

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

By

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Abstract: The effectiveness of a peer-delivered noncontingent reinforcement (NCR) intervention for the reduction of problem behavior was examined. The target students engaging in disruptive problem behavior were given a functional behavior assessment to determine the function of their problem behavior. A peer student in each class was identified and trained on providing a praise statement or nonverbal gesture to the target student following a specified amount of time. Following a baseline phase, NCR in the form of peer attention was administered on a fixed interval schedule for each student based on the mean inter-response time of three baseline sessions. This was shown to be effective for both participants.

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Table 1

*Inter-observer Agreement*

<b>Participant</b>	<b>Frequency of Problem Behavior Range</b>	<b>Frequency of Problem Behavior Average</b>
<b>1</b>	82%-100%	95%
<b>2</b>	80%-100%	94%
<b>3</b>	--	--

Table 2

*Fixed-interval Schedule*

<b>Participant</b>	<b>Treatment</b>	<b>Fading Phase 1</b>	<b>Fading Phase 2</b>	<b>Fading Phase 3</b>
1	26 seconds	33 seconds	41 seconds	51 seconds
2	31 seconds	39 seconds	49 seconds	61 seconds
3	--	--	--	--



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Figure 1

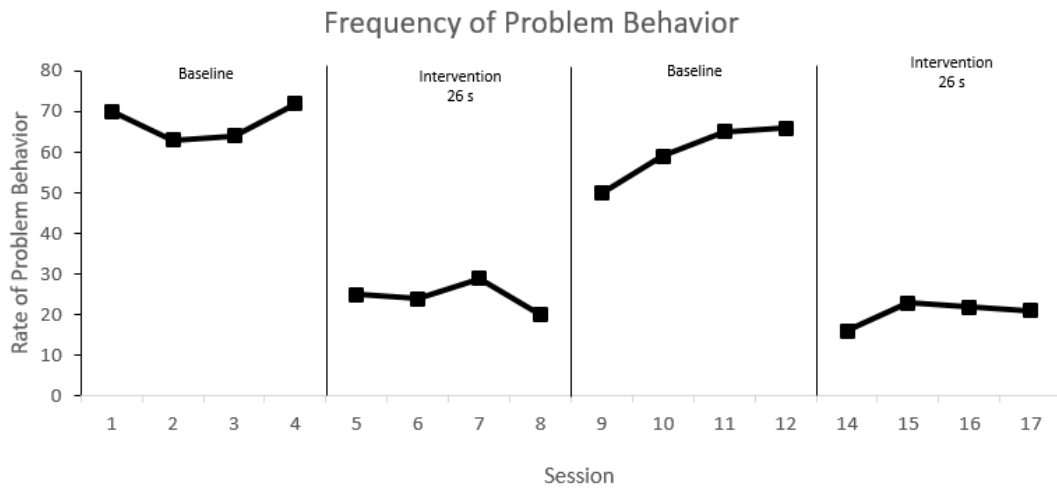


Figure 1. Frequency of disruptive behavior for Participant 1.

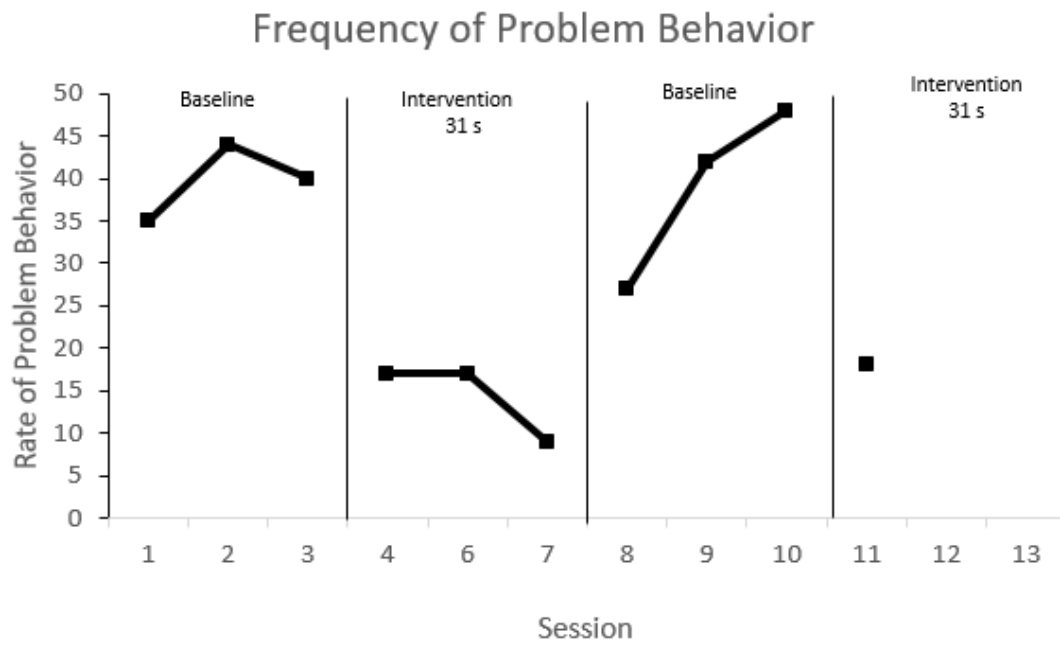


Figure 2. Frequency of disruptive behavior for Participant 2.

## CHAPTER I

### INTRODUCTION

#### **Applied Behavior Analysis**

The school setting has not always utilized Applied Behavior Analysis (ABA), and when it was, special education classrooms or settings were the primary focus as opposed to general education classrooms (Coleman, 1970). Further, Coleman (1970) asserted due to the public mindset of no longer institutionalizing individuals with developmental disabilities and/or extreme behaviors, and the “disenchantment” with special education classrooms in school, ABA should be utilized in general education classrooms as well. Skinner and Hales (1992) demonstrated facilitating better academic growth by using ABA procedures effectively compared to parent-centered approaches and Piagetian approaches. Coleman (1970) was able to effectively control classroom behavior with the use of ABA reinforcement procedures. Furthermore, antecedent interventions (interventions that are utilized prior to the target behavior occurring), consequence interventions (interventions that are utilized following the target behavior), and skill replacement interventions (interventions that teach a replacement behavior that are more appropriate than the problem behavior), are the three most commonly used types of behavioral interventions in schools (Bregman, Zager, & Gerdtz, 2005).

## **Antecedent Interventions**

Two types of behavioral interventions that are effective in reducing problem behavior are antecedent and consequence interventions. Consequence behavioral interventions have been shown to be effective in reducing self-injurious behaviors in a developmentally delayed population (Iwata et al, 1990). Similarly, antecedent behavioral interventions were found to be effective in reducing an ASD's student vocal stereotypy when visual cues were utilized (Haley, Heick, & Luiselli, 2010). A benefit of choosing to implement antecedent behavioral interventions as opposed to consequence behavioral interventions is that because the antecedent intervention will occur prior to the problem behavior occurring, the intervention itself is preventative in nature; indicating that the problem behavior is less likely to occur during the intervention (Stichter, Sasso, & Jolevette, 2004). Additionally, Rivera, Gerow, and Kirkpatrick (2019) found that most teachers and other school staff feel that antecedent interventions reduce problem behavior significantly within the school setting. Further, antecedent behavioral interventions provide individuals an alternative choice to the use of Type I or Type II (i.e., positive and negative) punishment procedures (Smith & Iwata, 1997).

