THE USE OF NONCONTINGENT REINFORCEMENT FOR THE REDUCTION OF PROBLEM BEHAVIOR AND THE APPLICATION OF WEBER'S LAW TO A FADING PROCEDURE

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Abstract: The effectiveness of noncontingent reinforcement (NCR) for the reduction of problem behavior was examined. The students exhibiting problem behavior were given a functional behavior assessment that determined the function of their behavior. NCR in the form of teacher attention was administered on a fixed interval schedule for each student based on the mean inter-response time of three baseline sessions. Once NCR effectively reduced problem behavior in all participants, a fading procedure was implemented. The fading procedure was based on the application of Weber's Law of just noticeable difference.

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Inter-observer Agreement

Participant	**Frequency of Problem Behavior Range**	**Frequency of Problem Behavior Average**
1	80%-100%	89%
2	80%-100%	90%
3	80%-100%	86%

Table 2

Fixed-interval Schedule

Participant	Treatment	Fading Phase 1	Fading Phase 2	Fading Phase 3	Fading Phase 4
1	41 seconds	51 seconds	64 seconds	80 seconds	100 seconds
2	45 seconds	56 seconds	70 seconds	88 seconds	110 seconds
3	42 seconds	--	--	--	--

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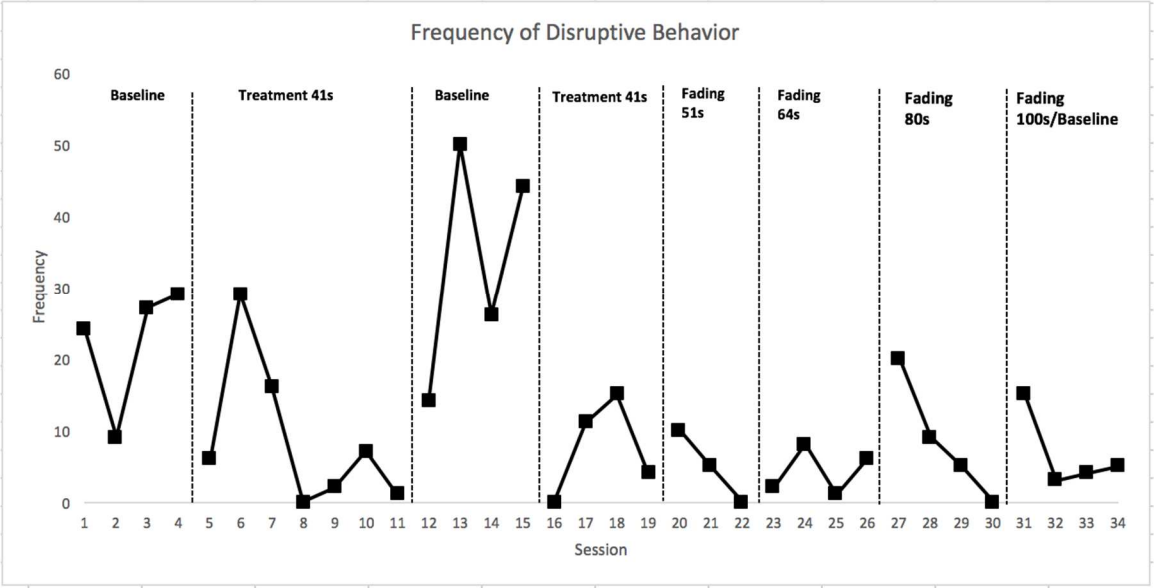


Figure 1. Frequency of disruptive behavior for Participant 1.

Figure 2

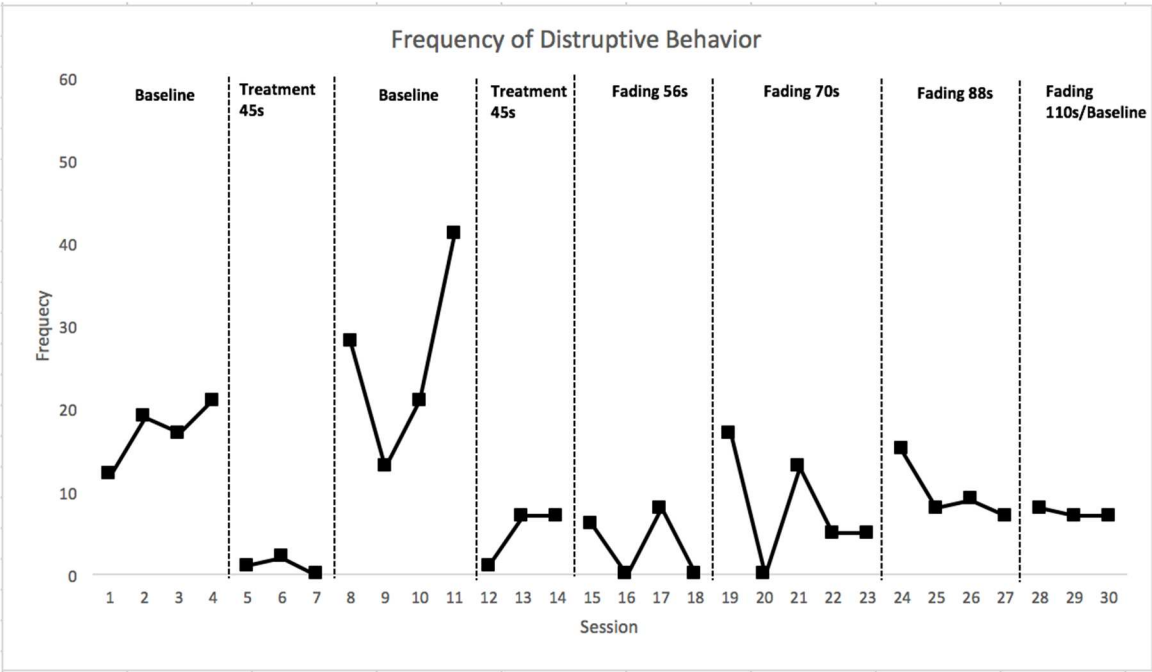


Figure 2. Frequency of disruptive behavior for Participant 2.

Figure 3

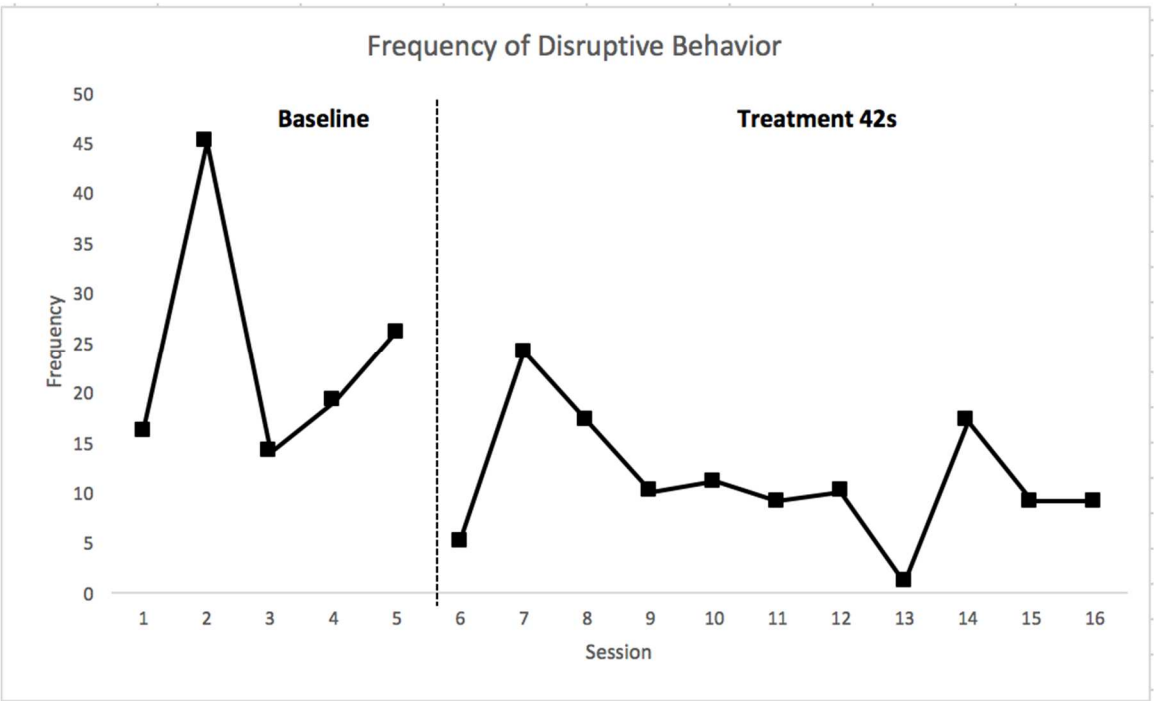
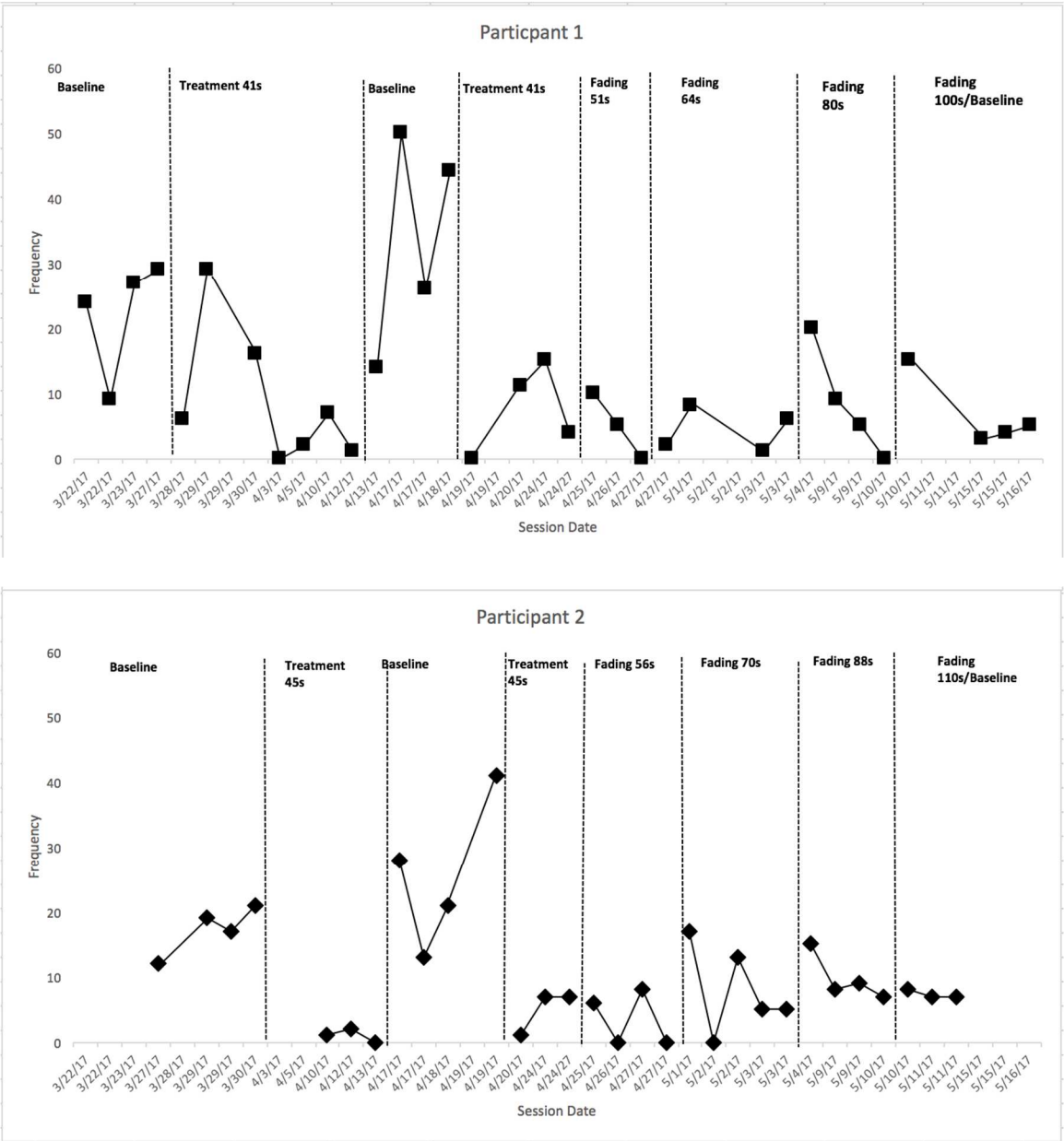


