaged in rather than work were talking, looking around the room, drawing pictures or scribbling.

Alternative Behavior. This was applied only in Experiment 2. A specific alternative behavior was taught to all participants at the beginning of DRA. For Albert, the alternative behavior began as a hand signal he selected. It was first three fingers held up with the thumb covering them. Albert later reported that this was too difficult so it was changed to holding up his first two fingers. During DRA fading, the hand sign was replaced with cards he handed the experimenter for ease of decreasing the alternative response. Kelly was taught the hand sign for “break” as her alternative behavior. This was the standard American sign for break and began with her holding two closed fists together, with thumb knuckles touching. Then she separated her hands in a downward

motion, pinkies first. For Jacob, the alternative behavior was a hand raise. Miguel and Alex were given a laminated card that was red on one side and green on the other. The card was sitting on the table with the red side up, and the boys used a hand to flip the card so the green side was facing up. If the rate of the alternative behavior was very high yet DRA was selected as the best intervention, it was faded in some way to decrease the rate of this behavior. This is described in more detail in the description of DRA fading below.

Collateral Effects

Collateral effects may have actually been dependent variables, but they were not typically targeted for the intervention. However, for Alex and Miguel, engagement was targeted during DRA fading. Since these collateral effects did not necessarily change with the interventions, they were not included with the dependent variables.

Engagement. The student was working without physical prompting on an academic task. Tasks were supplied by teachers and the experimenters on the level the student was typically performing in class. For work the participants could not perform alone, the experimenters provided assistance as needed. For reading assignments, students read aloud so the experimenter could determine when the student was engaged. Engagement scores are represented in Figures 6-9 for Experiment 1 and Figures 19-22 for Experiment 2 for Albert, Kelly, Miguel and Alex.

Physical Aggression. The student hit, kicked, pinched, scratched, bit, or threw an item. Because it was difficult to determine the students' intentions when throwing objects, any time an item was thrown it was marked as physical aggression, regardless of the target the item hit. Albert, Kelly, Miguel, Alex all engaged in some amount of physical aggression, and these graphs can be viewed in Figures 11-13 for Experiment 1 and 27-41 for Experiment 2 with other graphs that can be found in Appendix C.

Spitting. Miguel engaged in spitting, which was scored any time saliva passed from his mouth onto anything not attached to him. He sometimes spit between his front teeth and other times spit with his lips. While it was frequently targeted at experimenters' faces, this was scored independently because much of it was directed elsewhere. For example, he occasionally spit on the table before smearing it around and dancing on it.

Spitting was scored distinctly from physical aggression but past researchers have likely considered it a form of aggression.

Property Destruction. This was defined as breaking or ripping apart an item, or immersing an item in the toilet. Albert, Kelly, Alex and Miguel all destroyed some property during Experiment 2. During Experiment 1, only Miguel engaged in this behavior. Miguel was also the only participant who placed items in the toilet. All participants wrote on tables, beneath the desk, or the wall at some point. However, this was not scored as property destruction because the camera did not reliably pick up the product of this vandalism. Because participants frequently held a writing utensil up to the wall as if they were writing but did not actually mark on the wall, it was important to the experimenters that only those events that resulted in permanent products that were ruined were scored as property destruction. Property destruction was scored separately from physical aggression and the separate graphs are located in Appendix C, but past researchers have likely considered it a form of aggression so it was combined with physical aggression and spitting within the body of the paper.

Out of Seat. This was defined as the participant's seat out of her assigned chair, whether or not she was engaged in an appropriate activity. Kelly was the only participant whose out of seat behavior was selected to be graphed.

Extinction bursts. Increases in responding during the first three treatment sessions. The level of responding was higher than during the final five baseline sessions (Lerman & Iwata, 1995). This was applicable to be measured only in Experiment 2.

Extinction-induced aggression. Increased aggression during the first three treatment sessions. The level of aggression was higher than during the final five baseline sessions (Lerman, Iwata & Wallace, 1999). While data were collected separately on spitting, physical aggression and property destruction, they all fall into this category of aggression. This was applicable to be measured only in Experiment 2.

Design and Procedures

Experiment 1: Functional Analysis

A functional analysis was conducted to determine the most likely maintaining variable for the problem behavior. Each session lasted between 6 and 10-minutes, but most sessions were 10-minutes. The phases were altered between sessions. The functional analysis was conducted within a multielement design, and the basic procedures were described by Iwata, Dorsey, Slifer, Bauman, and Richman (1982/1994). There were a few changes to this functional analysis. First, during all phases except play, academic work was provided and the participant was told to complete it. Help understanding the assignment was provided as needed. Next, since Jacob's target behavior was work refusal he did not have a play condition. Finally, the breaks provided during the escape from demands phase lasted for 30-seconds. For all participants but Alex, this was reset whenever the target occurred. For Alex it was not reset. Instead, he always received a break for 30-seconds, then the task was reintroduced after 30-seconds. The first target behavior after it was reintroduced yielded another 30-second break.

Attention. When the behavior occurred, the experimenter delivered attention to the participant. Statements such as, "don't do that" and "no talking" were made. A range of types of social reinforcement were attempted. The end result was that it was typically neutral, as a response to the content of what was said. This was an attempt to imitate the social reinforcement students gained in the classrooms when they were not supposed to be talking but nevertheless succeeded in gaining the attention of a peer. All untargeted responses were ignored unless they were unsafe.

Tangible. Materials that the participant were likely to enjoy, and were commonly found in classrooms, were stored in the treatment room. The items they chose from included drawing materials, board games, puzzles, Legos and magazines. Whenever the unwanted behavior occurred, the materials were offered to the participant for 30-seconds. At the end of the 30-seconds, the materials were removed. The experimenter did not talk to the participant during this phase. All untargeted responses were ignored. This phase

was introduced to only those participants whose classroom observations indicated that the target behavior might have been maintained by tangible reinforcement.

Escape from Demands. Instructional directions were given to the participant with his academic assignment and the participant was told there was no talking. For Kelly, Albert, Alex and Miguel, whenever he ceased engagement, demands were given. If the inappropriate vocalization occurred, the work was removed for 30-seconds. For Kelly, Albert and Miguel the break was restarted every time they spoke again. For Alex the timer was not reset so the work was reintroduced after 30 seconds. On those occasions that the participant did not engage in the target behavior and stopped working, a graduated prompt hierarchy was utilized. If Jacob stopped doing his work he was given a break rather than more demands. All untargeted responses were ignored unless they endangered someone.

Play. This condition served as a control. Preferred materials were available throughout the session. These were items available in typical classrooms, including drawing materials, board games, puzzles, Legos and magazines. The experimenter spoke to the participant every 30-seconds, regardless of the behavior that is occurring. However, it was typically delivered more frequently because experimenters would play games to participants and praise their appropriate behaviors. Untargeted responses were ignored during this phase.

Visual Analysis. Data were graphed with data paths that represented the behaviors of the participants. These graphs were visually inspected to determine the differences in responding during each phase. The data points appeared consistently higher in one phase than another were selected for the baseline condition of Experiment 2.

Experiment 2: Comparing DRA to Extinction

A reversal design (Bailey & Burch, 2002) was used to compare EXT to DRA. Each condition occurred once, then the most preferred intervention was determined and replicated. When necessary, the final phase was altered to decrease the alternative behavior and reduce collateral effects. Prior to the start of each EXT or DRA session, the basic procedures of the condition was described briefly to the participant. For example, during an extinction from attention condition, the participant would have been told, “I

need you to do your work and not talk. I will not be able to talk to you because I'm busy".

Visual Analysis. Data were graphed with data paths that represented the behaviors of the participants. These graphs were visually inspected to determine the success of the interventions and when the conditions needed to be changed. The trend, level and variability of the data were evaluated to conclude improvements and failures. Trend was the overall direction in which the data path was headed. This should have been headed in a downward direction for unwanted behaviors, and in an upward direction for desired behaviors. The variability of the data path was the amount of upward and downward change it exhibited across a phase. The level of data path was the point on the y-axis around which the path most consistently hovered. The level, trend and variability of data paths in the current study were examined for changes over time. The data path was considered stable when the variability was low and the data points headed in a consistent trend or level. The most behaviors possible were judged to be relatively stable before conditions were changed.

Sessions were typically 10-minutes in length but ranged from 6-10 minutes. They occurred as many as six times per day. All were videotaped for later data collection. When dangerous behaviors occurred, steps were taken to ensure the safety of everyone involved, and when necessary the session was ended.