## **Noncontingent Reinforcement**

Noncontingent reinforcement (NCR) is an antecedent intervention involving the application of reinforcement on a fixed-time schedule contingent upon engaging in appropriate behavior (Tucker, Sigafos, & Bushell, 1998). It is considered an antecedent intervention because the reinforcement precedes the problem behavior, as opposed to following the behavior and thereby acting as a consequence. The use of NCR has been shown to be applicable in schools to help decrease problem behavior and increase on-task engagement in students (Goetz, Holmberg, & LeBlanc, 1975). Carr et al. (2000) proposed the definition of NCR is that when a problem behavior occurs, the function is reinforced to the individual independent of the problem behavior itself. Put another way, if functional behavioral analysis determines the function of a problem behavior is to receive peer attention, a peer

could then provide attention to the target student independent of the problem behaviors occurring; thus reducing the likelihood the target student would engage in a problem behavior to obtain peer attention.

A common confusion when discussing NCR is how it differs from differential reinforcement of other behaviors (DRO). DRO is providing reinforcement contingent upon other, specified behaviors, and problem behaviors are put on extinction (i.e., are no longer reinforced; Lennox, Miltenberger, Spengler, & Erfanian, 1988). Vollmer, Iwata, Zarcone, Smith and Mazaleski (1993) specified that the reduction of extinction-induced behavior (i.e., extinction burst), ease of implementation, and higher rates of reinforcement makes NCR more desirable and more beneficial over DRO. However, it should be noted that NCR can cause extinction bursts as well (Vollmer, Ringdhal, Roane, & Marcus, 1997). An extinction burst may occur when reinforcement is withheld for a previously reinforced maintained problem behavior due to the individual having a learning history of gaining access to reinforcement for that behavior in the past. The use of fading procedures can help abate the effect of extinction bursts.

### **Fading Procedures**

Initially, teachers, peers, and school staff may be able and willing to implement a dense schedule of NCR to a target student, but over time, it may not be practical or feasible to maintain this dense of a schedule. Therefore, a fading procedure is beneficial to the school to slowly scale back and reduce prompts back to conditions that are similar to baseline, but also maintain the decrease in problem behavior. Ogletree and Oren (2001) describe fading procedures as the removal of prompts in a systematic way that the discriminative stimulus ( $S^D$ ) still continues to elicit the targeted behavior. Fading procedures also help to reduce and possibly even prevent extinction burst following NCR implantation. When systematically fading the application of indiscriminable contingencies (i.e., a strategy where it becomes more difficult for the target individual to discriminate between phases),

Gross, Duhon, and Doerksen-Klopp (2014) were able to maintain the integrity of the behavioral intervention treatment being implemented by teachers. Another fading procedure that could be implemented to systematically fade support and prompts is Weber's law.

### **Weber's Law**

Weber's Law is, "the change in a stimulus that will be just noticeable is a constant ratio of the original stimulus" (Britannica, "Weber's Law," n.d.). Put another way, Weber's law is the smallest amount of stimuli that is noticeable proportional to the original stimuli. An example could be if an individual has a ten-pound bag in one hand, and ten pounds, one ounce in the other hand, it likely would be extremely difficult to notice which hand was holding the heavier bag. However, if the individual had the ten-pound bag in one hand and a one-hundred-pound bag in the other, it is likely the individual would be able to discriminate between the differences in weight. Therefore, the noticeable difference in weight is a constant ratio of the initial weight. Weber's Law of Just Noticeable Difference could be an efficient way to systematically reduce problem behaviors when applied to a systematic fading procedure ensuing a treatment phase.

While there currently is no literature on the application of Weber's law to systematically fading a behavioral intervention in the schools, it has been examined in other contexts. A study had participants use their right hand to grasp and hold differently sized objects and estimate the difference in size of the objects (Jazi & Heath, 2014). Scores of just noticeable differences were then calculated to determine if the estimation of differences in sizes of the objects followed Weber's law (Jazi & Heath, 2014). In order to calculate the just noticeable difference, Weber's fraction, consisting of the ratio of differential threshold and the standard deviation of the magnitude of the examined stimuli, was applied (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 the schools, and if the application of Weber's Law of Just Noticeable Difference can be applied effectively to a fading procedure to reduce problem behavior at baseline conditions. Put another way, to obtain an acceptable reduction of problem behavior with the same conditions that occurred before implementation of the intervention. For example; if a student has a history of engaging in problem behavior in order to access peer attention and has been receiving the desired attention, even if it is negative, contingent upon the problem behavior, will providing the student with peer attention that maintains the problem behavior eliminate the need for the problem behavior to occur? The learned behavior of engaging in problem behavior and receiving peer attention for the problem behavior will change after the implementation of NCR and a fading procedure utilizing Weber's law due to the student no longer requiring engagement in the problem behavior. The current study's research questions are the following:

1. Will the use of non-contingent reinforcement in the form of peer attention (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**

Antecedent interventions are more advantageous in comparison to consequence-based interventions in that they reduce the likelihood of harm or injury due to behaviors, improve the instructional environment, and correct environments that are deficient (Kern & Clarke, 2005).

Compared to consequence-based interventions, antecedent interventions are preventative in nature in that antecedent interventions are used to modify an organism's environment in order to reduce the likelihood of problem behavior occurring (Luiselli & Murbach, 2002). Due to teachers having difficulty supporting and managing students with challenging and/or disruptive behavior, antecedent interventions can help teachers stop the problem behavior before it starts (Wood, Kisinger, Brosh, Fisher, & Muharib, 2018). Further, there are two types of antecedent events that can influence problem behaviors and can be manipulated in antecedent interventions:

Discriminative stimuli ( $S^D$ ) and establishing operations (EO; Miltenburger, 1998). An  $S^D$  is a stimulus change which affects how reinforcing something is, increases the likelihood of a specific response, and alters the likelihood of that response being used under those conditions again in the future (Michael, 1982). An EO, on the other hand, is defined by Michael (1982) as "any change in the environment which alters the effectiveness of some object or event as reinforcement and simultaneously alters the momentary frequency of the behavior that has been followed by that

reinforcement” (pp. 150-151). An example of an EO is thirst on a hot, summer day. If an individual or organism did not have access to water on a hot day and was really thirsty, the individual or organism would likely find water to be highly reinforcing given the state of deprivation. However, if it were a cooler day and the organism had water already, water may not be as reinforcing to the individual given the circumstances. Additionally, McComas, Thompson, and Johnson (2003) indicated that attention can serve as an EO. It was determined that when attention was withheld and the individual was socially isolated, attention was established as positive reinforcement; however, when social attention was provided, the reinforcing quality of the attention seemed to diminish in its effectiveness (McComas et al., 2003). Further, it was also found that when provided attention during the pre-session, the likelihood of the students engaging in problem behavior to access attention was diminished (McComas et al, 2003). In a follow up study to McComas; Roantree and Kennedy (2006) determined that pre-session attention acted as an EO and increased the value of the social attention as a positive reinforcer during the functional analysis. This indicates that pre-session attention can serve as an EO, but also as an Abolishing Operation (AO) where the reinforcing effects of a stimulus are decreased and decrease response probability (Roantree & Kennedy, 2006).