Figure 3. Frequency of disruptive behavior for Participant 3.

Figure 4



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CHAPTER I

INRODUCTION

The use of applied behavior analysis (ABA) has been shown to be effective in schools as early as the year 1969 (Haring & Hauck, 1969). Moreover, the use of ABA procedures have been demonstrated to be more effective in facilitating academic growth compared to other programs such as Piagetian and parent centered approaches (Skinner & Hales, 1992). ABA can be used to construct behavioral interventions in order to reduce problem behaviors in children. The three most commonly used types of behavioral interventions are antecedent interventions (interventions that are implemented before a target behavior occurs), consequence interventions (interventions that are implemented after a target behavior occurs), and skill development interventions (interventions designed to teach alternative behaviors that are more adaptive than the problem behavior) (Bregman, Zager, & Gerdtz, 2005).

Antecedent Interventions

Both consequence and antecedent behavioral interventions are effective in reducing problem behavior. Iwata et al. (1990) demonstrated the use of consequence behaviors could adequately reduce self-injurious behavior in individuals with developmental delays. While Hailey, Heick, and Luiselli (2010) were effective in implementing an antecedent intervention that utilized the use of visual cues to reduce vocal stereotypy in a second grade student with ASD. One benefit of antecedent interventions compared to consequential interventions is that antecedent interventions provide an alternative option to the use of aversive consequences or the denial or rewards or privileges (Smith & Iwata, 1997). Another benefit of the use of antecedent interventions is it is preventative in nature,

meaning the problem behavior is less likely to occur during treatment (Stichter, Sasso, & Jolevette, 2004). Further, antecedent interventions are beneficial in that results are typically seen quickly and they help remediate the environment in which the problem is occurring, which also improves the degree in which the teacher can focus on instruction (Kern & Clarke, 2005).

Noncontingent Reinforcement

One type of antecedent intervention that has been shown to decrease problem behavior in students and is commonly used in educational settings is the use of noncontingent reinforcement (NCR) (Panahon & Martens, 2013). The standard definition of NCR is when a reinforcer determined by the function of a problem behavior is administered to an individual independent of the response (Carr et al, 2000). For example, if a functional behavior analysis determines the function of a behavior is teacher attention, the teacher administers attention to the student independently of behaviors, reducing the likelihood that the student will engage in the problem behavior in order to obtain teacher attention. NCR is also referred to as an antecedent intervention because reinforcement precedes the behavior, compared to acting as a consequence. NCR differs from other widely practiced methods of reinforcement such as differential reinforcement of other behaviors (DRO), in which reinforcement is contingent upon other behaviors, and withheld when undesirable behaviors occur (Lennox, Miltenberger, Spengler, & Erfanian, 1988). NCR has several benefits over DRO such as, the reduction of extinction-induced behavior, higher rates of reinforcement, and the ease in which NCR is implemented (Vollmer et al., 1993).

One complication of NCR is occasionally the reinforcer may be delivered after the target behavior, which may inadvertently reinforce the behavior one is attempting to reduce (Britton et al., 2000). However, Hagopian, Fisher, and Legacy (1994) found that a reinforcement schedule that is denser than the occurrence of the problem behavior might reduce the likelihood of this problem occurring. While the use of NCR may produce some complications it is still useful. For example, in

a study conducted by Butler and Luiselli (2007), noncontingent escape was provided to a thirteen-year-old girl with autism after a functional behavior analysis determined escape was the function of her problem behavior. The problem behavior was reduced when opportunities for escape were systematically provided, and a fading procedure was implemented in a step-wise fashion (Butler & Luiselli, 2007).

Fading Procedures

Because it is not always practical for teachers or behavioral therapists to intervene on a problem behavior for an extended period of time, a fading procedure would likely be a beneficial method to reduce the prompts back to baseline conditions without the problem behavior continuing to occur. Fading is referred to as the systematic removal of prompts in such a way that the discriminative stimulus (SD) elicits the targeted response (Ogletree & Oren, 2001). A bedtime fading procedure was demonstrated to be effective in reducing sleeping difficulties in children with Autism Spectrum Disorders (Kodak & Piazza, 2008). Further, compliance in the home was maintained after a systematic fading procedure reduced the number of high-probability requests in both a fifteen year-old boy and a fifteen year-old girl with developmental disabilities (Ducharme & Worling, 1994).

Fading procedures may also aid in the reduction of extinction bursts following the implementation of NCR as a behavioral intervention. Vollmer, Ringdhai, Roane, and Marcus (1997) discuss extinction bursts as a negative side effect of NCR. For example, when considering NCR, reinforcement is given that is not contingent on the problem behavior with the assumption access to reinforcement will reduce the likelihood of the problem behavior occurring. However, if that reinforcement is withheld, an extinction burst may occur because the individual has become accustomed to having access to reinforcement. In order to abate the impact of an extinction burst, a fading procedure may be implemented. Gross, Duhon, and Doerksen-Klopp (2014) were able to systematically fade the application of indiscriminable contingencies in order to maintain the treatment integrity of behavioral interventions implemented by teachers. The use of indiscriminable contingencies is a strategy that aids in the maintenance of the reduction of a problem behavior

because it becomes more difficult for the client to discriminate between the intervention phase and the fading or maintenance phase (Freeland & Noell, 2002).

Weber's Law

When a fading procedure is implemented it may be beneficial to fade reinforcement in a manner that makes it difficult for the subject to differentiate the gradual extinction of reinforcement, and fading techniques that utilize such procedures must be examined. Weber's Law of Just Noticeable Difference may be an efficient method to systematically reduce problem behavior when applied to a fading procedure ensuing a treatment phase. According to Britannica, Weber's Law is, "the change in a stimulus that will be just noticeable is a constant ratio of the original stimulus" ("Weber's Law," n.d.). In other words, the smallest amount of stimuli that is noticeable is proportional to the original stimuli. For example, if one is holding five pounds in one hand, and five and a quarter pounds in the other hand, it would be difficult to notice which hand was holding the heavier weight. In fact, it may not be noticeable at all. However, if one was holding five pounds in one hand, and fifty pounds in the other, it is very likely one would notice the difference in weight. Therefore, the noticeable difference in weight is a constant ratio of the initial weight.

While literature on the application of Weber's Law to applied behavior analysis and fading procedures does not exist, it has been examined within the context of tactile hand grasping. In a study conducted by Jazi and Heath (2014) participants were required to use their right hand to grasp differently sized objects place on their left forearm and palm, and estimate the difference of sizes in the objects. Just noticeable differences (JND) scores were calculated to determine if the noticeability of different sizes in the objects, and the estimation of size differences in the objects placed in the palm adhered to Weber's Law. In order to calculate JND, Weber's fraction is applied. Weber's fraction consists of the ratio JND (also known as the differential threshold) and the standard deviation of the magnitude of the examined stimuli (Grondin, Ouelett, & Rousell, 2001).