Baseline. The functional analysis phase that resulted in the highest level of behavior was selected as the baseline condition. The participants were told before each session to do their work, and for all but Jacob they were told there was no talking. Sessions were run the same as during Experiment 1. For Jacob, baseline was the tangible condition, for Miguel and Albert it was attention, and for Kelly and Alex it was escape from demands.

Extinction. During EXT, the reinforcing outcome was no longer presented. When the response was maintained by social reinforcement, as with Albert and Miguel, it was no longer provided for the behavior. When the response was maintained by tangible items, as with Jacob, the stimuli were no longer provided for work refusal and a prompt hierarchy was in place to increase engagement. When the behavior was maintained by negative reinforcement, as with Kelly and Alex, demands were longer be terminated

following an inappropriate vocalization. As with Jacob, the prompt hierarchy was in place to enforce the demands.

DRA. During DRA, EXT was again in effect. In addition, a specific alternative response was immediately reinforced by the variable present during baseline. The alternative response was taught by the experimenter before the start of each DRA phase. The phase began when the participant correctly performed the alternative response without physical prompting. Albert and Miguel's alternative behavior resulted in 30-seconds of attention from the experimenter. The experimenter set a timer to know when the attention should stop. During the 30-seconds of attention, the participant was permitted to talk but those vocalizations were scored as inappropriate if they threatened, swore, cried or screamed, as with the play condition. For example, if the participant threatened to hit the experimenter in the head while attention was being given, it was scored as inappropriate. Attention typically included positive statements, and if the participant did not speak, the experimenter still spoke to him a minimum of every 30-seconds. Miguel's behavior became so difficult to manage that during the second phase of DRA, he was redirected to his work whenever he would wander away from the table, aggress or spit. At the end of 30-seconds, the experimenter would stop the timer and for Albert would stop talking. For Miguel, the experimenter would quietly tell him the time was up. For example, she might have whispered, "I can't talk to you anymore".

Jacob was given 30-seconds of access to preferred items when he engaged in his alternative behavior, hand-raising. When it occurred, the experimenter would say, "you can play" and the items he had selected at the start of the session were delivered to him. These items were typically found in the classroom and did not appear very highly preferred. The items he reported to experimenters that he would really enjoy playing with were a video game, four wheeler, and bicycle. However, it was believed that these items would be too difficult to introduce to the regular classroom on a consistent basis after the study had been completed. Therefore, items available on a daily basis were selected for him to choose from. A formal preference assessment was not performed, instead Jacob was permitted to select two items from the array of toys the experimenter brought. These were the same toys he selected from during Experiment 1. The toys he typically selected

were a stencil and small “Wooly Willy” toy. After 30-seconds, Jacob was told, “Back to work or raise your hand”.

Kelly and Alex were given a 30-second break from academic tasks when they engaged in the alternative behavior. The experimenter would say, “Okay, you can take a break” when she set the timer, and as the timer went off would say, “okay, back to work”. Unlike those who gained attention during DRA, Kelly and Alex were not permitted to speak during the break. This was done to decrease the likelihood that attention would begin to reinforce the alternative response and create a confound. For Kelly and Alex, the intervention was considered DNRA.

DRA Fading. When the replicated intervention phase ended, the collateral effects were examined to determine if any were occurring at unacceptable rates. The most consistent problem was that the alternative behavior occurred too frequently. This meant it would not be manageable in a classroom. Therefore, different ways to decrease the use of the alternative behavior were examined. For Albert, he began with 20 cards, one representing every 30-seconds in his 10-minute session. The number of cards he began with was gradually decreased until he began with only 1 card. When he had less cards than he needed to receive attention throughout the entire session, no stipulations were placed on when the cards could be used. He was permitted to look at the timer when debating when to use a card.

For Miguel and Alex, engagement as well as lack of target behavior were tied into their use of the alternative behavior. In Miguel’s case, he earned a card whenever he spent time engaged in his work without inappropriately vocalizing. This amount of time began with 30-seconds, then was increased to a final length of 10-minutes. This was increased based on his level of engagement and level of target behavior. When the time was reset because he spoke or stopped working, the length to earn the next card was either not increased or actually decreased to increase the likelihood that he would earn a card. The card was handed to him with the red side up, and he had 30-seconds to flip it to green or would lose the card. This loss occurred once.

Alex was taught to discriminate between red and green stimuli to reveal when the card flip would be reinforced. DRA fading sessions with his card on the table with the red side up. A table tent that was red on one side and green on another was in his sight. It

faced red when he was not allowed to take a break. He was told he needed to work quietly for increasing durations for the experimenter to turn the table tent to green. When that was turned to green, he was permitted to flip his card to green and earned a 30-second break.

Interobserver Reliability and Treatment Integrity

All sessions were reviewed by at least one observer for the presence or absence of independent and dependent variables, as well as side effects. Interobserver reliability for all variables, including treatment integrity was assessed in an average of 34.9% (Range = 28.9- 43.9%) of all sessions. To perform this, two independent observers analyzed the videotapes and record the presence or absence of all variables and side effects. Reliability methods were selected from the description by Bailey and Burch (2002). Occurrence-nonoccurrence reliability ($[A/(A+D)] \times 100$) was measured for those behaviors that occurred at variable levels. To perform this, each interval was evaluated for the presence or absence of each behavior. An agreement would be scored if both observers noted that the behavior did or did not occur. A disagreement was counted for each interval in which one observer recorded that the behavior occurred and the other decided it did not. For those behaviors that occurred rarely, occurrence reliability was collected ($[Ao/(A+D)] \times 100$) to yield a more conservative score. To measure this score, only those intervals in which both observers recorded that the behavior occurred were counted as agreements. When the observers disagreed on whether the behavior occurred were marked as disagreements. Those in which both observers recorded that the behavior did not occur were not counted. The behaviors that were assessed with this type of reliability were spitting, physical aggression and property destruction. During the functional analysis, such behaviors were so rare that for some participants the sessions selected for reliability did not include them. If this is the case, no score was reported for that behavior in the table. The collateral effect agreement was calculated with a “plus or minus one interval” method. This was done because it was difficult to determine exactly which interval a behavior occurred when data collection was performed in different locations and with different timers.

Table 1 presents average scores obtained for reliability measures. The range is also presented. This range includes low levels for some behaviors because occurrence reliability was selected and the behavior occurred rarely. Those scores at or below 80% were re-evaluated by the primary investigator. The problems were identified as primarily timing issues so the behavior was marked in the wrong interval.

Treatment integrity scores were collected for all sessions of both experiments. The average integrity scores for each participant was above 98% throughout all sessions. Any session in which integrity was below 80% was dropped and thus not included in the results. This occurred twice, once during each experiment. Table 1 displays the reliability scores obtained for all participants including treatment integrity.

Social Validity

A questionnaire was delivered to teachers, parents and staff who interacted regularly with the participants as well as students and others not involved in the study. Forty-seven total respondents completed surveys. This was done before the results of the study or final intervention were revealed to those involved. The questionnaire asked questions about the goals, interventions and results of the study. Those who completed it were given compact discs with short video clips of the participants to rate. In addition, they evaluated some of the work products left from Experiment 2. Please see Appendix B for a copy of the questionnaire, work products and graphs of all responses.

RESULTS

Experiment 1: Functional Analysis

Inappropriate Vocalizations

Figure 1 shows Albert's inappropriate vocalizations in the functional analysis phase. There was some overlap between conditions until the eighth session, then the

attention data path became differentiated and above the others. The attention phase was selected as the baseline condition of Experiment 2 for Albert.

Table 1: The reliability scores obtained for each participant, experiment and treatment integrity.