Antecedent interventions have been shown to be effective in increasing appropriate behaviors and decreasing the problem behaviors. Schulz et al. (2017) determined that the antecedent interventions noncontingent reinforcement and differential reinforcement of alternative behaviors were both effective at increasing appropriate behavior in preschool-aged children. Park and Scott (2009) demonstrated there is a functional relationship between an antecedent intervention and the student’s engagement in on-task behaviors. Specifically, after a functional assessment was conducted students were provided access to their tangible reinforcers noncontingently for a period of time (Park & Scott, 2009). Having noncontingent access to the reinforcer decreased the students’ problem behavior and increased their on-task behavior (Park &

Scott, 2009). Additionally, when the researchers withdrew the intervention and returned to baseline, problem behavior increased with all students and on-task behavior decreased. This suggests that a systematic fading procedure may be needed to withdraw the intervention. Furthermore, antecedent interventions can be utilized when students engage in more complex behaviors and behavior chains where a typical contingency-based intervention (i.e., consequence intervention) would not be nearly as effective (McIntosh & Av-Gay, 2007). Further, the utilization of antecedent interventions can be applied to individuals as well as groups. When an antecedent intervention of behavior specific praise was administered to fourth grade classrooms at different schools, on-task behavior was increased (Chalk and Bizo, 2004). Antecedent interventions can also be utilized for academic behaviors. A reading antecedent intervention (Listening, Passage, Preview) was implemented and all participants' reading fluency was increased (Eckert, Ardoin, Daly, & Martens, 2002). Additionally, Eckert et al. (2002) demonstrated that when the reading intervention was paired with contingent reinforcements, four of the six students' increased further compared to when contingent reinforcement was not utilized.

### **Functional Assessment**

Functional assessment is used to systematically understand factors that contribute to and maintain problem behavior (Sugai, Lewis-Palmer, & Hagan-Burke, 2000). It is considered a multimethod strategy as opposed to a single test approach and is also considered to be a proactive approach to planning and is a crucial link to matching an intervention to a student's behavior within their current environment (Barnhill, 2005). Information collected through the functional assessment process helps inform the formation of the behavior intervention plans that are used in the school systems (Sugai et al., 2000). Additionally, the Individuals with Disabilities Education Improvement Act of 2004 endorses the utilization of functional assessments to develop positive behavior supports to support and intervene on students with behavioral difficulties (Park & Scott,

2009). Further, the goal of functional assessments is to enhance the effectiveness of the behavior intervention plans, as well as inform the development of procedures for adults who will implement the intervention plan (Sugai et al., 2000). Interventions that are chosen without the use of functional assessment could actually increase and strengthen the problem behavior as opposed to increasing and strengthening the replacement behavior (Barnhill, 2005). Teachers and other school staff can conduct functional assessments to help identify the function of the student's behavior (Wood et al., 2018).

Research has indicated that interventions that are informed by functional assessments have better outcomes than interventions that are not informed by functional assessments (Bruni, Hixson, Wyse, Corcoran, & Fursa, 2017). Further, when a function based intervention was put into place in a general education setting for a high school student with Attention Deficit/Hyperactivity Disorder (ADHD), results showed a functional relation between the intervention and on-task behavior (Majeika et al., 2011). In a meta-analysis conducted by Walker, Chung, and Bonnet (2018), it was determined that interventions informed by functional assessments resulted in moderate to strong intervention effects and indicates that functional assessments are feasible and informative in the general education setting. Additionally, while functional assessments can be conducted in an educational setting, functional assessments can also be conducted in other environments as well. Umbreit (1997) conducted a functional assessment to determine the function of pant wetting behavior with an adult female with intellectual disability in a work environment. It was hypothesized after the functional assessment that the function of the pant wetting behavior was to access staff attention (Umbreit, 1997). This behavior was then eliminated when an antecedent intervention in the form of attention from the staff was provided to the individual during times when the wetting behavior most often occurred (Umbreit, 1997).

One of the important pieces of functional assessment is the hypothesis statement. The hypothesis statement is derived from the process which describes the problem behavior as well as the variables that are thought to be associated with the occurrence of the problem behavior (Sugai et al., 2000). Most problem behaviors are either considered behavior excess or behavior deficits, and the determination of the function of the behavior assists in the determination of which variable(s) to manipulate in order to achieve appropriate levels of the behavior (Kruger et al., 2016). Additionally, functional assessment utilizes several strategies to determine possible antecedents and consequence to identify the function of behavior (Horner, 1994).

Functional assessments were first used to help develop appropriate interventions for individuals with severe disabilities (Reed, Thomas, Sprague, & Horner, 1997). However, the use of functional assessments now has been extended and adapted to apply to all individuals who display behavior difficulties across a variety of settings, including educational settings (Reed et al., 1997). Additionally, the most common functions of problem behavior have been identified by Broussard and Northup (1995) as teacher attention, peer attention, and escape of academic demands. Data for functional assessments can be collected by multiple methods including record reviews, interviews, and direct observation; all of which are detailed below. The utilization of all of these measures or a combination of them is recommended as best practice to assess the convergence of data from multiple sources and multiple settings (McIntosh & Av-Gay, 2007).

### **Components of Functional Assessment**

**Record review.** One of the initial steps in conducting functional assessments is to review the student's record in a systematic manner by looking at: special education status, attendance, grades, state test scores, retentions, disciplinary data, health information, and previous accommodations and/or interventions (Barnhill, 2005). Record reviews are an essential part of conducting a functional assessment (Gable, Hendrickson, & Sasso, 1995). In a student's record,

office discipline referrals may provide some indication of the possible function of a problem behavior if the setting, type of problem behavior, if others were involved, and the consequence for the behavior are listed. Academic data in the student's record may also be beneficial to help determine if a skills deficit in academic performance in one or more subject areas could contribute to the problem behavior (Sutherland & Singh, 2004). Additionally, if the school uses a screening tool for their academics, those results and data could also be beneficial to ascertain if the student is struggling academically. Radford and Ervin (2002) were able to hypothesize the function of a thirteen-year-old boy's behavior after a review of his records, including office discipline referrals and previous school records; and direct observation. It was determined by Radford and Ervin (2002) that this student's aggressive behavior typically occurred during unstructured periods of the day and when he was negatively interacting with his peers.

**Interviews.** Interviews are an indirect method of obtaining data on a student's problem behavior, however, they are important piece of the functional assessment. While interviews may sometimes be biased, when analyzed in an objective manner, they can provide the interviewer with useful information as the informants are exposed to a larger range of situations in which the problem behavior may occur (McIntosh et al., 2008). Additionally, interviews have become more common in schools as a tool for collecting data as they are easily administered to teachers, parents, and students (McIntosh et al., 2008). Interviews with teachers and caregivers have become increasingly common as a way to obtain data for students' problem behaviors (McIntosh et al., 2008).