Current Study

The purpose of this study is to determine whether NCR is an effective method of reducing problem behaviors in schools, and if the application of Weber's Law of just noticeable difference can be effectively applied to a fading procedure to reduce problem behavior at baseline conditions. In other words, to obtain an acceptable reduction of problem behavior with the same conditions that existed before the intervention was implemented. In doing so we will have then altered the participant's behavior by changing their learning history. For example, if a student has a history of engaging in problem behavior in order to access teacher attention and has been receiving the desired attention contingent upon the problem behavior, even if it is in the form of negative attention, will providing the student with what is maintaining the problem behavior eliminate the need for the problem behavior to occur. The learned behavior of engaging in problem behavior and receiving reinforcement for such behavior will change after the implementation of NCR and fading procedure because the student will no longer require engagement in the problem behavior. Therefore, the research questions are the following:

1. Will the use of non-contingent reinforcement (an antecedent intervention) on a fixed interval schedule be effective in reducing problem behavior?

2. Can the intervention be faded systematically using Weber's Law to result in adequate responding at the same conditions that occurred before the intervention was implemented?

CHAPTER II

REVIEW OF LITERATURE

Antecedent Interventions

Definition of Antecedent Interventions

While the utility of antecedent interventions has been understood by behavioral researchers for some time and have been effectively utilized to reduce problem behavior, they have not been utilized as often as consequence-based interventions (Luiselli & Cameron, 1998). In comparison to consequence-based interventions, antecedent interventions are preventative in nature because they are intended to modify the environment so that problem behavior is less likely to occur (Luiselli & Murbach, 2002). Further advantages of antecedent interventions are that they are quick acting, correct deficient environments, bolster the instructional environment, and reduce the likelihood of harm or injury (Kern & Clarke, 2005). Two types of antecedent events can influence problem behavior: Discriminative stimuli (S^Ds) and establishing operations (EOs). The manipulation of these events aid in the implementation of an antecedent intervention (Miltenburger, 1998). An S^D is defined as, "a stimulus is the occasion upon which a response is followed by reinforcement" (Skinner, 1953, p. 108). In other words, a S^D is the cue that is provided that elicits a behavior that is then reinforced. An EO is defined as "an environmental event, operation, or stimulus condition that affects and organism momentarily altering the reinforcing effectiveness of other events or the frequency of occurrence of that organisms repertoire" (Michael, 1993). More succinctly, an EO is the condition of the environment that may reduce or increase the effectiveness of a reinforcer. Antecedent interventions are developed by

obtaining information through observations of environmental events that precede the problem behavior or are related to the desired behavior (Kern & Clemens, 2007). Along with EOs, motivating operations (MOs) are also relevant when considering antecedent interventions. MOs affect behavior because they contribute to how motivating a reinforcer may be to a subject in that specific setting (Laraway, Syncerski, Michael, & Poling, 2003). For example, on a very hot day water may be very reinforcing, however, if the subject has already had several glasses of water the water may not be as reinforcing. While the hot day may be an EO, the extent to which water will be reinforcing is the MO (Kruger et al., 2016). While the consideration of MOs in guiding intervention is in its infancy, taking MOs into consideration when combined with tactics, such as prompting, may aid in the formulation of antecedent intervention used for academic difficulties (Kruger et al., 2016).

Typically, a functional based assessment (FBA) is used to determine the function of the behavior and therefore create an appropriate intervention based on the function or functions of the behavior. Antecedent events such as S^Ds, EOs, and MOs are taken into consideration, as well as the consequences of the behavior that may act as a maintaining factor (Ingram, Lewis-Palmer, & Sugai, 2005). Finally all of the information (setting events, antecedents, behavior, and consequences) is organized into statements that hypothesize the function of the behavior and guide intervention (Ingram, Lewis-Palmer, & Sugai, 2005). Modifications are then made to the environment or preceding conditions that trigger the problem behavior in a way that aids in preventing the problem behavior from being implemented (Kern & Clemens, 2007). Some examples of antecedent interventions include: establishing clear expectations, increasing behavior specific praise, presenting material at students' instructional level, providing a high number of opportunities to respond, providing alternative methods to complete the task, and establishing a clear and predictable schedule (Kern & Clemens, 2007).

Review of Antecedent Intervention Literature

Antecedent interventions have been implemented across a broad variety of settings, behaviors, and populations. An antecedent intervention conducted by Luiselli & Murbach (1998), demonstrated the reduction in tantrum behavior of a five-year-old girl with developmental disabilities by placing novel staff members to work with her at the time tantrum behavior was most likely to occur, because an FBA demonstrated she was less likely to tantrum when novel staff members were present. An antecedent intervention that included environmental enrichment and a choice of materials was found to reduce repetitive behavior such as hand clapping and eye poking in a child diagnosed with Autism Spectrum Disorder (Hansen & Wadsworth, 2015). The manipulation of a classroom environment that included structuring leisure activities in a way in which the leisure activities include differential reinforcement of incompatible behavior, when the problem behavior consisted of a fifteen-year-old student with ASD consistently rearranging classroom objects, may also be perceived as an antecedent intervention (Sigafoos, Green, Payne, O'Reilly, & Guilio, 2009). Sometimes the development and implementation of antecedent interventions can be relatively simple. Work completion is a common problem across educational settings, and Stenhoff, Davey, and Lignugaris/Kraft (2008) demonstrated that when providing an antecedent intervention such as giving a choice between the completion of two assignments, work completion in a high school student with a learning disability increased compared to baseline levels of work completion.

Antecedent interventions can be applied to both individuals and groups and across settings. Chalk & Bizo (2004) implemented an antecedent intervention in which behavior specific praise was administered to four fourth grade classrooms at two different schools, which resulted in the increase of on-task behavior in all four classrooms. Antecedent interventions are also effective with academic behaviors. When an antecedent intervention (i.e., Listening Passage Preview) for increased reading fluency was implemented with six students, all six students reading fluency increased; further, when the antecedent intervention was paired in contingent reinforcement four of the six student's reading fluency increased compared to when the

antecedent intervention was implemented without contingent reinforcement (Eckert, Ardoin, Daly, & Martens, 2002). While antecedent intervention are commonly implemented with students in educational settings, antecedent intervention may also be implemented with adults with disabilities in work environments. A twenty-six-year-old female with an intellectual disability worked at a facility that employed adults with disabilities and was observed to be wetting her pants intentionally (Umbreit, 1997). After a functional assessment was conducted it was hypothesized that the function of her wetting herself was staff attention; therefore, staff attention was provided during break times when the behavior was most often occurring, and the problem behavior was eliminated (Umbreit, 1997).

FBAs are helpful in matching the correct interventions to an individual based on the function of their behavior that have the ability to maintain effectiveness over time. Kern et. al. (2006) found through the use of a three-year longitudinal study of a young boy with developmental disabilities that engaged in aggressive behavior, the antecedent intervention implemented based on a functional behavior assessment was effective in reducing aggressive behavior in all three years, aside from implementation lapses that were a result of illness.

Components of Functional Assessment

Most problem behavior is either an issue of behavior excess (aggression/disruption) or an issue of behavior deficits, (work completion) and determining the function of a behavior aids in determining which variables to manipulate in order for appropriate levels of behavior occurrence (Kruger et al., 2016). Functional assessments involve several strategies that identify antecedent and consequence events in order to determine the function of a behavior (Horner, 1994). Functional behavior analysis differs from functional behavior assessment because a functional assessment is based on several different strategies used to hypothesize the function of a behavior, while functional analysis relies on the systematic manipulation of the environment in order to experimentally determine hypothesized functions (Horner, 1994). Therefore, functional behavior

analysis is more experimental in nature than functional behavior assessments. Some forms of functional behavior assessments consist of the use of formal protocols that aid in the development of a hypothesis for the function of a behavior, as well as the use of direct observations that help determine antecedents and consequences of behavior in order to determine function (Lalli, Browder, Mace, & Brown, 1993). Functional assessments were first utilized to aid in intervention development for individuals with severe disabilities, however, their use have been extended to be applied to individuals displaying behavior difficulties (Reed, Thomas, Sprague, & Horner, 1997). Moreover, functional assessment can be useful for the development of intervention in general education settings. Based on data from assessment, Lewis and Sugai (1996) hypothesized the function of a student's behavior in the general education classroom was maintained by peer attention, and that hypothesis was confirmed during a function-based intervention that consisted of the student receiving high rates of peer attention contingent on student's on-task behavior. Within educational settings, the most common functions of problem behavior consist of: teacher attention, peer attention, and escape from academic demands (Broussard & Northup, 1995).

Direct Observation

Direct observations serve several purposes in an educational setting such as, assessing academic and behavioral problems, monitoring student behavior over time, and aiding in the determination of behavioral function (Thompson, Felce, & Symons, 2000). When conducting a direct observation, it is important to note that observations should only be conducted on behaviors that can be directly measured and counted (Lewis, Scott, Wheby, & Wills, 2014). It is necessary to clearly and systematically define behavior before conducting a direct observation. Operational definitions of behavior clear up any ambiguity of the observed behavior by explicitly defining the behavior that is to be observed. For example, an operational definition of the aggressive behavior of an institutionalized adult male was, "striking another person once or another object more than once" (Montgomery, 1993).

Several strategies of direct observation may be utilized, however, when assessing the function of a problem behavior two strategies for conducting a direct observation are typically used: event-based observations and interval-based observations (Sticher, Lewis, Johnson, & Trussel, 2004). Within event-based observations the observer may observe using an event-recording strategy or duration-recording strategy. Event-recoding strategies (also referred to as a frequency count) tally the amount of incidents a behavior occurs within a given time frame, while duration recoding records the amount of time the student engages in the target behavior (Sticher, Lewis, Johnson, & Trussel, 2004). Within interval-based observation several types of interval recording may be used, and the decision to use a certain interval recording strategy depends on the target behavior and setting being observed. Interval observation strategies include: whole interval recording, partial interval recording, and momentary time sampling (Alberto & Troutman, 2013). Whole interval recoding involves recording if the target behavior occurs during the entirety of each interval observed, partial interval recording involves recording whether the observations occurs at all during any part of the intervals observed, and momentary time sampling involves whether or not the behavior occurs at the end of each interval observed (Alberto & Troutman, 2013).