Participant	Experiment 1	Experiment 2
Albert	Target: 94.5% (Range= 82.5-100%) Engagement: 84.1% (Range= 67.5-100%) Treatment Integrity: 99.6% (Range= 95-100%) 66.7% Sessions Assessed	Target: 91.8% (Range= 66.7-100%) Alternative Behavior: 89.2% (Range= 50-100%) Engagement: 92.2% (Range= 65-100%) Physical Aggression: 81.3% (Range= 40-100%) Treatment Integrity: 97.7% (Range= 40-100%) 35.7% Sessions Assessed
Kelly	Target: 85.3% (Range= 65-100%) Out of Seat: 89% (Range= 62.5-100%) Engagement: 87% (Range= 66.7-100%) Physical Aggression: 100% Treatment Integrity: 100% 43.8% Sessions Assessed	Target: 81% (Range= 72-100%) Alternative Behavior: 99.5% (Range= 86.6-100%) Engagement: 91.5% (Range= 65-100%) Out of Seat: 93.7% (Range= 70-100%) Physical Aggression: 86.7% (Range= 66.7-100%) Treatment Integrity: 99.7% (Range= 97.5-100%) 44% Sessions Assessed
Jacob	Target: 83.3% (Range = 67.5-100%) Treatment Integrity: 100% 28.6% Sessions Assessed	Target: 85.1% (Range= 73.3-100%) Alternative Behavior: 98.1% (Range= 90.6-100%) Treatment Integrity: 99.4% (Range= 95-100%) 30.8% Sessions Assessed
Miguel	Target: 90% (Range= 77.5-100%) Engagement: 88.8% (Range= 65-100%) Property Destruction: 100% Treatment Integrity: 82.2% (Range =28.6-100) 42.1% Sessions Assessed	Target: 90.1% (Range= 70-100%) Alternative Behavior: 99.4% (Range= 91.7-100%) Physical Aggression: 80.8% (Range= 0-100%) Engagement: 93.8% (Range= 75-100%) Property Destruction: 100% Spit: 83.3% (Range= 0-100%) Treatment Integrity: 99% (Range= 90.9-100%) 25.9% Sessions Assessed
Alex	Target: 95.4% (Range= 75-100%) Engagement: 97.1% (Range= 87.5-100%) Treatment Integrity: 100% 31.8% Sessions Assessed	Target: 84% (Range= 70-100%) Engagement: 92.3% (Range= 75-100%) Alternative Behavior: 95.5% (Range= 72.5-100%) Property Destruction: 100% Physical Aggression: 86.1 (Range= 50-100%) Treatment Integrity: 97.5% (Range= 85-100%) 26.3% Sessions Assessed

Figure 1: Albert's inappropriate vocalizations during Experiment 1.

Figure 2 represents Kelly's behavior during the functional analysis. Hers included a tangible condition because observations suggested access to tangible items might have been maintaining some of her unwanted behaviors. While attention, demand and tangible conditions all yielded high levels of responding, the differentiation shown between the demand and tangible phases resulted in the decision to use the demand condition as baseline for Kelly.

Figure 3 displays Miguel's inappropriate vocalizations during Experiment 1. Responding was high in both the attention and demand conditions. However, attention was selected as the baseline condition for Experiment 2 for two reasons. First, attention levels of responding were higher than demand more frequently than vice versa. Second, Miguel's behavior during Experiment 1 required redirection due to safety issues. Therefore, the experimenters felt that the demand condition may have been confounded with the addition of attention delivered for some of the collateral effects.

Figure 2. Kelly's inappropriate vocalizations across Experiment 1.

Figure 4 shows Alex's inappropriate vocalizations across the functional analysis conditions. During the first twelve sessions of this experiment, this target behavior rarely occurred. However, there was sudden increase in responding following this, and a differentiation between the data paths became clear. Therefore, the escape from demands condition was selected as his baseline phase for Experiment 2.

Work Refusal

Figure 5 represents Jacob's work refusal during Experiment 1. The data paths did not show an ideal amount of differentiation between conditions. However, the tangible condition was determined to be the highest because it had the most data points above the other phases. Therefore, the tangible condition was used as baseline during Experiment 2. The target behavior was scored differently than a regular percentage. During the phases that work refusal could only occur a maximum of every 30-seconds, since the consequence yielded the removal of the academic assignments for 30-seconds, the percent was taken out of possible intervals the behavior could have occurred.

Figure 3. Miguel's inappropriate vocalizations across Experiment 1.

Figure 4. Alex's inappropriate vocalizations across different conditions of the functional analysis.

Figure 5. Jacob's work refusal during Experiment 1.

Engagement

Figure 6 shows untargeted engagement during the attention and escape from demand phases during Experiment 1 for Albert. During the play phase academic assignments were not delivered so no path represents that condition. The graph does not show a visually significant difference between attention and demand in terms of engagement in academic activities, although there was a slightly higher tendency of engagement to be higher with the demand condition.

Figure 7 shows Kelly's level of engagement during Experiment 1. The attention phase seemed to yield the most engagement when compared to escape from demands and the tangible condition. This parallels the fact that her target behavior was most affected by the escape from demands phase, since the target resulted in a break from academic tasks and therefore less work was done.

Figure 6. Albert's engagement in demand and attention conditions during Experiment 1.

Figure 8 displays Miguel's engagement scores during the functional analysis. It appeared that there was slightly less engagement during the attention condition than demand. However, this was not clear or consistent enough to determine that was affected by the presence of the independent variables.

Figure 9 shows Alex's percent of intervals engaged during Experiment 1. His data differ from the other participants' because his level of engagement was so high at the start of the functional analysis. The data paths on both attention and escape from demands decreased and did not result in one intervention yielding superior engagement scores.

Figure 7. Kelly's engagement during Experiment 1.

Figure 8. Percent of whole intervals in which Miguel was engaged during demand and attention conditions for Experiment 1.

Figure 9. Alex’s engagement between the escape from demands and attention conditions.

Out of Seat

Kelly’s out of seat behavior is represented in Figure 10. This collateral effect was measured for her because it seemed more likely to be affected by the independent variables than some of the other variables that were recorded for her. During play, participants were not scored for out of seat behavior because some of the activities they engaged in kept them from staying seated. An uptrend can be seen during the escape from demands phase and a downtrend is shown during the attention condition.

Aggression

Albert’s physical aggression and property destruction were graphed on the same axes in Figure 11. During the functional analysis, these behaviors did not occur except during the escape from demands condition. For ease of readability, this data path is the only one shown.

Figure 10. Kelly's out of seat behavior during the demand, tangible and attention phases.

Figure 11. Albert's physical aggression and property destruction.

Figure 12 displays Kelly's physical aggression during the functional analysis. She did not engage in any property destruction during this experiment. She only physically aggressed during one condition and session, which was the attention condition.

Figure 13 shows Miguel's physical aggression, spitting and property destruction during the functional analysis. He only aggressed physically during the attention condition during Experiment 1. Spitting behavior also only occurred during the attention condition. He destroyed property during the demand and attention phases of Experiment 1. Separate graphs of these behaviors could not be placed on the same axis because they were too difficult to read. However, they are probably all forms of aggression so were combined for Figure 13. Appendix C holds the separate graphs for physical aggression, spitting and property destruction.

Figure 12. Kelly's physical aggression during Experiment 1. It occurred once, during the final attention condition.

Figure 13. Miguel's combined physical aggression, spitting and property destruction during Experiment 1.

Experiment 2: Comparing DRA to Extinction

Inappropriate Vocalizations

Figure 14 reflects the targeted inappropriate vocalizations during Experiment 2 for Albert. The first baseline was quite variable although the last five data points increased until they leveled off at all intervals with the target behavior. The EXT phase included several data points at or around zero levels, but still the data path was very variable and covered a range of 95%. After the inappropriate vocalizations decreased to a consistent level of 0%, baseline was reintroduced. During this phase, the data path exhibited an upward and high trend, ending at 100%. Upon the introduction of DRA, the behavior immediately decreased to around 0%. The third baseline condition revealed high variability and responding, similar to the first baseline phase. Finally, the DRA condition was replicated. During the second DRA phase, responding was much lower than in

baseline although a little higher than during the first DRA phase. This replication of the DRA condition had slightly higher rates of the target behavior although the level was still low and eventually moved to 0% by the end of DRA fading.

Figure 15 displays Kelly's inappropriate vocalizations during Experiment 2. In this figure, the baseline phase is short and variable. When compared to the DRA phase, it appears that baseline was on a downward trend and the DRA phase continued this. The first DRA condition was variable and had a steady trend downward until it reached 0 at the end. A return to baseline revealed a very high data path that moved upward to 100%. The EXT data path was variable and moved steadily at a higher level than DRA. At the end it did decrease to 0% before the next return to baseline. The third baseline phase mirrored the scores on the second, which were high. The final condition was a return to DRA, which had a data path that immediately dropped to around 0%.

Figure 14. Albert's inappropriate vocalizations in a reversal design.

Figure 15. Kelly's inappropriate vocalizations during Experiment 2.