Interviews with the teachers and caregivers is also important in attaining social validity (Barnhill, 2005). By interviewing the teachers and caregivers, the interviewer is having these informants provide information on what they are struggling with the most with regards to a student's behavior and what they would like to see instead (Barnhill, 2005). Additionally, an effective structured interview can educate the interviewee about functional assessments through

the questions asked during the interview (Barnhill, 2005). Another integral piece of the interviewing process is the student interviews. When students are included, the interviewer may have access to higher quality and a larger range of information (Kern, Dunlap, Clarke, & Childs, 1995).

**Direct observation.** Direct observation provides an opportunity to watch and code a student's problem behavior directly in the school setting. The direct observation in a school setting provides an objective measurement of the problem behaviors as they occur in the natural classroom or school setting (Nock & Kurtz, 2005). Further, direct observations are preferred as the data are objective in nature as opposed to the biased, subjective nature of interviews, record reviews, and rating scales (Nock & Kurtz, 2005). Direct observations also can describe and evaluate specific behaviors, and have been shown to have greater external validity than behavior scales alone (Nock & Kurtz, 2005). Additionally, direct observations provide data that helps to hypothesize the function of the behavior, thereby providing information on the purpose of the problem behavior (Nock & Kurtz, 2005). However, when conducting a direct observation, only behaviors that can be directly measured and counted should be observed (Lewis, Scott, Wheby, & Wills, 2014). Additionally, it is important to systematically and clearly define all behaviors of interest before observing. These definitions, also referred to as operational definitions, ensure that everyone is looking for the same exact thing, by explicitly defining the behavior(s) that are to be observed.

There are several forms of direct observation. Two of these forms detailed by Briesch, Chafouleas, and Riley-Tillman (2010) are systematic direct observation and direct behavior rating. Systematic direct observations are able to provide a direct estimate of behavior that allows narrow, discrete observations of problem behaviors and are recommended when the problem behavior occur frequently throughout a period of time or throughout the day (Briesch et al., 2010). Direct behavior ratings, on the other hand, are single-item scales that are used to rate an

operationally defined target behavior after a specified amount of time (Briesch et al., 2010). Additionally, there are other strategies that may be utilized for direct observations. Event-based observations and interval-based observations can be used for conducting direct observations (Sticher, Lewis, Johnson, & Trussel, 2004).

There are two forms of event-based observations, an event recording strategy, and interval-based observations where different forms of interval recording could be utilized (Sticher et al., 2004). Event-recording strategies, also referred to as frequency count(s), utilize tally marks for the amount of times a student engages in a problem behavior (Sticher et al., 2004). There are several forms of interval recordings including whole interval, or the recording of the problem behavior if it occurs during the entirety of each interval observed; partial interval, or the recording of the problem behavior if it occurs at any point of the intervals observed; and momentary time sampling, or the recording of the problem behavior if it occurs at the end of each observed interval (Alberto & Troutman, 2012). The decision to use a certain interval recording strategy depends on the target behavior and/or the setting that is being observed (Albert & Troutman, 2013).

### **Noncontingent Reinforcement**

NCR is reinforcement based upon the function of a problem behavior which is delivered to the target individual, therefore, it is sometimes viewed as a manipulation of EOs. Carr et al. (2000) proposed the definition of NCR is that when a problem behavior occurs, the function is reinforced to the individual independent of the problem behavior itself. Noncontingent reinforcement (NCR) is an antecedent intervention involving the application of reinforcement on a fixed-time schedule contingent upon engaging in appropriate behavior (Tucker, Sigafos, & Bushell, 1998). However, NCR can be implemented on different schedules which is discussed below. Additionally, NCR acknowledges the response-reinforcer relationship and utilizes it to



increase prosocial behavior while decreasing the problem behavior (Carr et al., 2000). Several other procedures can also be utilized in NCR including satiation/habituation and extinction, to decrease inappropriate behavior after NCR (Holden, 2005).

The use of NCR has been shown to be applicable in schools to help decrease problem behavior and increase on-task engagement in students (Goetz, Holmberg, & LeBlanc, 1975). An example of NCR is when determined by Functional Behavioral Assessment, the function of a student's behavior is to obtain peer attention, a peer would provide attention to the target student independently of problem behavior. This would then decrease the likelihood the target student would engage in the problem behavior to obtain peer attention. Tucker et al. (1998) recommended that an initial assessment should be conducted prior to the implementation of NCR to identify the function of the problem behavior to ensure that NCR is effective. Carr et al. (2000) determined that NCR has been shown to be an effective treatment for a variety of behaviors including aggression, disruption, and inappropriate vocalization. Additionally, it was determined NCR has been shown to effectively treat behaviors maintained by attention, tangibles, escape/avoidance, and automatic reinforcement (Carr et al., 2000).

Due to the nature of NCR, it is classified as an antecedent intervention because the peer would be delivering reinforcement preceding the behavior as opposed to after the behavior already occurred, a consequence. The way that NCR is implemented, sometimes a reinforcer can be delivered following the problem behavior; thereby reinforcing the behavior that is trying to be decreased (Carr et al., 2000). However, with NCR, the access to the reinforcer is freely given, therefore, the individual no longer has to engage in the problem behavior to receive the reinforcer, thereby reducing the problem behavior (Carr et al., 2000). Noncontingent reinforcement follows the principle that organisms will alter their own behavior to adapt to alternative rates of reinforcements delivered upon different contingencies, or otherwise known as the matching law (Borrero & Vollmer, 2002). This indicates that when reinforcement is not freely

available and effortless to attain, the probability that an individual who has engaged in problem behavior in the past, will engage in problem behavior to access the reinforcement (Holden, 2005). Additionally, it was found by Vollmer et al. (1993) that adventitious reinforcement (i.e., accidentally reinforcing the problem behavior contingent upon its occurrence) was not a problem with NCR. Furthermore, Ingvarsson, Kahng, and Hausman (2008) came to a similar conclusion when providing NCR in the form of an edible and determined that adventitious reinforcement did not account for the study's findings that NCR reduced the problem behavior. The schedule of NCR becomes an important factor in the efficacy of this intervention.

### **Schedules of Noncontingent Reinforcement**

A NCR intervention is generally begun with reinforcement provided on a dense schedule that would be gradually thinned (Slocum, Grauerholz-Fisher, Peters, & Vollmer, 2018). That is, NCR is provided very frequently when the intervention is first started and over time, the rate of NCR is slowly faded out to a schedule that could be effectively maintained in a more natural setting. MacDonald, Ahearn, Parry-Cruwys, Bandcroft, and Dube (2013) found that schedules of reinforcement that are effective in reducing problem behavior will disperse positive reinforcement intermittently. There are two different forms of intermittent schedules of reinforcement: interval and ratio. Interval schedules are fixed on passage of time since the last reinforcement was provided (Carr, Kellum, & Chong, 2001). Ratio schedule are fixed on amount of responses since the last reinforcement was provided (Carr et al., 2001). Interval schedules can either be implement on a fixed schedule, or after every specific and consistent amount of time that has passed, reinforcement is provided; or on a variable schedule, or after about every specific amount of time that has passed, reinforcement is provided (Carr et al., 2001).