Interviews

While interviews may be an indirect method of obtaining data, they have their benefits within a functional behavioral assessment. Interviews and rating scales have become increasing more common methods of obtaining data pertaining to behavior because they can easily be administered to teachers, caregivers, and students (McIntosh et al., 2008). Student interviews are also a beneficial aspects within the interview process for a functional assessment. When students are included in the interview process the examiner may gain higher quality of information, a larger range of information, and more effective support plans (Kern, Dunlap, Clarke, & Childs, 1995). Rating scales can be useful when the assessor does not know much about the student prior to the FBA, and several standardized rating forms are available to psychologists to further

evaluate specific problem behaviors such as self-injurious behavior, aggressive and destructive behavior, and stereotypic behavior (Zaja, Moore, Ingen, & Rojahn, 2011). However, one caution regarding the use of interviews and rating scales is that the information may sometimes be biased. However, when analyzed objectively, they still may yield useful information because they informants are exposed to a larger range of settings and situations in which behavior may occur (McIntosh et al., 2008).

Record Reviews

While the review of records may seem tedious, it is an essential aspect of conducting a functional assessment (Gable & Hendrickson, 1995). For example, the review of a student's office referral forms may aid in the indication of the function of a problem behavior through analysis of the setting, type of problem behavior, and if other peers or staff were involved. Another aspect of a record review that may sometimes be overlooked is the review of academic data such as universal screeners and academic progress monitoring data, if it is available. Reviewing such data may shed light on an academic deficit that contributes to the target behavior, such as the student does not understand the assignment or perhaps is more advanced than other students and becomes bored, then consequentially engages in a problem behavior (Sutherland & Singh, 2004). After a thorough review of records such as office discipline referrals and previous school records, as well as direct observations, Radford and Ervin (2002), were able to hypothesize the function of a thirteen-year-old boy's aggressive behavior because they were able to determine from records that his aggressive behavior usually occurred during unstructured activities and when he had negative interactions with peers. They were then able to put in place an appropriate intervention based on their hypothesis.

Functional Analysis

Because functional assessments do not explicitly manipulate the environment and are not experimental in nature, only a general hypothesis of the function of a behavior can be determined.

Sometimes when a behavior analyst is experiencing time constraints or does not have the proper resources to conduct a functional behavior analysis, or the functional assessment provides a strong hypotheses for the function of a problem behavior, a functional assessment may be sufficient for planning a behavioral intervention. However, if a functional assessment does not yield a strong hypothesis, a functional analysis may be necessary to determine the function of a problem behavior. Through the use of a functional analysis Buszinska and Wojcik (2010) were able to determine the function of a four-year-old autistic child's problems with speech difficulties and found that the use of selected speech was a necessary component to incorporate into the intervention. When exposed to several conditions (time alone, attention, access to preferred music, opportunity to escape, and opportunity for free play), several hypotheses of self-injurious behavior in a twelve-year-old boy with cognitive deficits were tested when functional analysis was conducted for a minimum of three sessions a week over a twelve week period (Carey & Halle, 2002). It was then determined that the student's self-injurious behavior was in response to task demand and was maintained by escape, and the examiners were therefore able to successfully implement an appropriate escape-contingent intervention (Carey & Halle, 2002). Sometimes behaviors do not occur at a rate that is easily observed in a naturalistic setting even though the behavior is destructive. Therefore, functional assessments may not be the most efficient method in obtaining data related to the problem behavior, and experimental manipulation may aid in a more time efficient methods of obtaining the function of a problem behavior that is occurring at low rates. Tarbox, Wallace, Tarbox, Landaburu, and Williams (2004) found that in order to assess the function of low rate destructive behavior, it is beneficial to modify a traditional functional analysis by initiating sessions of functional analysis contingent upon the occurrence of the target behavior. Because the use of functional analysis has become more widely used across settings and within diverse populations, the process of conducting a functional analysis sometimes may be altered (Edwards, Magee, & Ellis, 2002). A functional analysis of a ten-year-old boy with Attention Deficit Hyperactivity Disorder (ADHD) and

Emotional Disturbance (ED) that engaged in destruction of property, off-task behavior, and physical aggression was conducted by using standard protocols; however, the student engaged in aggressive behavior after the examiner would try to remove task demand (worksheets) which is not a typical response (Edwards, Magee, & Ellis, 2002). The examiners then had to modify their functional analysis by administering verbal tasks such as answers to multiplication tables and spelling words instead of a physical task demand, which implied the function of the behavior was escape maintained (Edwards, Magee, & Ellis, 2002).

Noncontingent Reinforcement

Definition of Noncontingent Reinforcement

Sometimes viewed as a manipulation of EOs, NCR is reinforcement based on the function of a problem behavior delivered to an individual. The reinforcement is not dependent on the individual's behavior, which in turn reduces the problem behavior because the individual no longer engages in inappropriate behavior in order to access the reinforcer (Carr et al., 2000). NCR is most effective when the reinforcer identified in the FBA matches the reinforcer that is provided during the implementation on NCR (Austin & Soeda, 2008). Several processes, such as extinction and satiation/habituation, can be used in order to decrease inappropriate behavior after the use of NCR (Holden, 2005). Extinction is used because the contingency between the response and the consequence is removed, and satiation/habituation because when a reinforcer is repeatedly presented may reduce the reinforcing effect (Holden, 2005). Further, the likelihood that responses elicited as a result the deprivation of reinforcement is removed (Michael, 1993). Fischer et al. (1999) suggests the matching theory may be another process NCR utilizes. This theory suggests NCR works because the individual receives effortless reinforcement, however if the reinforcement is not available the probability of problem behavior increases due to the fact that the individual needs to act out in order to obtain reinforcement (Holden, 2005).

NCR is often implemented on fixed or variable time schedules, and the reduction of problem behavior is more likely to occur when the schedule of NCR is frequent (Perez-Gonzalez, 2005). Some benefits of NCR include the ease of implementation, the effectiveness of reducing problem behavior, and the fact that less side effects are evident that when other behavioral interventions are implemented that are declarative in nature (Linberg, Iwata, Roscoe, Worsdell, & Hanley, 2003). In fact, because of the ease of implementation, teachers and staff may be more likely to deliver NCR with fidelity and integrity (Tucker, Sigafoos, & Bushell, 1998).

Schedules of NCR

Effective schedules of reinforcement disperse positive reinforcement intermittently (MacDonald, Ahearn, Parry-Cruwys, Bandcroft, & Dube, 2013). The two types of intermittent schedules of reinforcement are interval schedules which are based on the amount of time that has passed since the last reinforcement was delivered, and ratio schedules which are based on the number of responses necessary to receive reinforcement (Wolery, Bailey, Sugai, 1998). For interval and ratio schedules, fixed and variable schedules may be implemented. Fixed-interval schedules allocate a rule for the presentation of a reinforcer based on a constant amount of time, while the schedule of reinforcement for a variable schedule varies but averages out at a specific number (Wolery, Bailey, Sugai, 1998).

When implementing NCR, schedules of reinforcement are often provided continuously or in dense schedules (reinforcement is given very often and in short intervals; Lalli, Casey, & Kates, 1997). Marcus and Vollmer (1996) found that a fixed-interval schedule is compatible with NCR, and problem behavior in the form of tantrums in a five-year-old diagnosed with autism was reduced during the intervals that reinforcement was not provided. When rats were provided cocaine noncontingently by the experimenter through a catheter on a fixed interval schedule of 15 minutes, the rats were less likely to seek cocaine (by pushing a red lever) than if they did not receive noncontingent cocaine when the dose was similar to or higher than the treatment dose (Markou, Mercedes, & Everitt, 1999). However, when the noncontingent dose was less than the

treatment does, drug-seeking behavior increased (Markou, Mercedes, & Everitt, 1999). This demonstrates that the dosage of reinforcement is an important consideration to make, and may not be as effective if the level of reinforcement is not as strong as when the behavior was maintained.

Dense schedules of reinforcement may be more difficult to implement because they require reinforcement at quicker rates. Hagopian, Fischer, & Legacy (1994) questioned if a leaner schedule of reinforcement (reinforcement delivered every five minutes) was as effective as denser schedules of reinforcement (reinforcement delivered every 10 seconds) in reducing attention maintained destructive behavior in identical quadruplets diagnosed with intellectual disabilities and pervasive developmental disorder. They found that denser schedules on fixed-intervals were more effective in reducing the destructive behavior almost immediately, and the leaner schedules of reinforcement on fixed-intervals was only effective after a systematic fading procedure was implemented.

Sometimes schedules of NCR are based on practicality and need. Staff at a personal care residence based their schedule of NCR in the form of social attention of the frequency of the behavior (several times an hour) and the shortest interval they felt was logistically possible for their staff to adhere too; therefore, NCR was delivered on 20-minute intervals and was eventually faded to 30-minute intervals (Yury, 2011). The setting and resources where NCR will occur may guide schedules of NCR based on the availability of staff the type of reinforcement given (Tucker, Sigafoos, & Bushell, 1998).

Review of Noncontingent Reinforcement Literature

NCR on a fixed-time schedule has been found to be more effective than other procedures such as extinction (Vollmer et al., 1998). Nolan and Filter (2012) found that when NCR is paired with response cost (RC) both verbal and physical problem behavior within a school setting in an internationally adopted student diagnosed with ADHD was reduced. Further, Jones, Drew, and Weber (2000) were able to reduce disruptive behavior exhibited by an eight-year-old boy

diagnosed with ADHD after noncontingent attention was administered, when peer attention was found to be the function of the problem behavior based on a functional analysis. The class the boy was in was given 30 seconds to play with other peers in 90 second intervals, and the student assigned to play with the boy was told to ignore his disruptive behavior (Weber, 2000). The implementation of NCR reduced the boy's occurrences of disruptive behavior when minute-by-minute sessions were recorded (Weber, 2000).