Figure 16 displays Miguel's target behavior during Experiment 2. The first baseline phase had an increasing trend but the first few data points were very low. During DRA, a downward trend brought the data points near 0%. In the first return to baseline, an upward trend was revealed and the phase ended at 90%, around where the first baseline ended. During EXT, the data path was variable and never decreased to consistently low levels. The condition was ended because Miguel's physical aggression became too common and difficult for the experimenters to manage and it did not seem likely that the intervention could have been replicated in his regular classrooms. The final return to baseline revealed high responding and an uptrend. When DRA was replicated, the data path reversed to the previous DRA levels before fading began. As soon as fading started, responding decreased to 0%, then increased slightly before ending back at 0%.

Figure 17 shows Alex's inappropriate vocalizations in a reversal design. During an escape from demands baseline, the target behavior ranged from 0 to 100%. EXT was also variable with a slight downward trend. The slope of the path dropped to a sharper trend downward at the end of the condition. During a return to baseline the data path increased before DRA was introduced. DRA resulted in a clear uptrend before a sudden

Figure 16. Miguel's inappropriate vocalizations during Experiment 2.

drop that ended at 0%. The final return to baseline revealed levels similar to the second baseline. When DRA was repeated, the data path moved down to similar points as the end of the first DRA. A drastic jump occurred when DRA fading began. This fell after the first three sessions of fading, and at the end of the condition reached near zero levels.

Figure 17. Alex's inappropriate vocalizations during Experiment 2.

Work Refusal

Jacob's work refusal during Experiment 2 can be found in Figure 18. During the tangible condition baseline, levels were around 35%, which was comparable to his responding during Experiment 1. During EXT, the percent of partial intervals of work refusal lingered around baseline levels before dropping to end at 0%. During the first return to baseline, the behavior immediately increased to above the scores found in the original baseline condition. DRA was introduced next, and the data path fell in a manner similar to EXT. The third and final baseline had a data path higher than above the last two. EXT was selected as the condition to return to because the behavior dropped slightly more expeditiously than it had with DRA. A return to EXT yielded an immediate drop of work refusal. No fading was done because no problematic collateral effects had occurred.

Figure 18. Jacob's work refusal during Experiment 2.

Engagement

Engagement was scored as a positive collateral effect throughout Experiment 2. Whole intervals were scored in which the participants actively completed academic assignments. As many assignments as possible were saved for later examination, but the

data paths for engagement in an academic task were not demonstrative of correct completion of the assigned work. Participants were only corrected on their work if they asked for help or continually answered questions incorrectly. In this case, the experimenter would explain the instructions to them or state the rule the participant seemed to miss while attempting to complete work. For example, if a participant continually added on a math worksheet instead of following the rules to subtract numbers, the experimenter might have read the rules at the top and stressed the word, “subtract”. If the participant continued to add, the experimenter might have said, “Remember, when we subtract we take away so we count backwards”.

Figure 19 displays Albert’s engagement during Experiment 2. During the first baseline there was some variability in the amount of intervals he spent engaged, then it dropped off to a consistent 0%. In the EXT phase engagement was again variable, then it dropped to around zero levels until the second DRA phase. At this point, the data tended to stay near 0% but some went as high as 97.5% intervals engaged. This figure suggests that EXT results in the most time spent engaged when compared to DRA and baseline. This is likely because Albert was not permitted to talk during EXT but could gain attention of the experimenter during DRA by exhibiting the alternative behavior. During DRA, Albert was able to spend the entire session speaking to the experimenter about non-academic topics. Since Albert could speak less to the experimenter while working on assignments, engagement may have competed with both inappropriate vocalizations and the alternative behavior. During DRA fading one might have expected engagement to increase as less time could be spent speaking with the experimenter. However, engagement did not increase during this time. This, combined with the variability of engagement during EXT suggests that a lack of attention contingent upon the target behavior alone was not enough to increase engagement.

Figure 20 displays Miguel’s engagement in Experiment 2. During the first baseline, engagement started high but dropped rapidly to 0%. In DRA, the behavior began low and steadily increased until the end of the condition. The second baseline revealed a rapid reduction back to 0% engagement, followed by an EXT phase with a slight increase in, but still very little, engagement. The third baseline showed no engagement, which increased during the return to DRA. It was not until DRA fading that

engagement increased steadily to appropriate levels. For Miguel, DRA fading included a contingency in which he could earn the operandum to perform the alternative response when he was engaged. The results of this experiment for Miguel indicated that engagement was more likely to occur during DRA than EXT or baseline. However, the behavior had to be targeted in order to see consistent and appropriate levels of responding.

Figure 21 is the graph of Kelly's engagement during Experiment 2, and Figure 22 represents this for Alex. The difference observed between the various phases of the reversal design makes engagement appear to be considerably affected by the independent variables. Kelly and Alex's target behavior appeared to be maintained by escape from demands, requiring the baseline condition to be an escape from demands, with escape-EXT and DNRA as the other interventions. During escape-extinction and DNRA, the experimenters required Kelly and Alex to be engaged in activities. When they were not, a graduated prompt hierarchy was utilized. It may be that this prompt hierarchy served as an independent variable that was responsible for the behavior change. If that is the case, engagement was not a collateral effect, but was instead a main effect like inappropriate vocalizations.

Out of Seat

Out of seat behavior was measured for all participants throughout both experiments. However, it showed potential importance for Kelly because it seemed to be an avoidance response and antecedent for work refusal. This affected the likelihood of independent engagement and the quality of prompt hierarchy delivered because it was difficult for the experimenters to get to her when she was out of her seat. Kelly frequently slid from her seat, crawled under the table or desk, sat on her hands, performed head-stands or curled into fetal position. Figure 23 shows the partial intervals in which she did not sit in her assigned seat during Experiment 2. The data paths do not demonstrate a consistent reversal throughout the design, although there appears to be some relation between the independent variables and likelihood that Kelly was out of her seat.

Figure 19. Albert's engagement during Experiment 2.

Figure 20. Miguel's engagement during Experiment 2.

Figure 21. Kelly's engagement during Experiment 2.

Figure 22. Alex's engagement during Experiment 2.

Figure 23. Kelly's out of seat behavior during Experiment 2.

During all baseline conditions, she was consistently out of seat more than she was in it. In the first DRA and EXT there were similar levels of out of seat behaviors, although she tended to be out of seat slightly more during EXT. In the final DRA phase she was never out of her seat.

Extinction Burst

The figures for Experiment 2 were assessed for the presence of extinction bursts. To meet the criterion for this, the response would have been higher during the first three sessions of EXT than they were during the final five baseline sessions, or all baseline if there were less than five sessions. In this study, we found no evidence of such extinction bursts.

Extinction-Induced Aggression

The definitions described by the authors for physical aggression, spitting and property destruction are likely all forms of aggression. Miguel showed all three of these

behaviors, while Alex, Albert and Kelly met criteria for physical aggression and property destruction. Jacob did not exhibit any of these. Figures 24-27 show graphs of these behaviors combined. To measure these, the data sheets were assessed for any of the three behaviors. If more than one of these occurred in a given interval, the interval was just scored once. Figure 28 displays Miguel's rates of these behaviors because so many occurred. For these figures, the scores were counted by incident and divided by the number of minutes in that session. Appendix C displays separate figures for physical aggression, property destruction and spitting.

To meet criteria for extinction-induced aggression, we would expect to see a higher incidence of aggression during the EXT phase. Upon review of Figure 24, we concluded that extinction-induced aggression did not occur for Albert. The graph of just physical aggression, without property destruction, also did not reveal any hint of extinction-induced aggression. In fact, baseline conditions seemed to result in the most aggression. Figure 25 shows Kelly's property destruction and physical aggression, and the results are similar. There may be some increase in aggression during EXT when compared to the second baseline, but when compared to the other two baseline phases this difference seems minute. Figure 26 has Alex's property destruction and physical aggression and the data path again reveals no noteworthy change in aggression. The highest percent of partial intervals with aggression was found in DRA, however the difference was not large or consistent enough to draw conclusions from this. Figure 27 displays Miguel's aggressive behaviors and this does indicate that, for him, extinction-induced aggression may have occurred. Figure 28 shows the rates of behavior to better outline this phenomenon. Inspection of the rate per minute of these aggressive behaviors, it appears that extinction-induced aggression does occur. The rate of behavior during EXT is higher than during any other phase, and it is much more variable and higher during EXT than baseline or DRA. While DRA results in lower rates of aggression, clearly incidents still occurred.

Figure 24. Albert's physical aggression and property destruction during Experiment 2.

Figure 25. Kelly's physical aggression and property destruction during Experiment 2.

Figure 26. Alex's physical aggression and property destruction during Experiment 2.