The most commonly used schedule of NCR is a fixed interval (FI) schedule (Carr et al., 2001). Jones, Drew, and Weber (2000) found that a target student's disruptive classroom behavior

decreased when NCR from a peer was given on a FI schedule. When comparing dense schedules (NCR delivered every ten seconds) of NCR to lean schedules (NCR delivered every five minutes), Hagopian, Fischer, and Legacy (1994) found that denser schedules reduced the behavior of identical quadruplets with intellectual disability who displayed aggressive, self-injurious, and disruptive behaviors. Hagopian et al. (1994) determined that the denser FI schedules were more effective in reducing the problem behavior almost immediately, while the leaner FI schedules were only effective after a fading procedure was implemented systematically. Further, it was found that a fixed interval schedule reduced the tantruming behavior of a five-year-old on the autism spectrum during the intervals that reinforcement was not provided (Marcus & Vollmer, 1996). During an experiment where rats were provided NCR in the form of cocaine through a catheter on a FI schedule of 15 minutes, it was found the rats were less likely to push a lever to seek cocaine than if they were not receiving the cocaine noncontingently at a similar or higher than the treatment dose (Markou, Mercedes, & Everitt, 1999). Further, it was noted that when the NCR does was less than the treatment dose, the lever pushing behavior increased (Markou et al., 1999). Wallace, Iwata, Henley, Thompson and Roscoe (2012) found that denser schedule of NCR seem to be more effective because they eliminate the establishing operation for responding, and thinner schedule seem to produce extinction and extinction bursts. However, it has been found that implementing NCR on a dense schedule of reinforcement can be difficult to evaluate because the NCR is delivered so frequently and independent of the target or problem behavior that it can confound the variables (Wallace, Iwata, Hanley, Thompson, & Roscoe, 2012).

Additionally, denser schedules of reinforcement can help mediate the extinction bursts. Extinction refers to when the same reinforcer that was maintaining some form of problem behavior is no longer provided contingent upon that problem behavior (Barnhill, 2005). An example of extinction is if a student is engaging in talking out of turn in a classroom to make his

or her peers laugh, instructing the peers to no longer laugh when the target student engages in the behavior. An extinction burst occurs when the extinction procedures are implemented and the student escalates his or her behavior in an attempt to receive the reinforcement that is being withheld (Barnhill, 2005). Problem behaviors that are intermittently reinforced (i.e., not reinforced for every occurrence) are more challenging to extinguish than problem behaviors on a continuous schedule of reinforcement (Barnhill, 2005).

### **Review of the Noncontingent Reinforcement Literature**

Using NCR after administering a functional analysis has been shown to be successful (Lalli, Casey, & Kates, 1997; Jones et al., 2000). Tucker, Sigafos, and Bushell (1998) determined that for NCR to be successful, the practitioner must properly identify the function of the problem behavior, provide access to the reinforcement on a continuous basis, and fade the schedules of reinforcement. Lalli et al. (1997) assessed the effects of providing NCR determined on the average latency to the first occurrence of problem behavior during baseline. By doing this, Lalli et al. (1997) were able to start NCR for aggressive behaviors and self-injurious behavior in three participants that were less dense than what was typically defined in the literature. NCR was also found to successfully decrease self-injurious behavior in individuals with intellectual disability (Kahng, Iwata, DeLeon, & Wallace, 2000). Derby, Fisher, and Piazza (1996) compared contingent attention and NCR for a child's self-injurious behavior. It was determined that attention provided contingently upon the self-injurious behavior increased the behavior while NCR in the form of attention reduced the self-injurious behavior to near-zero levels (Derby et al, 1996).

When the function of a mildly intellectually disabled eight-year-old girl's destructive behavior was found to be escape, she was provided directive prompting procedures, differential reinforcement, and extinction (Piazza, Contrucci, Hanley, & Fisher, 1997). However, her

destructive behaviors continued in novel settings, including during her hygiene routines (Piazza et al., 1997). Piazza et al. (1997) then decided to implement an intervention utilizing NCR and reduced the child's destructive behaviors. Fritz, Jackson, Stiefler, Wimberly, and Richardson (2017) were able to show that NCR in the form of social attention was able to reduce the problem behavior in three of five children who attended day treatment centers and were referred for assessment and treatment of their problem behavior. The other two participants showed a reduction of problem behavior when DRA was also included (Fritz et al., 2017).

Noel and Rubow (2018) found that NCR is effective in reducing problematic perseverative speech behaviors with a student diagnosed with high functioning autism spectrum disorders. Further, Vollmer et al. (1993) compared differential reinforcement of other behaviors (DRO) and NCR as treatment options for adult females engaging in self-injurious behaviors. NCR was considered to be the superior treatment due to NCR mitigating the extinction bursts (Vollmer et al, 1993). Additionally, Vollmer et al. (1993) found that NCR may be more advantageous than DRO due to the ease of implementation, especially for caregivers. Specifically, Vollmer et al. (1993), found that when utilizing DRO, the caregiver would need to observe each instance of the problem behavior to make sure the schedule is reset correctly; however, with NCR, the schedule is not affected by the subject's behavior. This study was replicated by Hagopian, Fisher, and Legacy (1994) and the same findings were observed. Additionally, it was demonstrated by Hagopian et al. (1994) that it is important to begin NCR with a dense schedule of reinforcement.

Von Schulz et al. (2017) evaluated the interventions of NCR and Differential Reinforcement of Alternative Behavior (DRA) in preschool children and found both worked to decrease the preschool children's problem behavior and increased their on-task behavior, however, NCR was more effective. The utilization of NCR has shown to produce greater or comparable reductions in problem behavior compared to DRO, DRA, and extinction alone (Carr

et al., 2000). Additionally, NCR has been shown in the literature to produce a higher rate in delivery of reinforcement compared to other similar procedures, such as DRO (Carr et al, 2000). NCR is also more advantageous over DRO due to the ease of implementation (Wallace et al., 2012). When implementing DRO, an expert or consultant either needs to be present or is required to train a separate individual on the criterion for reinforcement and whether or not that has been met, requiring continuous monitoring (Wallace et al., 2012). However, continuous monitoring is not required with NCR because the reinforcer will be delivered regardless of the target student's behaviors (Wallace et al., 2012).

The utilization of fixed-time schedules for NCR has been shown to be more effective than other procedures such as extinction (Vollmer et al., 1998). When an eight-year-old boy diagnosed with ADHD was engaging in disruptive behavior, Jones, Drew, and Weber (2000) were able to reduce his behavior by utilizing NCR in the form of peer attention. During the intervention, the boy's peers were given 30 seconds to play with other peers in 90 second intervals, and the confederate peer assigned to play with the target student was instructed to ignore any disruptive behaviors (Jones et al, 2000). When minute-by-minute sessions were recorded, it was determined that the utilization of NCR reduced the target student's engagement in disruptive behavior (Jones et al., 2000). Further, fixed-time schedules of NCR have been shown to be effective with adults who engage in problem behaviors as well. After determining a forty-six-year old man was engaging in bizarre speech and problem behaviors to access staff attention, social attention was placed on a fixed-time schedule of 30, 60, or 90 seconds and bizarre speech was ignored by the experimenter (Mace & Lalli, 1991). After implementing NCR, the problem behavior was shown to be reduced with few to none occurrences during the implementation of the intervention (Mace & Lalli, 1991).