NCR may also be applied to adults that exhibit a problematic behavior. When staff attention was found to be the function of attention in a forty-six year-old man with moderate intellectual disabilities, social attention was delivered on a fixed-time schedule of 90, 60, or 30 seconds and all bizarre speech was ignored by the experimenter, the problem behavior was reduced to little or no occurrences during the implementation of the intervention (Mace & Lalli, 1991). Moreover, when several highly preferred stimuli were offered noncontingently to two adults living in residential facilities, self-injurious behavior was reduced in both individuals; however, when the reinforcement was delivered contingent on self-injurious behavior the problem behavior was not suppressed (Fischer, Iwata, & Mazaleki, 1997).

Some experiments compare the effectiveness of NCR to other behavioral interventions. When sensory extinction was compared to NCR to reduce self-injurious behavior in three children with developmental disabilities, both interventions were effective in reducing self-injurious behavior, but self-injurious behavior was reduced at a more rapid rate when NCR that consisted of noncontingent access to preferred items was implemented compared to when protective gloves were worn by the participants (Roscoe, Iwata, & Goh, 1998). When compared to other methods of reinforcement, NCR was found to as effective at reducing self-injurious behavior maintained by social attention as differential reinforcement of other behavior (DRO); however, NCR was reported to be easier to implement and provided higher rates of reinforcement than DRO (Vollmer et al., 1993). Allison, Wilder, Chong, and Lugo (2012) also found NCR as

effective as DRO in reducing food selectivity in a child with autism. Further, when social validity was analyzed the caregiver of the child indicated a preference of NCR compared to DRO (Allison, Wilder, Chong, & Lugo, 2012).

One criticism of NCR is that is does not teach appropriate replacement behaviors (Mildon, Moore, & Dickson, 2004). When combining NCR with functional communication training and superimposing functional communication training on to the NCR intervention, Mildon, Moore, and Dickson (2004) were able to lower disruptive behavior in a student to rates near zero. All individuals are different and the manifestations of their problem behaviors as well the function of their behaviors differ, so while NCR may work alone for some individuals, it may not always be the case for all individuals. Because NCR is so easy to administer, an interning teacher was able to provide NCR in the form of escape that consisted of three-minute breaks from class on fixed-interval schedule (Moore, Robinson, Coleman, Cihak, & Park, 2016). Although NCR was also paired with reinforcement of a daily choice of escape activities, the interning teach was able to successfully increase time on-task and reduce disruptive behavior in the classroom (Moore, Robinson, Coleman, Cihak, & Park, 2016).

Fading Strategies

Definition of Fading Strategies

Fading strategies involve controlling for a prompt or reinforcement in the initial stages of intervention, and then systematically reducing the prompt or reinforcement (Wolery, Bailey, Sugai, 1998). The most beneficial aspect of the utilization of a fading strategy is that the participant in the intervention does not become dependent on a prompt or reinforcement when acquiring a new skill (Cooper, Heron, & Heward, 2007). Fading strategies can be applied to many types of interventions including interventions that utilize various forms of reinforcement or prompts. One type of fading strategy is called stimulus fading. Stimulus fading is when a physical aspect of a relevant stimulus is exaggerated in order to elicit the correct response, and then the

exaggerated features of the stimulus are gradually reduced (Macduff, Krantz, & McClannahan, 2001). One example of this strategy is when teachers trained a child with a developmental disability to iron clothes. The teacher would start with a very obviously wrinkled shirt for the child to iron, and then slowly decrease the amount of visible wrinkles (Macduff, Krantz, & McClannahan, 2001). While some fading strategies rely on altering the physical prompt given for learning, others rely on the systematic removal of reinforcing stimuli. For example, an intervention for a child who had selective mutism was established by allowing a stranger to administer task items to the child, while the presence of the child's mother (the reinforcer) was slowly removed until the child could appropriately engage with the stranger (Wulbert, Nyman, Snow, & Owen, 1973).

Implementation of Fading Strategies

Initially, schedules of reinforcement should be denser than the schedule of reinforcement that maintained the problem behavior (Hagopian, Fischer, & Legacy, 1994). However, dense schedules of reinforcement are not always practical in applied settings, such as school classrooms. Therefore, it may be beneficial to fade the schedule of reinforcement until the behavior reaches a socially appropriate level. This ensures that the beneficial results of the intervention are maintained throughout time. However, determining the schedule of reinforcement for a fading procedure may be complicated because the effectiveness of a leaner schedule of reinforcement may depend on the rate the reinforcement is scheduled (Tucker, Sigafoos, & Bushell, 1998).

Fading procedures are also utilized with children who have behavioral difficulties with eating and drinking. Hagopian, Farrell, & Amari (1996) were able to successfully increase consumption of water using a fading procedure that gradually increased the water given in a twelve-year-old boy with autism spectrum disorder and severe gastrointestinal problems who was completely refusing food and water. Fading procedures may also aid in the intervention of

children who have problems with selective eating. Barahona, Dubard, Luiselli, and Kesterson (2013) found with an intervention implemented eighteen-year-old female student with Autism Spectrum Disorder (ASD) that had trouble eating the necessary amount of food and the necessary variety of food, a fading procedure that gradually increased novel food into preferred food combined with a visual schedule of the meal, was effective in rapidly normalizing her feeding behavior within a school setting.

One method of fading sometimes used with children who display difficulties interacting with others is script fading. Krantz & McClannahan (1993) developed a social script to initiate conversation in four children diagnosed with autism spectrum disorder with peers and successfully faded the script in five steps by reducing the number of scripted social initiations, and as the script was faded, initiations of social engagement increased. Script fading may also be implemented in settings outside of educational settings. Brown, Krantz, McClannahan, and Poulson (2008) implemented a script fading procedure during stimulated shopping trips with three children with autism. The children were taught social scripts for things to say within certain situations at a grocery store, upon appropriate reciting the scripts were faded from the last word to the first word (Brown, Krantz, McClannahan, & Poulson, 2008). Consequentially, the children were then able to generalize their newly acquired skills in local grocery stores and other retail outlets (Brown, Krantz, McClannahan, & Poulson, 2008). Further, researchers are beginning to consider the use of script fading for learning activities on computers (Bouyias, Y. & Stavros, D., 2012). However, when compared to script fading on a computer that consisted of fading of scripts based on student's responses alone to fading on a computer combined with peer monitoring, the combination intervention was more effective in the development of academic skills (Bouyias, Y. & Stavros, D., 2012). This may be due to the fact that the peer monitoring was more reinforcing to the students than the computer automated script prompts.

While fading strategies are implemented in a variety of settings, Milan, Mitchell, Berger, & Pierson (1981) were able to implement a fading procedure for bedtime behaviors in a child with ASD. When paired with a Positive Routine and verbal praise after each component of the Positive Routine, Milan, Mitchell, Berger, & Pierson (1981) were able to reduce severe tantrums and achieve a desired bedtime in three emotionally disturbed handicapped students by fading the procedure until the time of the desired bedtime. An intervention that included prompts, social reinforcement, and pictorial feedback to increase the recreational behavior in mentally retarded children was successfully faded after the gradual removal of prompts and feedback; moreover, following the fading procedure there was no decrease in recreational play in the children (Katz & Singh, 1986).

Weber's Law

Weber's Law has been found to be valid across many realms of stimulus perception in humans (Stevens, 1975). However, the most typically referred example of Weber's Law is when college students hypothesizes the weights of objects that were the same in size, but differed in weight (Oberlin, 1936). The students were less confident in their hypothesis of the weight difference in the objects as the objects became heavier (Oberlin, 1936). Kacelnik & Fausto (1998) were able to predict risk-taking behaviors in non-human animals and humans after applying Weber's Law to the representation of time intervals and the amount of food given to participants. Upon the application of Weber's Law, scientists have found that change in a stimulus is detected more easily when the baseline level of the stimulus are small (Redelmeier & Dickinson, 2011). Further, when levels of stimulus are high a large change in the stimulus must occur for a difference to be detected; however, when levels of stimulation are low a small change in stimulus may be easily detected (Snell, Gibbs, & Varey, 1995) For example, a loss of 10 kilograms in a human weighing 70 kilograms is easier to perceive than the weight loss of 10 kilograms in a human weighing 170 kilograms (Redelmeier & Dickinson, 2011). In an experiment conducted by Sargisson and White (2007), when pigeons were training in a timing

procedure that consisted of reinforcement of long and short delays of pecking a key, it was found that generalization was in accordance with Weber's Law and generalization was greater with longer delays than shorter delays.

While Weber's Law has often been applied in the field of psychophysics, it has also been applied in the field of marketing. Research in the area of marketing suggests demand for goods and services typically fall above or below critical price points (Monroe, 1973). When Weber's Law was applied to price discrimination of various goods when tested with housewives, Weber's Law held in a similar manner as with sensory stimuli (Miller, 1981). Zarrel (1978) examined differential thresholds (the smallest detectable difference) based on Weber's Law at three prices that ranged from twenty-eight cents to 150 dollars when applied to soap, hairdryers, and bicycles and found the differential thresholds did exist and larger perception of prices were more easily detected than smaller ones. Snell, Gibbs, and Varey (1995) surveyed undergraduate participants and found Weber's Law to be exhibited within the participants when they were given scenarios that involved winning the lottery, car repair, calculators, candy bars, and vacations. The participants were asked to make decisions such as saving five dollars on a twenty-dollar calculator compared to a one-hundred-dollar calculator, and the students upheld Weber's Law (Snell, Gibbs, & Varey).

The Weber Fraction

In order to fully understand Weber's Law, one must apply the Weber fraction to the examined stimuli. The Weber fraction consists of the difference threshold in discrimination and the magnitude of the examined stimuli, and if this ratio remains constant this Weber's Law has been reported to remain valid (Grondin, 2001). In other words, the ratio consists of the difference threshold on the standard deviation (Grondin, Ouelett, & Rousell, 2001). Further, the Weber fraction has been applied to the field of time perception and has been reported to be valid in generalized forms of Weber's Law (Killeen & Weiss, 1987). When interval timing is applied to

Weber's Law, the coefficient of variation is also held constant; this phenomenon is also referred to as scalar timing (Gibbon, 1977).