Figure 27. Miguel's physical aggression, spitting and property destruction during Experiment 2.

Figure 28. Rates of Miguel's physical aggression, spitting and property destruction during Experiment 2.

Alternative Behavior

The percent of partial intervals in which the alternative behavior occurred is graphed in the figures. The score was created by adding the number of intervals in which the alternative behavior occurred and dividing it by the number of possible intervals the alternative response could have occurred. For example, 20 intervals were present in a 10-minute session. Since the alternative response yielded 30-seconds of attention, a break, or access to tangible items, the alternative response could have been reinforced on a maximum of 10 intervals. Therefore, if the alternative response occurred during 9 intervals, the percent graphed would have been 90%. During DRA fading, the alternative response was limited. The scores reported in Figures 29-33 were consistent with the described formula during DRA. It was always the number of intervals in which the alternative response occurred divided by the number of possible intervals. Figures 34-36 show the rate of alternative behaviors across sessions. This measure demonstrates the

number of times the response occurred each minute. The line labeled “maximum rate” shows the total possible rate the behavior could have occurred in that session. This is shown because the possible rate changed during DRA fading.

Figure 29. Albert’s alternative behavior in percent of intervals across the experimental design.

Figure 30. Kelly’s alternative behavior in percent of intervals across the experimental design.

Figure 31. Jacob's alternative behavior in percent of intervals across the experimental design.

Figure 32. Miguel's alternative behavior in percent of intervals across the experimental design.

Figure 33. Alex's alternative behavior in percent of intervals across the experimental design.

Figure 34. Albert's rate of alternative behavior per minute. The maximum rate displays the highest rate possible during that data point. The actual rate is the Albert's rate of alternative behavior.

Figure 35. Kelly's rate of alternative behavior per minute. The maximum rate displays the highest rate possible during that data point. The actual rate is the Kelly's rate of alternative behavior.

Figure 36. Jacob's rate of alternative behavior's per minute. The maximum rate displays the highest rate possible during that data point. The actual rate is the Jacob's rate of alternative behavior.

Figure 37. Miguel's rate of alternative behavior's per minute. The maximum rate displays the highest rate possible during that data point. The actual rate is the Miguel's rate of alternative behavior.

Figure 38. Alex's rate of alternative behavior per minute. The maximum rate displays the highest rate possible during that data point. The actual rate is the Alex's rate of alternative behavior.

Social Validity

Fifty total respondents completed the social validity survey (see Appendix B), although several were incomplete, as certain questions pertained to only those who knew the clients. Forty-seven respondents reported their primary job title. Of these, thirty-eight were students, with 2 teachers, 1 teacher's assistant, 3 parents and guardians, and 3 were other members of society. The results of the survey showed that people approved of the use of DRA and EXT, although they tended to prefer DRA when asked to compare the two interventions. Those who ranked work products tended to select the quality of the worksheets turned in during EXT over those from DRA. The goals were considered to be good selections both for the specific participants as well as for other students with problem behaviors. Respondents were asked to view short video clips and the behavior in the final session was considered much better for Albert, Kelly, Alex and Miguel. Jacob's behavior was ranked as either acceptable or somewhat acceptable. The clips that displayed behaviors from undisclosed phases were ranked and DRA was rated best for Miguel. However, for the other participants, responses hovered between DRA and EXT with no consistent preference. The work products shown to respondents were rated and for Kelly, DRA products were most preferable to the respondents. However, for all four other participants, they rated those completed during EXT as best.

Anecdotally, Albert, Miguel and Alex all indicated a preference toward DRA over EXT and baseline conditions. As an example, after Alex had been taught the alternative behavior, which he called a game, Alex asked the experimenter if he could "play the game again" the next day. This suggests that DRA may be more preferable to clients.

CONCLUSIONS

Experiment 1: Functional Analysis

Conducting Experiment 1 and basing the contingencies in Experiment 2 from the results increased the likelihood that the interventions we discussed were performed

properly and functionally. However, the results of some functional analyses, particularly Jacob and Miguel's, were not very conclusive. This might have interfered with the quality of interventions performed in Experiment 2. The target behaviors in Experiment 2 with both Miguel and Jacob seemed to be influenced by the interventions, which may indicate that either the conclusions the authors drew from their functional analyses were correct, or that the interventions utilized were powerful enough to affect behavior although they were not properly function-based.

The collateral effects observed during the functional analyses were the same as those exhibited during Experiment 2. However, one point about aggression should be discussed. For Albert and Kelly, physical aggression and property destruction occurred at low rates throughout both experiments. During the functional analysis, such responses only occurred during a different phase than the one selected for baseline of Experiment 2. For Albert, both property destruction and physical aggression occurred during escape from demands, and escape from demands did not occur again as Experiment 2 did not utilize it for him. For Kelly, physical aggression occurred during the attention condition and but escape from demands was selected as her baseline in Experiment 2. Miguel's physical aggression, property destruction and spitting all occurred during Experiment 1, but his occurred during both escape from demands and attention. The attention phase was selected as his baseline and during Experiment 2, his rates of these behaviors were unacceptable, particularly during EXT. A few explanations result. First, it may be that extinction-induced aggression is common and Albert and Kelly would have exhibited more if the other baseline condition was selected for Experiment 2. Next, it may be that the phenomenon is not that common and they did not aggress as much because a different baseline was selected. If this is the case, Miguel may have aggressed less if a different baseline was selected for his behavior. This would indicate that another condition of the functional analysis could have been identified and assessed. The tangible condition was not utilized with Miguel, and a variety of other versions may have been attempted. For example, a preference assessment for types of attention could have been performed, then the highest could have been compared to the results of the others. Given that aggression occurred during the escape from demands condition also, and aggression was not actually

targeted, it is impossible to determine if aggression would have occurred in other conditions, or if the one selected for the intervention would have made a difference.

Experiment 2: Comparing Extinction to DRA

Speed of Target Behavior Reduction

DRA produced the quickest target behavior reductions and most complete reduction for four of the five participants in this study. For Jacob, EXT yielded the most rapid reductions. Jacob's target behavior differed from the others, so the answer to this research question was that DRA resulted in faster reductions of inappropriate vocalizations than EXT. EXT produced the quickest work refusal reductions. These are preliminary findings and should not be generalized to other participants and settings. In addition, the speed of reduction alone may not be enough to conclude one intervention is preferable. One point of this study is to demonstrate that other factors, such as collateral effects, can help in that decision-making process.

Behavior Variability

The findings for the amount of variability caused by DRA and EXT are less clear than the speed of reduction. For Jacob's work refusal, and Kelly and Alex's inappropriate vocalizations the variability was about the same. For Miguel and Albert, there was a clear decrease in variability during DRA when compared to EXT. Given these findings, the response to this research question is that DRA sometimes produced less variability than EXT. The target behavior of inappropriate vocalizations clearly resulted in a lot of variability for all participants. It is likely due to some dimension of the target behavior, since this was not true of work refusal. In this case, the differences in variability between behaviors was not helpful in evaluating the interventions.

Negative Collateral Effects

Neither EXT or DRA produced extinction bursts during this study. Extinction-induced aggression was found with Miguel, and it was considered so extreme by the experimenters that the condition could not be completed. For the other participants, this phenomenon was not observed.

Out of seat behavior was displayed for Kelly, and this was considered a negative collateral effect. Compared to baseline, there were slight improvements in this untargeted behavior just with the introduction of each independent variable for the target behavior. Given the high levels observed across the entire experiment, it does not appear that the two interventions would yield any noteworthy decrease of the behavior. Clearly, a variable was present that maintained the behavior and needed to be removed to see decrease out of seat behavior.

To conclude, EXT did produce aggression for one participant in the study. However, given that the other children were aggressive but it was not sensitive to extinction, we believe it is unlikely that 20% of students would aggress due to extinction. It may be that criteria can be determined to identify whether aggression is likely to occur. If aggression levels increase when compared to baseline, extinction should probably be stopped. No extinction bursts were observed and no other negative side effects seemed to be affected by the interventions.

Positive Collateral Effects

Engagement was measured as a positive collateral effect for Albert, Alex, Miguel and Kelly. The findings were inconsistent across participants, but for Albert and Alex EXT appeared to produce the highest levels of engagement. For Kelly, neither intervention seemed to alter the amount of engagement. Finally, for Miguel, DRA seemed to produce the most engagement. While differences in engagement were not large or consistent enough to determine there were more positive collateral effects with EXT, we can conclusively state that DRA did not produce more positive collateral effects than EXT.