While NCR is an evidenced-based intervention, all individuals and their problem behaviors are different, as are their function of behaviors; so while NCR may work alone for

some individuals, others may require it to be used in conjunction with another intervention, or a different intervention all together. A common criticism of NCR is that while it works, it does not teach the target individual appropriate replacement behaviors to engage in instead of the problem behaviors (Mildon, Moore, & Dickson, 2004). However, Mildon et al. (2004) were able to demonstrate that when functional communication training was superimposed with the NCR intervention, disruptive behaviors in the students decreased to near zero.

### **Fading Strategies**

Prompts and reinforcers are utilized in interventions to teach new skills, increase compliance to the intervention, and to increase engagement in the intervention, however, it is possible that the target student may become dependent on these prompts and reinforcers, thereby decreasing generalizability and maintenance of the new skill (Odom, Chandler, Ostrosky, McConnell, & Reaney, 1992). The purpose of fading strategies is to systematically reduce the prompt or reinforcement (Wolery, Bailey, & Sugai, 1998). Fading strategies are useful in that the participant receiving the intervention does not become dependent on the reinforcement or prompt when acquiring a new skill because the prompts and reinforcement will be reduced over time (Cooper, Heron, & Heward, 2007). There are two types of fading strategies; stimulus fading and reinforcement fading; described below.

When a physical component of a relevant stimulus is exaggerated to elicit the appropriate response and then the exaggerated features of the stimulus are reduced gradually, it is known as stimulus fading (Macduff, Krantz, & McClannahan, 2001). An example of stimulus fading is when a teacher or other school staff are training students with developmental disabilities to do life skills such as ironing clothes; the teacher would present the student with a very wrinkled shirt for the student to iron, and over time decrease the amount of visible wrinkles (Macduff et al., 2001). Fading interventions gradually have been shown to be effective in increasing the effects of the

intervention. For example, Odom and Watts (1991) showed when a visual feedback system was taken away and not faded in a systematic manner, the target behavior of peer initiations of the target participants decreased to the same level as baseline. Additionally, Odom et al. (1992) used teacher verbal prompt and a visual feedback system to increase social initiations of students. The verbal prompts from the teacher were gradually faded while the visual feedback system was introduced; and then the visual feedback system was faded as well (Odom et al., 1992). It was found after a short maintenance phase, the interactions of the students were maintaining at the level found during the intervention (Odom et al., 1992). Valentino, LeBlanc, & Raetz (2018) were able to show that a vibrating prompt was effective to cue individuals on the autism spectrum to eat at an appropriate pace and demonstrated the ability to successfully fade the tactile prompt by intensity. It was found that intensity fading was more successful than frequency fading because it was easier to transfer the stimulus control by changing the features of the antecedent stimulus (i.e., intensity fading) than abruptly removing the antecedent stimulus (frequency fading; Valentino et al, 2018). When the reinforcement of an appropriate response is reduced systematically, that is considered reinforcement fading. An example of reinforcement fading is when an intervention is implemented for a child who has selective mutism. This intervention was utilized by having a stranger to the child administer items to the child with the child's mother in the room (Wulbert, Nyman, Snow, & Owen, 1973). Gradually, the mother's presence was slowly faded until the child was able to engage with the stranger without the mother in the room (Wulbert et al, 1973).

When an intervention is introduced, initially the schedule of reinforcement should be denser than the schedule of reinforcement for the problem behavior (Hagopian, Fisher, & Legacy, 1994). Dense schedules of reinforcement may not be always practical in applied setting such as schools, however, therefore, it could be beneficial to fade the schedule of reinforcement until socially appropriate levels of the behavior are reached. This can be utilized in NCR. When



utilizing a NCR intervention, the availability of the continuous reinforcement should represent only the initial, temporary phase (Tucker et al., 1998). Once the problem behaviors have been decreased, it is important to fade the schedule of NCR to a level that is more natural, socially acceptable and ecologically valid (Tucker et al., 1998). The final schedule of NCR should be decided upon by all relevant caregivers and providers to ensure that that schedule is possible and practical (Tucker et al., 1998).

An intervention utilizing NCR successfully faded the reinforcement schedule to 50% where there were equal periods where the functional reinforcer was available and was not available (Slocum et al., 2018). Additionally, the fading was found to be associated with near zero levels of problem behavior (Slocum et al, 2018). Fritz et al. (2017) systematically thinned a NCR schedule from a FI schedule of every 20 seconds to a FI schedule of 5 minutes for three of five children engaging in problem behaviors. A common way to thin the NCR schedules is to increase the interval by fixed increments (i.e., adding five seconds or ten seconds) when engaging in problem behavior occurs below a predetermined criterion (Kahng et al., 2000). However, Kahn et al. (2000) found that thinning schedules of NCR on adjusting interresponse time values was just as effective as thinning by fixed increments. Slocum, Grauerholz-Fisher, Peters, and Vollmer (2018) successfully faded a NCR intervention implemented due to problem behavior. The fading procedure was introduced in a single 10 second period where access to the functional reinforcer was denied (Slocum et al, 2018). Over time, the fading procedure was increased from the 10 seconds to 30 seconds, 60 seconds, and finally 120 seconds while the problem behavior of aggression remained low (Slocum et al., 2018).

A fading procedure was implemented with a child with autism to decrease tantrums during bedtime (Milan, Mitchell, Berger, & Pierson, 1981). When Positive Routine components were paired with verbal praise, the severe tantruming behavior of the child was reduced and the desired bedtime was achieved (Milan et al., 1981). Katz and Singh (1986) were able to increase the

engagement in recreational play and able to successfully fade gradually the prompts and feedback without decreasing the engagement in play. Additionally, Tiger and Hanley (2006) were able to increase the milk consumption of a preschooler by adding chocolate syrup to the milk and then decreasing the milk. At the end of the study, the preschooler was drinking plain milk with no chocolate due to the systematic fading procedures (Tiger & Hanley, 2006).

### **Weber's Law**

Weber's law has been defined as "The stimulus increase which is correctly discriminated in any specified proportion of the attempts is a constant fraction of the stimulus magnitude" (Thurstone, 1927, p. 424). In other words, Weber's law seeks to determine when an organism is able to detect the slightest, or just noticeable difference in size of two objects that are being compared. The most common example of Weber's law was when students in college hypothesized the weights of different objects that appeared to be the same size, however, differed in amount of weight (Oberlin, 1936). Oberlin (1936) demonstrated that students were less confident in their weight difference estimates in objects as they became heavier.

Snell, Gibbs, & Varey (1995) demonstrated that when a stimulus is presented at high levels, a large change in that stimulus must occur in order for that difference to be detected. However, when levels of the stimulus are low, a small change in the levels of stimulus may be easily detected (Snell et al., 1995). Furthermore, Redelmeier and Dickinson (2011) applied Weber's Law and found that a change in the stimulus is better detected when the baseline level of the stimuli are small. An example of this is weight loss: It is easier to perceive and judge the weight loss of 10 kilograms in a human weighing a total of 70 kilograms as opposed to the weight loss of 10 kilograms in a human weight a total of 170 kilograms (Redelmeier & Dickinson (2011).