When calculating for Weber's fraction by training pigeons to discriminate the duration of a stimulus, Stubb (1968) found the fraction to equal 0.25 as the measure of just noticeable difference. Further, Perikel, Richelle, and Maurissen (1974) found pigeons were able to discriminate between ten second durations from one, five, and six second durations when a frequency equal to or less than .25 was utilized as the criterion. Also, Yamashita (1986) obtained the value of .25 for Weber's fraction when pigeons were trained to discriminate durations ranging from .25 seconds to 1 second. However, Getty (1975) obtained the value of 0.05 as the Weber fraction when applying it to humans. Alternatively, Guay and Salmoni (1988) found Weber's fraction to equal 14.5% when 10 undergraduate students attempted to discriminate between estimation of the duration of light on a switchboard ranging between one and nine seconds. It must be noted that the results of the calculation of Weber's fraction may vary with different durations, the application of Weber's fraction to humans, and different procedures to arrive at Weber's fraction (Stubb, 1968).

CHAPTER III

METHODOLOGY

Participants and Setting

Three participants were selected from a rural school district in the South-Central United States. Students that who were referred to the school's multidisciplinary data team for behavioral concerns were selected for consideration. On the school's office discipline referral forms, teachers had the opportunity to note the perceived function of the problem behavior. Three students with high rates of disruptive behavior and a perceived function of teacher attention were selected to participate in the study. FBA's were conducted to verify the function of disruptive behavior in the classroom was teacher attention. Participant 1 was a Native American male in the fourth grade taught by Teacher A. Participant 2 was a Native American female in the fourth grade also taught by Teacher A. Participant 3 was a Caucasian male in the fifth grade taught by Teacher B. Each session lasted fifteen minutes and two sessions occurred per day. Participants 1 and Participants 2 were both in Teacher A's class at the same time. However, treatment sessions were individually administered to Participant 1 and Participant 2 by Teacher A. Each participant received an individual treatment session in the morning, and an individual treatment session in the afternoon (two individual sessions per participant per day). Further, baseline and treatment conditions for Participant 1 and Participant 2 were independent from each other. Conditions for Teacher A can be found in Figure-4. The procedure of the study was explained to the participants' teachers, parents, and the school principal. Informed consent was obtained from the

parents of all three participants. The participants remained blind to the study in order to maintain the integrity of the study, therefore assent was not obtained from the participants. The primary investigator of the study acted as an external consultant for the teachers participating in the study. One session occurred in the morning and a second session occurred in the afternoon. Classroom activities that were occurring during the sessions included classroom instruction and independent seat work.

Materials

Materials included a Motivator device that was obtained from habitchange.com and quietly pulsated to mark the fixed-interval in which the teachers were to provide teacher attention. The Motivator device weighed three ounces and included a belt clip that allowed the teacher to discretely attach the device to their waist. The primary investigator utilized a timer to indicate the length of each session, as well as a cellular phone application that also marked the fixed-interval schedule in order to determine treatment fidelity. Teachers were provided with a document that included examples that could be used for providing teacher attention (see Appendix 1). A password protected Macbook Pro was utilized to record each session. An excel sheet was provided to secondary investigator to record inter-rater reliability that can be found in Appendix 3.

Dependent Variable

The dependent variable was the problem behavior exhibited by the participants. For all three participants, the problem behavior targeted was disruptive behavior in the classroom. Disruptive behavior was operationally defined as: talking to peers when not assigned to do so, asking for the teacher without raising hand, speaking out of turn without raising hand, making noise with mouth, banging desks or other classroom supplies and furniture, and dancing (defined as moving body including hips). Some of the behaviors defined were specific to individual participants. For example, dancing was specific to Participant 1 while banging classroom supplies and furniture was specific to Participant 3. Behaviors that were not included as disruptive were:

answering an open ended question asked to the class by the teacher without raising a hand or talking to the teacher when the teacher was at their desk providing noncontingent attention (treatment) or instructional aid for seatwork. Operational definitions were included on the inter-rater instructions sheet that is included in Appendix 2. Analysis of the problem behavior was conducted through the use of a frequency count, which is a total of the occurrence of the behavior within a given observation period.

Independent Variables

The independent variable was noncontingent teacher attention given by the teacher on a fixed-interval schedule. The fixed-interval schedule was determined by calculating the mean inter-response time of three baseline sessions and then was systematically faded based on Weber's Law of Just Noticeable Difference. Teacher attention included: walking by the participant's desk and putting a hand on the participant's shoulder, asking the student if they were understanding the classwork, providing positive feedback such as "good job" and "keep it up."

Experimental Design

In this study, a withdrawal design with nested changing criterion was utilized. The study consisted of A, B, A, B, C phases. The treatment phase consisted of A, B, A ,B phases. Phase A was the baseline data, which is the target behavior of the participant that has not been manipulated by the teacher. Phase B consisted of the teachers delivering NCR on a fixed-interval schedule. Experimental control is evident in the replication of baseline and treatment conditions. Phase C consisted of the fading procedure and withdrawal design based on nested changing criterion. The withdrawal condition was the systematic withdrawal of time the teacher granted NCR. The nested changing criterion was based on the application of Weber's Law.

Procedures

Permission to carry out the study was solicited through the Oklahoma State University Institutional Review Board (IRB) and the school district the participants reside in. The IRB

obtained from Oklahoma State University, as well as the consent forms issued to the parents can be found in the Appendices. Baseline data were collected using a frequency count of operationally defined problem behavior. A functional behavior assessment was conducted to verify the perceived function of the problem behavior with each participant. Results of the functional behavior assessment indicated the function of all three participants' disruptive behavior was maintained by teacher attention. Baseline data were collected in the classroom during three sessions. The primary investigator conducted three observations of the frequency of the problem behavior in each classroom, and a team of graduate students from Oklahoma State University observed a video recording of baseline sessions to determine inter-observer agreement.

Procedural Integrity

Treatment fidelity was measured during all phases and sessions by the primary investigator. During the baseline sessions, no action taken by the teacher was necessary. During the treatment and fading phases, the teacher was trained to deliver teacher attention each time the Motivator device pulsated. The primary investigator set the fixed-interval time on the Motivator device prior to each session. The primary investigator had a timer on a mobile device that was started after the first occurrence of teacher attention was provided, assuring the teacher and primary investigators devices were synchronized. The primary investigator recorded the number of times the device was set to pulsate and the teacher failed to provide teacher attention to the participant. The primary investigator consulted with the teacher and provided additional training when procedural integrity fell below 100%.

Inter-rater Reliability

Inter-observer agreement was measured by a team of graduate students at Oklahoma State University. Because the school district was over an hour away from university, the graduate students were unable to commute to the site in order to conduct in-vivo inter-observer agreement. Therefore, after consent from the principal of the school, the teachers, and the parents of all the

students in the class (including the parents of the participants) was obtained, each session was filmed on a Macbook Pro. The graduate team conducted inter-observer agreement by reviewing the video of the sessions the primary investigator provided and recorded the frequency of disruptive on the document found in Appendix 3. Inter-observer agreement was measured during 36% of the sessions for Participant 1, 33% of the sessions for Participant 2, and 31% of the sessions for Participant 3. Inter-observer agreement was calculated by comparing the frequency of the disruptive behavior recorded by the primary investigator, and the frequency of the disruptive behavior recorded by the research team member. Inter-observer agreement did not fall below 80% for any session observed. A table demonstrating inter-observer agreement for each participant can be found at Table 1.

Treatment Phase

The fixed interval time schedule was determined by the mean inter-response time of three baseline sessions for each student; Participant 1 (41 seconds), Participant 2 (45 seconds), and Participant 3 (42 seconds). The fixed interval time schedule for each participant can be found on Table 2. The primary investigator set the appropriate time based on inter-response times collected during the baseline phase on Motivator device. Inter-response times are the times between the end of each problem behavior and the beginning of the next. The teachers placed the Motivator device on their clothes and every time it pulsated the teacher granted NCR in the form of teacher attention. NCR in the form of teacher attention consisted of small gestures such as a hand on the shoulder, a smile, asking how the student is doing, and giving the students compliments. Examples of noncontingent attention that were provided to the teachers can be found on Appendix-1. However, if the student did engage in problem behavior, the teacher did not respond to the behavior. All sessions were recorded on video by the primary investigator for purposes of inter-observer agreement.

Fading Procedure

Inter-response times collected during baseline conditions were applied to Weber's fraction to determine the fading schedule, which was suggested by the literature to be 25% (Stubb, 1988; Perikel, Richelle, & Maurissen, 1974; Yamashita, 1986). The average rate of reinforcement given to the participants during baseline sessions was used to determine normalcy within the classroom. The fading procedure consisted of several phases that depended on the application on Weber's Law to the frequency of attention given at baseline conditions, which was determined by taking the median inter-response rate during observation settings, with each phase slightly increasing by 25% the amount of time that elapsed between each NCR given. Based on Weber's Law of JND, the interval of time the teacher grants NCR in the form of attention was systematically increased by 25% once sufficient stability, level, and trend were determined. All sessions were recorded by the primary investigator for purposes of inter-observer agreement. Upon the completion of the fading phases, the Teacher A was administering reinforcement at the average rate she was administering it to Participant 1 and Participant 2 prior to the treatment phase (M = 94s; M = 112s). Therefore, Teacher A was treating the participants in the same manner they were prior to the implementation of the treatment phase. Due to lack of procedural integrity from Teacher B, treatment for Participant 3 was discontinued.

Data Analysis

The data collected was analyzed visually. Once a stable level and trend was observed, the next phase was implemented. Level stability was determined by analyzing the amount of variability among the data points; if variability appears to be low then the data is considered to have a stable level (Gast & Spriggs, 2014). A general rule for the visual analysis of level stability is if 80% of the data points fall within a 25% range of the median level of the data (Gast & Sprigss, 2014). Trend was also considered during visual analysis of the data. Trend refers to the slope of the data, and the trend can either increase of decrease over time (Gast & Spriggs, 2014).