One can also examine engagement by intervention. For Kelly and Alex, escape-extinction and DNRA were actually compared. Of these, Kelly's engagement was higher than in baseline but comparable in escape-extinction and DNRA. For Alex, escape-extinction produced more engagement. For Miguel and Albert, whose inappropriate vocalizations were maintained by positive reinforcement, one of each seemed more affected by EXT and DRA.

Previously discussed positive collateral effects, such as leisure activities and self-help skills, did not occur during the sessions with any participants. It is likely that such behaviors would occur outside of the study when no data were being recorded. However, no anecdotal reports of such increases were noted. Kelly's frequency of affectionate behavior did increase outside of the treatment room as well as in the room between sessions, particularly toward the primary investigator. However, data were not collected on this and there did not appear to be a correlation with the phase of the study when such behaviors occurred. In this case, affectionate behavior included primarily spontaneous hugs but also eloping from an assigned location to gain the experimenter's attention and display an exciting trinket.

DRA Fading

Three participants' were introduced to some type of DRA fading. Albert and Miguel had decreased access to the operandum to perform their alternative responses, and Alex was taught a stimulus discrimination, in which he earned the preferred stimulus. Since each of these differed and were not replicated, only casual results can be discussed. All decreased the frequency of the alternative behavior to more manageable levels. Alex's target behavior did increase when fading was introduced, but only more research with this topic can determine if that would be consistent across other participants and behaviors.

Miguel and Alex's fading procedures introduced a contingency for a previous collateral effect, engagement. This was really a DRA contingency with engagement as the alternative response, with increasing durations of engagement required for the reinforcer. Such a technique may be more appropriate than Albert's because it increased another necessary behavior. The unfortunate aspect was that this was much more difficult

for the experimenters to implement. Albert's decreased access to the operandum was easier to implement and included a choice component by allowing him to select when he would use the cards. Miguel and Albert's alternative responses were faded to once per ten-minute session, and Alex's was faded out entirely.

Overall Findings and Implications

It seems that researchers who do not report negative collateral effects still use them as a rationale to select an intervention other than EXT. However, the few who have evaluated them consistently find they are not as common as some may think. The results of this study support that finding. While the extinction-induced aggression for Miguel was negative and extreme, it does not appear EXT produced any other negative side effects that should turn researchers away from it.

During Experiment 1, various levels of engagement were seen with differing phases. In the current study, only the levels of target behavior were used when determining the maintaining variable and thus the interventions used in Experiment 2. Future research may find interesting results with a focus on the presence of certain collateral effects during the functional analysis. If one reinforcer is differentiated with an untargeted behavior, that could indicate a sensitivity of those effects with the given reinforcer, accidental reinforcement or superstitious behavior. In addition, it could be indicative that the maintaining variable has actually been removed for the untargeted response and extinction or an extinction burst, depending on the level of behavior, is occurring. Future researchers may find that interventions selected with an emphasis on untargeted behaviors would be more likely to result in positive collateral effects.

A weakness of Experiment 1 is that the findings of the functional analyses were not as clean as would be ideal. This has been true with many published studies and interventions, but in this case it is difficult to discern whether the lack of clear findings for the functional analyses influenced the results in Experiment 2. It may be that the target behaviors were multiply maintained and would benefit more from an intervention created to change the contingency of both maintaining variables. Future research could

answer this question by operationalizing both clear and less differentiated functional analyses and comparing the effects of the interventions that follow.

A weakness of Experiment 2 is that the less preferred intervention was only performed once. Future research should replicate both phases to find if they are consistent findings across both, and other behaviors should be assessed during these.

It may be that the magnitude of the responses in this study changed but this was not measured. Future research would benefit from identifying a good way to measure magnitude changes. Future research should also delve into what participant characteristics make them more likely to increase in aggression during EXT.

Experiment 2 compared the results of the main and collateral effects of EXT to DRA. DRA was found to be preferable in regards to inappropriate vocalizations, a target behavior, as well as producing the least negative collateral effects. EXT seemed to produce slightly more positive collateral effects. However, no evidence of extinction bursts and only one participant's evidence of extinction-induced aggression occurred. That means that EXT may be underrated by some researchers, and more should assess such collateral effects before assuming they occur.

Overall, DRA and EXT improved the target behaviors during this study. However, the aggression produced by EXT for one participant was so extreme and inappropriate that the condition had to be stopped. The reasons the aggression occurred for him and not the others are unclear, which makes it difficult to determine the value of the two interventions. On one hand, it occurred with only 20% of the individuals studied. Not knowing which participants it would occur with may be enough to suggest DRA to practitioners.

Both interventions are reportedly difficult to implement. DRA requires that practitioners constantly reinforce the alternative behavior, and later fade the alternative response. EXT can be difficult because it is so hard to ignore the unwanted responses. For this study, EXT was simpler to implement, but was very difficult when the collateral response of aggression increased with Miguel. It likely depends on the behaviors of interest as well as the other responsibilities of the staff.

In this study, a functional analysis was conducted in which the maintaining variables for inappropriate vocalizations or work refusal were identified. Several

untargeted behaviors were selected and measured to assess differences in responding throughout the interventions. The maintaining variable selected from the functional analysis was used as baseline for the next experiment. The reversal design that followed compared the reinforcement phase with extinction from that reinforcement to DRA using the same reinforcer with the alternative behavior. The results of the study indicated a tendency for DRA to result in faster behavior reductions than EXT, although when examined by target behaviors, DRA worked best with inappropriate vocalizations and EXT worked best with work refusal.

Collateral effects were assessed for changes and the findings showed no extinction bursts and no difference between interventions with out of seat behavior. DRA resulted in the least amount of aggression. Extinction yielded higher levels of engagement, which was the only positive collateral change measured. The social validity survey revealed that respondents prefer DRA to EXT in theory. However, when they blindly rated work products and video clips, their answers told a different story. The work products were rated consistently higher with EXT, and video clips were considered about equal except with a preference toward DRA with Miguel. Therefore, findings for this study did not support the claims that EXT produces many unwanted side effects, with the exception of aggression. More research should be done to determine its presence on a larger scale when compared to a variety of other treatments. Until that has been done, researchers should collect data on collateral effects and use them to make data-based decisions before concluding that a given intervention would not work due to side effects.

In conclusion, the main, targeted effects of the interventions revealed that DRA was superior to EXT in reducing problem behaviors quickly. DRA is considered more socially acceptable and adds appropriate behaviors to the intervention. EXT is probably more likely than DRA to produce more aggression, so DRA should be used with highly aggressive clients. In certain situations, however, EXT may be preferable. It is less complicated than DRA to implement, especially when staff have several other priorities, and may result in more positive untargeted effects, such as increased engagement. Finally, the high rate of alternative behavior with DRA frequently needs to be faded, and with EXT this is not applicable.

APPENDIX A
Data Sheet

Observer:
Code Number:

Date:
Phase:

Start time:
Session #:
Experimenter:

**Write the letter corresponding
to every behavior present
during an interval**

(+) or (-)

		Target Behavior	Other Behaviors	Bystander Behavior
Int. Start	Int. End			
10:00	9:45			
9:45	9:30			
9:30	9:15			
9:15	9:00			
9:00	8:45			
8:45	8:30			
8:30	8:15			
8:15	8:00			
8:00	7:45			
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2:30	2:15			
2:15	2:00			
2:00	1:45			
1:45	1:30			
1:30	1:15			
1:15	1:00			
1:00	0:45			
0:45	0:30			
0:30	0:15			
0:15	0:00			

APPENDIX B
Social Validity Survey and Responses

Please circle the letter representing your opinions.

1. What is your current work title?

- a. Student (Graduate or Undergraduate) Major _____
- b. Teacher
- c. Professor
- d. Teacher's Aide/ Instructional Assistant
- e. Parent/Guardian
- f. Other: _____

Answer question 2 only if you know the student. Otherwise, please move to question 3.