Weber's law has also been utilized in the field of marketing. When tested with housewives, Weber's Law was applied to the price discrimination of goods and held similarly as was described above (Miller, 1981). When different thresholds were examined with prices of three items that ranged from twenty-eight cents to 150 dollars, it was determined that differential thresholds existed and that perceptions of prices were more easily detected when they were large as opposed to small (Zarrel, 1978). Additionally, when surveying undergraduate students, Snell et al., (1995) determined Weber's Law held when the students were provided scenarios including repairing a car, winning the lottery, candy bars, vacations, and calculators. Further, the students were asked to decide to save five dollars on a twenty-dollar calculator compared to a one-hundred-dollar calculator, and it was determined that Weber's Law held (Snell et al., 1995).

### **The Weber Fraction**

Specifically, the Weber fraction is made of the difference of the threshold in discrimination and the magnitude of the examined stimuli (Grondin, Ouelett, & Rousell, 2001). If this ratio remains the same, Weber's law is reported to remain intact (Grondin et al., 2001). Phrased another way, the Weber fraction is made of the difference threshold on the standard deviation (Grondin et al., 2001).

When trying to train pigeons to differentiate the duration of a stimulus to calculate for the Weber fraction, it was found the fraction as the measure of just noticeable difference to be 0.25 (Stubb, 1968). Furthermore, Perikel, Richelle, and Maurissen (1974) were able to determine that pigeons were able to differentiate one, five, and six second durations from ten second durations when a frequency equal to or less than 0.25 was utilized. Getty (1975) obtained a value of 0.05 as the weber fraction when applying the concept to humans. Conversely, the Weber fraction was found to equal 14.5% when a study of ten undergraduate students attempted to differentiate between a duration of light ranging between one to nine seconds (Guay & Salmoni, 1988).

However, it needs to be noted that the calculations of the Weber fraction may vary with different durations, different organisms, and different procedures.

## CHAPTER III

### METHODOLOGY

#### **Participants and Setting**

Three participants were selected from a rural school district in the South-Central United States. These students were referred to the schools' multidisciplinary data teams for behavioral concerns and were selected for consideration. Both schools that participated in this study utilize office discipline referral forms where teachers had the opportunity to record the perceived function of the problem behavior. All three students with high rates of disruptive behavior and perceived function of peer attention were selected to participate in the study. Participant 1 was a Native American male in the sixth grade taught by Teacher A. Participant 2 was a Caucasian male in the fourth grade taught by Teacher B. Participant 3 was an African-American female in the second grade taught by Teacher C. Participant 1 and Participant 2 each received an individual treatment session in the afternoon. Participant 3 never received baseline or treatment sessions due to the unforeseen effects of the COVID-19 pandemic. Confederate peers were selected based on observational data and teacher report. Students were moved prior to the beginning of the study to be in close proximity to the target student to ensure the NCR was as unobtrusive and undisruptive as possible.

The procedure of the study was explained to the participants, peer confederates, teachers, parents, and the schools' principals. Informed consent was obtained from the parents of all three

participants and all three confederate peers. Assent was obtained from the three confederate peers; however, not the study participants. The participants remained blind to the study in order to maintain the study's integrity. The primary investigator of the study acted as an external consultant for the teachers whose students were participating in the study. Each session occurred in the afternoon for both Participant 1 and Participant 2. Classroom activities that were occurring during the sessions included classroom instruction and independent seat work.

### **Materials**

Materials included a MotivAider device that was obtained by the researcher and given to the confederate peers to wear during the intervention conditions. The MotivAider device quietly pulsed to mark the fixed-interval in which the confederates provided noncontingent attention to the target student as part of the treatment protocol (see below). The MotivAider device weighed three ounces and included a belt clip that allowed the confederates to discretely attach the device to their waist. The primary investigator utilized a timer which indicated the length of each session, as well as a cellular phone application that also had the fixed-interval schedule in order to determine fidelity. Confederates were trained on different phrases to provide peer attention, and were reinforced with a piece of candy that was identified as a reinforcer. A password protected iPad was utilized to record each session. An excel sheet was provided to secondary investigators to record inter-rater reliability.

### **Dependent Variable**

The dependent variable was the problem behavior exhibited by the participants. For the two participants that data was collected, the problem behavior targeted was disruptive behavior in the classroom. For Participant 1, disruptive behavior was operationally defined as: talking to a peer, talking out in class without permission, playing with objects at his desk, dancing in his seat (defined as moving body including arms, feet, and hips), leaving his seat without permission, and

sleeping during class (defined as putting his head down on his desk for more than five seconds). For Participant 2, disruptive behavior was operationally defined as: out of seat behavior (including inappropriate sitting on a fitness ball), talking to peers without permission, speaking out of turn without raising his hand, and playing with objects around his area. Behaviors that were not included as disruptive included: answering an open ended question asked to the class by the teacher or approaching the teacher to discuss instruction. Operational definitions were included on the inter-rater instruction sheet that is included in Appendix 2. Analysis of the problem behaviors was conducted through the use of a frequency count, which is a total occurrence of the behavior within a given observation period.

### **Independent Variables**

The independent variable was noncontingent peer attention given by a confederate on a fixed-interval schedule. The fixed-interval schedule was determined by calculating the mean inter-response time of all baseline sessions and then will be systematically faded based on Weber's Law of Just Noticeable Difference. Peer attention is considered both physical and verbal attention and will include: giving the target student a thumbs up, fist bumping and/or high fiving the target student, and providing positive praise such as, "good job," "keep it up," "you are doing great."

### **Experimental Design**

A withdrawal design with nested changing criterion was utilized. This study consisted of A, B, A, B, C conditions. The treatment phase consisted of A, B, A, B conditions. Condition A was the baseline data, which is the target behavior of the participant that is not being manipulated by the confederate. Condition B consisted of the confederates delivering NCR on a fixed-interval schedule. Experimental control is evident in the replication of baseline and treatment conditions. Condition C would have consisted of the fading procedure and withdrawal design based on the

nested changing criterion. The withdrawal condition would have been the systematic reduction in frequency with which the confederated would have delivered NCR in the form of peer attention. The nested changing criterion would have been based on the application of Weber's Law. However, due to the unforeseen consequences due to the COVID-19 pandemic, Condition C was not able to be implemented with any of the participants.

## **Procedures**

Permission to carry out this study was solicited through the Oklahoma State University Institutional Review Board and the school district for which the participants reside. The IRB obtained from Oklahoma State University, as well as the consent forms issued to the parents and assent forms issued to the confederate peers 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 peer attention. Baseline data were collected in the classroom during three to four 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.

## **Treatment Integrity**

Treatment fidelity was measured during all phases and sessions by the primary investigator. During the baseline sessions, no action taken by the peer was necessary. During the treatment phases, the confederate peer was trained to deliver peer attention each time the Motivator device pulsed. 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 peer attention was provided, assuring the confederate peer and the primary investigator's devices were synchronized. The primary investigator recorded the number of times the device was set to pulsate and the confederate peer failed to provide teacher attention to the participant. The primary investigator consulted with the confederate peer and provided additional training when procedural integrity fell below 100%.