CHAPTER IV

FINDINGS

Procedural Integrity

Procedural integrity was 97% (ranging from 81% - 100%) for Teacher A (Participant 1 and Participant 2) for a total of 48 sessions. When procedural integrity fell below 100%, Teacher A was experiencing an interruption such as another staff member at the door. Procedural integrity was 43% (ranging from 10% - 67%) for Teacher B (Participant 3) for a total of 11 sessions. The primary investigator consulted with Teacher B after the sessions and provided additional training for the intervention implementation. However, procedural integrity continued to remain low. Teacher B stated she did not feel comfortable providing Participant 3 with positive reinforcement, and mentioned providing attention in form of "good job" felt unnatural.

Inter-rater Reliability

Table 1 represents inter-observer agreement results for each participant. Inter-observer agreement for the frequency of disruptive behavior ranged from 80% to 100% for all three participants. The mean Inter-observer agreement was 89% for Participant 1, and 90% for Participant 2, and 86% for Participant 3

Noncontingent Reinforcement

Participant 1 and Participant 2 were fourth grade students attending Teacher A's class simultaneously, and Participant 3 was a fifth grade student in Teacher B's class and never attended Teacher A's classroom. While Participant 1 and Participant 2 were members of the same classroom, Teacher A administered each treatment session independently for each participant.

Independent baseline and treatment conditions were established to prevent the generalizability of noncontingent teacher attention from Participant 1 to Participant 2. Conditions for baseline and treatment sessions for Teacher A can be found in Figure 4.

Participant 1. The treatment phases consisted of Teacher A providing Participant 1 with noncontingent attention on a fixed-interval interval schedule every 41 seconds. The fixed-interval schedule was determined by calculating the mean inter-response times of three baseline sessions. Visual analysis indicated the frequency of disruptive behavior decreased from baseline conditions in first treatment phase. Reversal to baseline conditions resulted in an increase of disruptive behavior slightly higher than levels present in the initial baseline phase. Further, disruptive behavior decreased to similar levels that were present in the initial treatment during the second treatment phase.

Participant 2. The treatment phases consisted of Teacher A providing Participant 2 with noncontingent attention on a fixed-interval interval schedule every 45 seconds. The fixed-interval schedule was determined by calculating the mean inter-response times of three baseline sessions. Visual analysis indicated the frequency of disruptive behavior decreased from baseline conditions in first treatment phase. Reversal to baseline conditions resulted in an increase of disruptive behavior similar to levels present in the initial baseline phase. Further, disruptive behavior decreased to similar levels that were present in the initial treatment during the second treatment phase.

Participant 3. The treatment phases consisted of Teacher B providing Participant 3 with noncontingent attention on a fixed-interval interval schedule every 42 seconds. The fixed-interval schedule was determined by calculating the mean inter-response times of three baseline sessions. Excluding an outlier that occurred at session 6, visual analysis indicated a slow decrease from baseline conditions during sessions 7 through 9 during the treatment phase. However, levels in the treatment phase were similar to those present in baseline conditions.

Fading

Participant 1. A fading procedure was the applied to a fixed-interval schedule of teacher attention. The frequency Teacher A provided Participant 1 with attention was recorded during three baseline sessions (M = 94s) and was utilized to determine normalcy. Each fading phase systematically increased the amount of time between occurrences teacher attention by 25%. The first fading phase consisted of Teacher A providing attention to Participant 1 every 51 seconds, the second phase every 64 seconds, the third phase every 80 seconds, and the fourth phase every 100 seconds. Each fading phase consisted of two 15 minute sessions per day. Visual analysis indicated the third and fourth fading sessions demonstrated an increase of the frequency of disruptive behavior at the first data points; however, levels stabilized in the following sessions of the fading phases. Visual analysis indicated the first and second fading sessions demonstrated levels stable levels throughout the fading sessions.

Participant 2. A fading procedure was the applied to a fixed-interval schedule of teacher attention. The frequency Teacher A provided Participant 2 with attention was recorded during three baseline sessions (M = 112s) and was utilized to determine normalcy. Each fading phase systematically increased the amount of time between occurrences teacher attention by 25%. The first fading phase consisted of Teacher A providing attention to Participant 2 every 56 seconds, the second phase every 70 seconds, the third phase every 88 seconds, and the fourth phase every 110 seconds. Each fading phase consisted of two 15 minute sessions per day. Visual analysis indicated the third and fourth fading sessions demonstrated an increase of the frequency of disruptive behavior at the first data points; however, levels stabilized in the following sessions of the fading phases. Visual analysis indicated the first and second fading sessions demonstrated levels stable levels throughout the fading sessions.

Participant 3. A fading procedure was not implemented because the treatment session did not produce a sufficient reduction of disruptive behavior. Procedural integrity for Participant 3

ranged from 10% - 67%, indicating Participant 3 was not receiving the recommended amount of noncontingent teacher attention to warrant satisfactory results.

CHAPTER V

CONCLUSIONS

The primary purpose of this study was to examine the use of NCR in the form of teacher attention on a fixed-interval schedule in order to reduce disruptive behavior in the classroom. Further, the study also aimed to examine the application of Weber's Law to a fading procedure in order to systematically fade the intervention to baseline conditions.

Participants 1 and 2 exhibited a reduction of disruptive behavior from baseline conditions, and experimental control was demonstrated when the same effects were replicated in the second treatment phase. Further, fading the intervention at 25% based on Weber's Fraction demonstrated to be a sufficient rate to increase the time between each application of teacher attention, and the level of the frequency of disruptive behavior stabilized throughout each fading session. By the final fading session, each participant was receiving teacher attention at the same rate they were at baseline conditions while the frequency of disruptive behavior remained low. The application of noncontingent teacher attention did not demonstrate the same effects in Participant 3 as in Participants 1and 2, likely due to procedural integrity not being maintained by Teacher B throughout the treatment phase. The primary investigator consulted with Teacher B and made sure she understood the instructions, allowed for opportunities for Teacher B to ask questions, and provided additional training. However, after several sessions of insufficient procedural integrity during the treatment phase, the primary investigator discontinued the intervention with Teacher B and Participant 3. Because the effects of the use of noncontingent

teacher attention were never demonstrated with Participant 3, a fading procedure was not implemented.

Social Validity

Both Teacher A and Teacher B were interviewed about their experience implementing the intervention. Teacher A (Participant 1 and Participant 2) mentioned implementing the intervention was a positive experience. She also stated that she noticed a positive difference in both Participant 1 and Participant 2 at times when the intervention was not in place, and appreciated the suggestion to systematically fade the intervention. She also communicated that she would be willing to implement the intervention again with other students in her classroom that may benefit from it. Anecdotally, the primary investigator noticed throughout the intervention Teacher A administered more positive attention to non-participants in her class than was observed before the implementation of the intervention. However, Teacher A did suggest she thought the intervention was more effective for Participant 1 than Participant 2. The primary investigator observed that peers often got in the way of Participant 2 and would try to initiate conversations with Participant 2 during treatment sessions, making it more difficult for Participant 2 to refrain from engaging in disruptive behavior. After several conversations and re-training Teacher B, the primary investigator informed Teacher B of the conclusion on the intervention with Participant 3 and an interview regarding her experiences followed. Teacher B stated, "it was very unnatural to provide positive statements and attention to Participant 3." She also stated that while the intervention itself was not difficult for her to understand or implement, she did not agree that Participant 3 should receive extra attention because of the difficulties she experiences with him in class. Further, she stated the intervention may have been more successful if a different student in her classroom was utilized. The primary investigator observed a caustic relationship between Teacher B and Participant 3 throughout the intervention sessions.

Implications for Practice

Implications for practice indicate the importance of matching a problem behavior with the function maintaining the problem behavior. This study emphasized that when a behavioral intervention (NCR) is matched with the function of a problem behavior (teacher attention), the frequency of the problem behavior is reduced. Schools can aid in the determination of the function of behavior by including data based decision making team within the school's support system, training teachers on function based behavior, and including the perceived function of a behavior on office discipline referral forms. These steps would help facilitate the identification of the function of problem behaviors, therefore indicating the correct intervention to implement. Noncontingent attention on a fixed-interval schedule is an easy method of reducing teacher attention maintained problem behaviors. However, the continuation of a behavioral intervention involving noncontingent teacher attention may not be practical over long periods of time. Therefore, a fading procedure is necessary to increase the practicality of the use of noncontingent teacher attention to remediate problem behavior. After the effectiveness of a behavioral intervention is established, a fading procedure can be utilized in order to reduce the problem behavior to the point that the intervention no longer occurs more than what is normal for a class or teacher. Fading may also aid in teacher buy-in of intervention implementation since the intervention will be systematically reduced and implemented less often while the frequency of problem behavior remains low. Currently, literature on fading procedures do not delineate exact procedures for fading. This study demonstrate that fading a behavioral intervention at 25% based on Weber's Law effectively maintains the reduction of problem behavior. Therefore, this rate of fading may be prescribed to other behavioral intervention that require a fading procedure.

Limitations

A few limitations were present in the current study. While the school utilized principles of Positive Behavior Interventions and Supports (PBIS), the teachers that participated in the study rarely utilized principles of PBIS within their individual classrooms. Ideally, the intervention would be faded to the amount of attention the teacher provided the entire class at baseline levels.

However, the teachers rarely addressed students in the class that were engaged in appropriate behavior. The students that displayed problematic behavior received the bulk of the teacher's attention in the form of re-direction or admonitions. Another limitation was the limited procedural integrity evident with Teacher B. While Teacher B agreed to participate in the study, her negative relationship with Participant 3 may have impacted her willingness to implement the intervention with full procedural integrity. A further limitation of the study was the distance from the location of the site the study took place from the location of the research team. Because the distance was so great, only the primary investigator was able to visit the site for observations on a daily basis. Therefore, video recording were utilized for inter-observer agreement. However, at times the camera on the Macbook Pro was obstructed, or the camera did not pick up some of the sounds the participants were making. Because of these limitations, inter-observer reliability was not at 100%.