2. How much do you agree with this statement, "The goal of decreasing inappropriate verbalizations is important for this student"?
- a. Strongly Agree
 - b. Agree
 - c. Neutral; Neither Agree nor Disagree
 - d. Disagree
 - e. Strongly Disagree

3. How much do you agree with this statement, “The goal of decreasing inappropriate verbalizations is important for many students”?
- a. Strongly Agree
 - b. Agree
 - c. Neutral; Neither Agree nor Disagree
 - d. Disagree
 - e. Strongly Disagree

4. How much do you agree with this statement, “The goal is decreasing work refusal is important for many students”?
- a. Strongly Agree
 - b. Agree
 - c. Neutral; Neither Agree nor Disagree
 - d. Disagree
 - e. Strongly Disagree

5. Extinction (EXT) means to stop the maintaining factor in a problem situation. What do you think of using EXT with school-aged children with behavior problems?
- a. Very Appropriate
 - b. Somewhat Appropriate
 - c. Neutral
 - d. Slightly Inappropriate
 - e. Very Inappropriate

6. Differential Reinforcement of Alternative Behavior (DRA) means to stop the maintaining factor plus provide an appropriate way for the client to re-gain the maintaining factor. What do you think of using DRA with kids with behavior problems?
- Very Appropriate
 - Somewhat Appropriate
 - Neutral
 - Slightly Inappropriate
 - Very Inappropriate

7. Please compare EXT to DRA with school-aged children with behavior problems.

- a. EXT is preferable to DRA
- b. DRA is preferable to EXT
- c. EXT and DRA are equally acceptable
- d. Not sure

8. If we found that attention maintained unwanted vocalizations, we might compare the effects of ignoring the unwanted vocalizations (EXT) to ignoring them plus adding a way for them to appropriately gain attention (DRA). How appropriate do you think these two interventions would be?
 - a. Very Appropriate
 - b. Somewhat Appropriate
 - c. Neutral
 - d. Slightly Inappropriate
 - e. Very Inappropriate

9. If we found that avoiding work maintained unwanted vocalizations, we might compare the effects of not allowing them to escape from demands (EXT) to not allowing them to escape from demands plus adding a way for them to appropriately earn a short break from demands (DRA). How appropriate do you think these two interventions would be?
- Very Appropriate
 - Somewhat Appropriate
 - Neutral
 - Slightly Inappropriate
 - Very Inappropriate

10. If we found that gaining access to toys maintained work refusal, we might compare the effects of not allowing him access to toys (EXT) to not allowing him access to toys for work refusal plus adding a way for him to earn a short period of access to toys (DRA). How appropriate do you think these two interventions were?

- a. Very Appropriate
- b. Somewhat Appropriate
- c. Neutral
- d. Slightly inappropriate
- e. Very Inappropriate

For the questions, please look over the work products attached to these sheets.

11. Rate the work products, labeled “A” through “D” from best to worst. Write the letter corresponding to your opinion on the line below.

←-----→
 Best Worst

12. Please use the cd provided to view video clips A, B and C. Before each session, the participant was told, “do your work, no talking”. Keep in mind that the target behavior for Albert, Kelly, Miguel and Alex was inappropriate verbalizations. For Jacob, the target behavior was work refusal. Rate the clips from best to worst. Write the letter corresponding to your opinion on the line below.

←-----→
 Best Worst

13. The clip labeled “D” displays the participant’s behavior at the end of the intervention. Please rate the behavior.

- Very Acceptable
- Somewhat acceptable
- Neutral
- Slightly unacceptable
- Very unacceptable

14. Please record any changes in the child's behavior that you have noted since the study began.
- a. The behavior is much better
 - b. The behavior is a little better: selected once, by Albert's teacher

- c. The behavior is no different, selected once, by Jacob's teacher's assistant
- d. The behavior is a little worse
- e. The behavior is much worse

15. Comments (optional).

This comment was written by someone who knows Jacob: "What does this survey have to do with this child. If there are any behavioral changes, how would you know if these changes were because of either program? The young men in question can benefit from any anger management program."

APPENDIX C

Separate graphs for physical aggression, spitting and property destruction

Albert's physical aggression during Experiment 2.

Albert's property destruction during Experiment 2.

Kelly's property destruction during Experiment 2.

Kelly's physical aggression during Experiment 2.

Miguel's physical aggression during Experiment 2.

Miguel's property destruction during Experiment 2.

Miguel's spitting during Experiment 2.

APPENDIX D
Review Board Approval Forms

Office of the Vice President For Research
Human Subjects Committee
Tallahassee, Florida 32306-2763
(850) 644-8633 · FAX (850) 644-4392

APPROVAL MEMORANDUM

Date: 12/1/2005

To:

Erin Petscher
183-4 Moore Drive
Tallahassee, FL 32310

Dept.: **PSYCHOLOGY DEPARTMENT**

From: **Thomas L. Jacobson, Chair**

A handwritten signature in black ink, appearing to read "Thomas Jacobson", with a long horizontal stroke extending to the right.

Re: **Use of Human Subjects in Research**
Comparing Collateral Effects of Extinction and Differential Reinforcement of
Alternative Behavior and Evaluating Attenuation Techniques

The forms that you submitted to this office in regard to the use of human subjects in the proposal referenced above have been reviewed by the Human Subjects Committee at its meeting on **11/15/2005**. Your project was approved by the Committee.

The Human Subjects Committee has not evaluated your proposal for scientific merit, except to weigh the risk to the human participants and the aspects of the proposal related to potential risk and benefit. This approval does not replace any departmental or other approvals which may be required.

If the project has not been completed by **11/14/2006** you must request renewed approval for continuation of the project.

You are advised that any change in protocol in this project must be approved by resubmission of the project to the Committee for approval. The principal investigator must promptly report, in writing, any unexpected problems causing risks to research subjects or others.

By copy of this memorandum, the chairman of your department and/or your major professor is reminded that he/she is responsible for being informed concerning research projects involving human subjects in the department, and should review protocols of such investigations as often as needed to insure that the project is being conducted in compliance with our institution and with DHHS regulations.

This institution has an Assurance on file with the Office for Protection from Research Risks. The Assurance Number is IRB00000446.

cc: Jon Bailey
HSC No. 2005.917

INFORMED CONSENT FORM

I freely and voluntarily and without element of force or coercion, consent to have my child participate in the research project entitled "Comparing Collateral Effects of Extinction and Differential Reinforcement of Alternative Behavior and Evaluating Attenuation Techniques".

This research is being conducted by Erin Petscher, M.S., M.A., who is a student of Applied Behavior Analysis in the Psychology department at Florida State University. I understand that the research project is supervised by Jon Bailey, Ph.D who is a Professor of Applied Behavior Analysis in the department of Psychology at Florida State University. I understand the purpose of the research project is to determine the best techniques to decrease student problem behaviors that may interfere with his or her education.

I understand my child will be asked to participate in an analysis to determine the cause of his or her problem behavior. He or she will then be asked to participate in an intervention to decrease the unwanted behaviors. The total time commitment for my child will be about 20 minutes per day, and will not occur during academic instruction. This time commitment will be made during the time period that my child's teacher chooses.

I understand that my child will be videotaped during this intervention and that the videotapes will only be used in private for trained observers to record data. The videos will be kept in a locked file cabinet and will be destroyed after the study.

I understand my child's participation is totally voluntary and I may remove his or her participation at anytime. If I decide he or she should stop participating it will not be held against me by the researcher or classroom teacher. All the data on my child's behavior will be kept confidential and identified by a subject code number. His or her name will not appear on any of the results. My personal information and data will be kept as confidential as the extent allowed by law.

I understand there is a possibility of a minimal level of risk involved if I agree for my child to participate in this study. He or she might experience frustration when his problem behaviors no longer yield the outcome he or she wants. The researcher will be available to talk with my child or me about any emotional discomfort we may experience. I am also able to stop my child's participation at any time I wish.

I understand there are benefits for participating in this research project. First, my child's inappropriate behavior should decrease. Appropriate alternatives to his or her behavior will be taught and the interventions may be transferred to the classroom. In addition, the decrease in my child's behavior problems may increase the quality of education he or she may receive in the classroom.

I understand that this consent may be withdrawn at any time without prejudice, penalty or loss of benefits to which I am otherwise entitled. I have been given the right to ask and have answered any inquiry concerning the study. Questions, if any, have been answered to my satisfaction.

I understand that I may contact Erin Petscher or Dr. Jon Bailey at (850) 644-6443, or the Institutional Review Board at (850) 644-8836 for answers to questions about this research or my rights. Graphic results will be sent to me upon my request.

I have read and understand this consent form.