Future Research

Future research should continue to investigate the application of fading procedures based on Weber's Fraction. While the current study examined the use of NCR, a fading procedure at 25% would likely be effective for inventions involving the fading of other interventions or stimuli. While extensive literature on the effectiveness of NCR and function-based intervention exist, replication of this study is necessary in order to determine if fading at 25% is effective. When replicating this study, it may be beneficial to ensure evidence-based classroom strategies are in place within the classroom, and that the teacher provides attention to all members of the classroom on a consistently. Further, replication is necessary because this study only included three participants, one of which exhibited poor procedural integrity. Querying the teacher's relationship and attitude towards the participant prior to intervention implementation may reduce the likelihood of poor procedural integrity. Moreover, replication with further participants for differing age groups and settings is necessary.

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APPENDICES

Examples of Teacher Attention

- Thank you for working quietly (Student).
- Keep doing well, (Student)
- (Student), thanks for staying quiet.
- I like how respectful you are being now (Student).
- (Student), good job doing what you are supposed to.
- I like your attitude today (Student).
- Keep on working hard (Student).
- Thanks for staying focused (Student).
- (Student), you are being such a good example.
- I love how well you are doing this hour (Student).
- Keep at it (Student).
- (Student), you are doing great.
- Keep up the good work (Student).
- Great job (Student).
- Good work (Student).

Other Options

- Hand on shoulder
- Assist with seat work

Inter-observer Instructions Form

Operational definition of "disruptive behavior"
Talking to peers, asking for teacher without raising hand, talking without permission, dancing (moving body in order to attract attention includes hips and head moving to the point other students have taken notice), making noises with mouth, banging on classroom furniture or supplies.
Does not count as "disruptive behavior"
Answering out loud when teacher asks class an open-ended question, talking to teacher when teacher is at his or her desk
Other Notes on disruptive behavior
If disruptive behavior is fairly consistent, wait 3 seconds before the end of one behavior and the beginning of a new behavior to count it as a separate behavior.
Data Entry
For Session #, record what was assigned on the calendar. For example, "NC Baseline Session 3."
For Frequency, just enter the frequency of behavior from your tally sheet.

Inter-rate Record Form

Session #	**Frequency**

PARENT/GUARDIAN PERMISSION FORM
OKLAHOMA STATE UNIVERSITY

PROJECT TITLE: Altering Student Behavior by Changing Learning History

INVESTIGATOR(S): Lisa Neitzke, M.S.
Graduate Student
Oklahoma State University

Gary Duhon, Ph.D
Associate Professor
Oklahoma State University

PURPOSE:
The purpose of this study is to determine whether teacher attention when given independently of student's problem behavior is an effective method of reducing problem behaviors such as blurting out and talking to peers in schools. Further, the study will determine an effective measure of gradually reducing teacher attention so the student is receiving attention at the same rate as the rest of the class.

PROCEDURES:
The investigator will determine the reason the child is engaging in problematic behavior by conducting direct observations, reviewing office discipline referrals, and interviewing the teacher after receiving permission from the parent. Based on the amount of times the student engages in problem behavior, the teacher will provide positive attention to the student on a fixed schedule. The reason behind this is that if the student receives positive attention from the teacher, the student will be less likely to engage in problem behavior in order to obtain attention. Further, positive teacher attention will be gradually reduced until the student is receiving the same amount of positive attention from the teacher as the rest of the class. Observations will be recorded daily for a duration of 15 minutes for approximately 6 to 8 weeks. The use of audio and video equipment is necessary to accurately assess integrity and fidelity of the study.

RISKS OF PARTICIPATION:
There are no known risks associated with this project which are greater than those ordinarily encountered in daily life.

BENEFITS OF PARTICIPATION:
The student participating in the study will benefit because they will learn to engage in appropriate behavior in the classroom and will no longer require intervention from the teacher.

CONFIDENTIALITY:
The records of this study will be kept private. Any written results will discuss group findings and will not include information that will identify you or your child. Research records will be stored on a password protected computer in a locked office and only researchers and individuals responsible for research oversight will have access to the records.

CONTACTS:
You may contact any of the researchers at the following addresses and phone numbers, should you desire to discuss your participation in the study and/or request information about the results of the study: Lisa Neitzke, M.S., Willard Hall, Dept. of Education Oklahoma State University, Stillwater, OK 74078, (281) 813-2897. If you have questions about your rights as a research

volunteer, you may contact the IRB Office at 223 Scott Hall, Stillwater, OK 74078, 405-744-3377 or irb@okstate.edu

PARTICIPANT RIGHTS:
I understand that my child's participation is voluntary, that there is no penalty for refusal to participate, and that I am free to withdraw my permission at any time. Even if I give permission for my child to participate I understand that he/she has the right to decline.

CONSENT DOCUMENTATION:
I have been fully informed about the procedures listed here. I am aware of what my child and I will be asked to do and of the benefits of my participation. I also understand the following statements:

I have read and fully understand this permission form. I sign it freely and voluntarily. A copy of this form will be given to me. I hereby give permission for my child _____(insert child's name here)_____ participation in this study.

_____ _____
Signature of Parent/Legal Guardian Date

I certify that I have personally explained this document before requesting that the participant sign it.

_____ _____
Signature of Researcher Date

Parent-Guardian Media Consent Form

Release Form for Video and Photos

Dear Parent/Guardian:

As a school psychology graduate student I am doing some of my dissertation research in your child's classroom. As a part of the requirements for my dissertation study, I am required to assess the integrity and fidelity of the implementation of my research in the classroom. I will be recording my time in the classroom, and only students and faculty in the School Psychology program and Oklahoma State University will view the video. **However, your child will not be actively engaged in the study, but may appear in the background of my video.**

No student name will appear with any materials that are submitted. All materials will be kept confidential. The form below will be used to document your permission for these activities.

Sincerely,
(***Sign Name Here***)

_____

Student Name: _____

School/Teacher: _____

I am the parent/legal guardian of the child named above. I have received and read your letter regarding the development of a pre-professional teaching portfolio and agree to the following:
Please check the appropriate box:

☐ **I DO** give my permission to you to include my child's image on videotape or photos as he or she participates in class conducted at _____by _____
(Name of School) (Name of Student Teacher)

and to reproduce materials that my child may produce as part of classroom activities. No names will appear on any material submitted by the teacher candidate.

☐ **I DO NOT** give my permission to videotape my child or to reproduce materials that my child may produce as part of classroom activities.

Signature of Parent/Guardian: _____ Date: _____

IRB Approval Letter

Oklahoma State University Institutional Review Board

Date:	Friday, December 02, 2016
IRB Application No	ED16140
Proposal Title:	Altering Student Behavior by Changing Learning History
Reviewed and Processed as:	Expedited

Status Recommended by Reviewer(s): Approved Protocol Expires: 12/1/2017

Principal Investigator(s):

Lisa Neitzke	Gary J Duhon
	423 Willard
Stillwater, OK 74078	Stillwater, OK 74078

The IRB application referenced above has been approved. It is the judgment of the reviewers that the rights and welfare of individuals who may be asked to participate in this study will be respected, and that the research will be conducted in a manner consistent with the IRB requirements as outlined in section 45 CFR 46.

☐ The final versions of any printed recruitment, consent and assent documents bearing the IRB approval stamp are attached to this letter. These are the versions that must be used during the study.

As Principal Investigator, it is your responsibility to do the following:

1.Conduct this study exactly as it has been approved. Any modifications to the research protocol must be submitted with the appropriate signatures for IRB approval. Protocol modifications requiring approval may include changes to the title, PI advisor, funding status or sponsor, subject population composition or size, recruitment, inclusion/exclusion criteria, research site, research procedures and consent/assent process or forms
2.Submit a request for continuation if the study extends beyond the approval period. This continuation must receive IRB review and approval before the research can continue.
3.Report any adverse events to the IRB Chair promptly. Adverse events are those which are unanticipated and impact the subjects during the course of the research; and
4.Notify the IRB office in writing when your research project is complete.

Please note that approved protocols are subject to monitoring by the IRB and that the IRB office has the authority to inspect research records associated with this protocol at any time. If you have questions about the IRB procedures or need any assistance from the Board, please contact Dawnett Watkins 219 Scott Hall (phone: 405-744-5700, dawnett.watkins@okstate.edu).

Sincerely,

Hugh Crethar, Chair
Institutional Review Board

VITA

Lisa Louise Neitzke

Candidate for the Degree of

Doctor of Philosophy

Thesis: THE USE OF NONCONTINGENT REINFORCEMENT FOR THE RUDUCTION OF PROBLEM BEHAVIOR AND THE APPLICATION OF WEBER'S LAW TO A FADING PROCEDURE

Major Field: Educational Psychology, option School Psychology

Biographical:

Education:

Completed the requirements for the Doctor of Philosophy Educational Psychology at Oklahoma State University, Stillwater, Oklahoma in July, 2018.

Completed the requirements for the Master of Science in Educational Psychology at Oklahoma State University, Stillwater, OK in 2014.

Completed the requirements for the Bachelor of Arts in Psychology at Oklahoma State University, Stillwater, OK in 2009.

Experience:

120 Hour Education Field Experience at Richmond Elementary
320 Hour Shadow Practicum Experience at Highland Park Elementary
335 Hour School-Based Practicum at Pawhuska Elementary
600 Hour Clinic-Based Practicum at OSU School Psychology Clinic

Professional Memberships:

School Psychology Graduate Organization (Fall 2013 – Present)
APA Representative (2015-2016)
Oklahoma School Psychology Association (Fall 2013 – Present)
National Association of School Psychologist (Fall 2013 – Present)
Association of Positive Behavior Supports (Fall 2016 – Present)