(Parent)

(Date)

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BIOGRAPHICAL SKETCH

Erin Seligson Petscher
(Previously Erin Celia Seligson)

PERSONAL INFORMATION

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EDUCATION

- Ph. D. Florida State University, Tallahassee, FL (expected 8/2006)
Psychology
Focus: Applied Behavior Analysis
Dissertation Title: Comparing Collateral Effects of Extinction and Differential Reinforcement of Alternative Behavior and Evaluating Attenuation Techniques
Chair: Dr. Jon Bailey
- M. S. Florida State University, Tallahassee, FL (2004)
Major: Psychology
Focus: Applied Behavior Analysis
Thesis Title: The Effects of Training, Prompting, and Self-Monitoring on Staff Behavior in a Classroom for Students with Varied Exceptionalities
Chair: Dr. Jon Bailey
- M.A. Western Michigan University, Kalamazoo, MI (2003)
Major: Psychology
Focus: Applied Behavior Analysis and Autism
Project Title: The Behavioral Research Supervisory System: Helping Students Avoid Procrastination
Chair: Dr. Richard Malott
- B. S. Western Michigan University, Kalamazoo, MI (2000)
Majors: Psychology and Sociology
Cum laude

AREAS OF INTEREST

Collateral Effects of Behavioral Interventions
Reducing Problem Behaviors in Schools
Parent Training
Early Intervention with Autistic Behaviors
Organizational Behavior Management

PROFESSIONAL EXPERIENCE

- 2004-present **Behavior Analyst**, Behavior Management Consultants, Responsible for conducting functional behavior assessments, writing and implementing behavior interventions, training and supervising 4 behavior specialists, helping create individualized educational plans and participating as a member of school intervention teams.
- 2004-present **Office Manager**, Florida Association for Behavior Analysis. Responsible for organizing one annual conference and one bi-annual conference and supervising students from the Society of Performance Management of Florida State University in their organization of an annual conference.
- 2004-2005 **Instructor**, Department of Psychology, Florida State University. Responsible for teaching , creating lectures and tests for, and grading twoundergraduate courses titled Psychology 2012: General Psychology.
- 2004-2005 **Volunteer Treasurer and Secretary**, Capital Area- Florida Association for Behavior Analysis. Responsible for managing finances and corresponding with members.
- 2003-2004 **Behavior Specialist**, Behavior Management Consultants. Responsible for collecting and tracking client data and implementing interventions.
- 2001-2002 **Teaching Assistant**, Department of Psychology, Western Michigan University. Responsible for leading weekly meetings for 27 graduate and undergraduate students, supervising the completion of 13 Master's level projects, updating course syllabi and lessons, grading coursework, self-development interviews and continuous quality improvement of the system. The course was titled Psychology 697: Applied Behavior Analysis Master's Project.
- 2001-2002 **Instructor**, Department of Psychology, Western Michigan University. Responsible for leading seminars for 20 undergraduates for two classes, teaching behavioral principles and shaping behavioral repertoires, grading coursework, career counseling, and continuous quality improvement of the

system. The course was titled Psychology 360: Concepts and Principles of Behavior Analysis.

- 2000-2003 **Instructor**, Department of Psychology, Western Michigan University, Responsible for leading seminars, training and supervising 8-15 undergraduates for four courses, teaching students how to perform discrete trial training, grading coursework, updating client procedures and continuous quality improvement of the system. The course was titled Psychology 357: Practicum for Special Populations.
- 2000-2003 **Behavior Technician**, Kalamazoo Regional Education Service Agency, Responsible for implementing behavior plans for pre-primary clients with autism, discrete trial training and tracking client data.

AWARDS AND RECOGNITION

Kellogg Dissertation Grant, Florida State University, 2006
Full Graduate Assistantship, Western Michigan University, 2002 – 2003; Florida State University, 2003-present
Graduate Student Research and Travel Grant, Western Michigan University, 2002
Golden Key National Honor's Society, 2000
Dean's List, Western Michigan University, 1999-2000

PROFESSIONAL MEMBERSHIPS

Capital Area of Florida Association of Behavior Analysis, 2003-present
Florida Association of Behavior Analysis, student member 2002-present
Association for Behavior Analysis, student member 2001-present
Behavior Analysis Association of Michigan, student member 2001-2003
Mid-Western Association for Behavior Analysis, student member 2001-2003

RESEARCH

Florida State University

- 2005-present Comparing Collateral Effects of Extinction and Differential Reinforcement of Alternative Behavior and Evaluating Attenuation Techniques, **Author and Investigator**

Western Michigan University

- 2002-2003 Increasing Independent Toy Play and Decreasing Stereotype with Preschoolers Diagnosed with Autism, **Author and Investigator**
- 2002 Treatment of Specific Animal Phobias and the Relationship of an Opiate Antagonist to Outcome, **Investigator**

PUBLICATIONS – REFEREED JOURNALS

- Seligson, E.C.** (2004). Using feedback effectively. *Organizational Behavior Management Network*. <http://www.obmnetwork.com/obmnetwork/sub/success%20stories/SeligsonEF.htm>
- Petscher, E.S., & Bailey, J.S.** (in press). The effects of training, prompting, and self-monitoring on staff behavior in a classroom for students with disabilities. Manuscript accepted for publication in *The Journal of Applied Behavior Analysis*.

PUBLICATIONS – MANUSCRIPTS IN PREPARATION

- Petscher, E.S., & Bailey, J.S.** Differential reinforcement of alternative behavior: A critical review. Manuscript in preparation.
- Petscher, E.S., & Bailey, J.S.** Comparing collateral effects of extinction and differential reinforcement of alternative behavior and evaluating attenuation techniques. Manuscript in preparation.

CONFERENCE PRESENTATIONS - REFEREED

2006

- Petscher, E.S. & Bailey, J.S. (2006). The effects of training, prompting, and self-monitoring on staff behavior in a classroom for students with disabilities. In M. Reiss (Chair), *Two studies on staff management in public schools*. Symposium conducted at the twenty-fifth annual meeting of the Florida Association for Behavior Analysis, Sarasota, Florida.

2005

- Seligson, E.C. & Bailey, J.S. (2005, May). *The use of prompting and self-monitoring to increase school staff implementation of a token economy*. Poster session presented at the thirty-first annual meeting of the Association for Behavior Analysis, Chicago, Illinois.

2003

Seligson, E.C., & Malott, R.W. (2003, May), *Increasing Independent Toy Play and Decreasing Stereotypy with Preschoolers Diagnosed with Autism*. Symposium conducted at the twenty-ninth annual meeting of the Association for Behavior Analysis, San Francisco, California.

2002

Seligson, E.C., Kehe, R., & Malott, R.W. (2002, February, May & October), *The behavioral research supervisory system: Helping graduate students avoid procrastination*. Poster sessions presented at the annual meetings of Behavior Analysis Association of Michigan, Ypsilanti, Michigan, Association for Behavior Analysis, Toronto, Ontario, and Mid-Western Association for Behavior Analysis, Kalamazoo, Michigan.

Seligson, E.C., Kehe, R., & Malott, R.W. (2002, May). The behavioral research supervisory system: Completing a thesis or dissertation before the deadline. In P.G. Osnes (Chair), *Undergraduate Preparation in Behavior Analysis: Pedagogy, Practice, and Professionalism*. Symposium conducted at the twenty- eighth annual meeting of the Association for Behavior Analysis, Toronto, Ontario.

Malott, R.W., Cutler, H., Otto, J., Van de Hey, E., Bratinscak, A., Seligson, E., & Kehe, R. (2002, May) *The behavior analysis training system at Western Michigan University*. Poster session presented at the twenty- eighth annual meeting of the Association for Behavior Analysis, Toronto, Ontario.

PRESENTATIONS – INVITED

2004

Seligson, E.C. *Functions and roles of IEP team members in elementary and secondary schools*. Guest lecture presented in SPS 5055: Foundations of School Psychology, Florida State University.

Seligson, E.C. *Sigmund Freud*. Guest lecture presented in PSY 2012: General Psychology, Florida State University

Seligson, E.C., *Anxiety Disorders*. Guest lecture presented in PSY 2012: General Psychology, Florida State University

TEACHING AND INSTRUCTION

Florida State University

PSY 2012 General Psychology (undergraduate level)

Directed Independent Studies (undergraduate level)

2006

Behavior Analysis in Schools: 10 Psychology undergraduate students

2004

Staff Training: 5 Psychology undergraduate students

Western Michigan University

PSY 357: Special Populations Practicum (undergraduate and graduate students)

PSY 360: Concepts and Principles of Behavior Analysis (undergraduate students)

PSY 697: Applied Behavior Analysis Master's Project (undergraduate and graduate students)

PROFESSIONAL DEVELOPMENT

PSY 6945: Teaching Psychology Practicum, Spring 2004

PSY 5847: Supervised Teaching, Summer 2004