### **Inter-rater Reliability**

Inter-observer agreement was measured by a team of school psychology graduate students at Oklahoma State University. Due to the hour long drive to the school district in this study, the graduate student team was unable to commute to the site in order to conduct in-vivo inter-observer agreement. Therefore, after consent from the principals of the schools, the teachers, and parents of all the students in the class (including the parents of the participants and confederate peers) was obtained, each session was filmed on an iPad. The graduate team conducted inter-observer agreement by reviewing the video of the session the primary investigator provided, and recorded the frequency of disruptive behavior on the document found in Appendix 3. Inter-observer agreement was measured during 50% of the sessions for Participant 1 and 40% of the sessions for Participant 2. 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 in Table 1.

### **Baseline Phase**

Baseline data was collected for two of the students that were recommended to the primary investigator. The primary investigator observed each student, and utilized a frequency observation tool to track instances of problem behavior. The observations occurred during a fifth

hour math class for Participant 1 and during science for Participant 2. These are the times the teachers indicated are the most likely for problem behavior to occur, and also corroborated by office discipline referrals for participant 2. Baseline data was collected for both participants until a stable trend of four data points were collected for Participant 1, and a stable trend of three data points were collected for Participant 2. Once this trend was achieved, the treatment phase began.

### **Treatment Phase**

The fixed interval schedule was determined by calculating the mean inter-response time of all baseline sessions for each student; Participant 1 (26 seconds), and Participant 2 (31 seconds). The fixed interval time schedule for each participant can be found on Table 2. Inter-response times are the times between the end of each problem behavior and the beginning of the next. The primary investigator set the appropriate time based on inter-response times collected during the baseline phase on the MotivAider device. The confederate peers placed the MotivAider device on their clothes or in their hands and every time it pulsed, the confederate granted NCR in the form of peer attention. NCR in the form of peer attention consisted of telling the participant great job, nonverbal hand signals (i.e., thumbs up), and high fives and fist bumps. However, if the target student was not engaging in behavior, the confederate did not respond to the behavior. All sessions were recorded on video by the primary investigator for the purposes of inter-observer agreement.

### **Fading Procedures**

Inter-response times collected during baseline conditions were going to be applied to Weber's fraction to determine the fading schedule, which was suggested by the literature to be 25%. The average rate of reinforcement that was going to be given to the participants during baseline sessions will be used to determine "normal" rates of peer attention within the classroom. The fading procedures was going to consist of several phases that depend on the application of

Weber's Law to alter the frequency of attention given at baseline conditions and slightly increasing by 25% the amount of time that elapses between each NCR given. However, due to the unforeseen consequences of the COVID-19 pandemic, data was not able to be collected for any of the participants during this phase of the study.

### **Data Analysis**

All data that were collected were analyzed visually. Once a stable level and trend was observed, the next phase was implemented. The stability of level was determined by analyzing amount of variability among the data points. As recommended by Gast and Spriggs (2014), if 80% of the data points fell within a 25% range of the median level, stability was determined. Trend was also considered during visual analysis of the data. Trend refers to the slope of the data, and the trend can either increase or decrease over time (Gast & Spriggs, 2014).

## CHAPTER IV

### FINDINGS

#### **Procedural Integrity**

Procedural integrity was 95% (ranging from 74% - 100%) for Confederate Peer A (Participant 1) for a total of 8 sessions. When procedural integrity fell below 100%, Confederate Peer A was either answering a question from the teacher, asking the teacher a question, or in the middle of writing something down on his worksheets. Additionally, Participant 1 would sometimes leave his seat to wander the classroom making it so Confederate Peer A missed some intervals. Procedural integrity was 100% for Confederate Peer B (Participant 2) for a total of 4 sessions.

#### **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 both participants. The mean inter-observer agreement was 95% for Participant 1 and 94% for Participant 2.

#### **Noncontingent Reinforcement**

### ***Participant 1***

The treatment phase consisted of Confederate Peer A providing Participant 1 with noncontingent attention on a fixed-interval schedule every 26 seconds. The fixed-interval schedule was determined by calculating the mean inter-response times of four baseline sessions. During the initial baseline conditions, Participant 1 was engaging in approximately two or more disruptive behaviors per minute, thereby reducing his engagement in his school work. Visual analysis indicated there was a stable trend and little variability in the initial baseline phase. The level of disruptive behavior frequency decreased from the first baseline condition to the first treatment phase. Reversal to baseline conditions resulted in a level change and an upward trend of frequency of disruptive behaviors. Although the frequency was initially lower than previous baseline sessions, disruptive behavior steadily increased throughout the return to baseline phase. When the intervention was re-introduced, Participant 1's disruptive behavior decreased to similar levels that was observed in the first intervention phase. At the end of the second intervention phase, Participant 1 was engaging in approximately one or less disruptive behaviors per minute. This resulted in an increase in engagement in the school work and attention to his teacher.

### ***Participant 2***

The treatment phase consisted of Confederate Peer B providing Participant 2 with noncontingent attention on a fixed-interval schedule every 31 seconds. The fixed-interval schedule was determined by calculating the mean inter-response times of three baseline sessions. During the initial baseline conditions, Participant 2 was engaging in approximately one or more disruptive behaviors per minute, thereby reducing his engagement in his school work and ability to listen to his teacher. Visual analysis indicated there was some variability in the baseline sessions, however, the frequency of disruptive behavior was trending upwards. The level of disruptive behavior frequency decreased from the first baseline condition to the first treatment

phase. Reversal to baseline conditions resulted in a level change and a sharp upward trend of frequency of disruptive behaviors. Although the frequency was initially lower than previous baseline sessions, disruptive behavior sharply increased throughout the return to baseline phase. When the intervention was re-introduced, Participant 2's disruptive behavior decreased to similar levels that was observed in the first intervention phase, however, only one data point was collected as a result of the unforeseen consequences of the COVID-19 pandemic. At the end of the first intervention phase, Participant 2 was engaging in approximately less than one disruptive behavior per minute. This resulted in an increase in engagement in the school work and attention to his teacher.

## CHAPTER V

### CONCLUSION

The primary purpose of this study was to investigate the use of NCR in the form of peer attention on a fixed-interval schedule in order to reduce disruptive behavior in the classroom. Additionally, this 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.

Both Participants 1 and 2 displayed a reduction of disruptive behavior from baseline conditions, and experimental control was demonstrated with Participant 1 when the same effects were replicated in the second treatment phase. However, due to the unforeseen effects of the COVID-19 pandemic, the primary investigator was unable to collect the full three data points for Participant 2. Additionally, due to the global pandemic, the primary investigator was unable to answer the second question of this study and unable to implement Weber's Law as a systematic fading procedure.

#### **Social Validity**

Both Teacher A and Teacher B were interviewed via email about their experiences having the intervention implemented in their classrooms. Teacher A (Participant 1) thought the intervention worked really well in her classroom. She stated she could tell the difference between

Participant 1's on-task and off-task behaviors as well as Confederate Peer A's. She reported she would be happy to have the intervention implemented in her classroom again so long as she receives help. Teacher B (Participant 2) thought the intervention was a success in her classroom. She reported she liked the "encouraging" atmosphere the intervention created in her classroom and stated she would like to run the intervention again in the future.

### **Implications for Practice**

This study further emphasized the importance of matching a problem behavior with the function that maintains it. When a behavioral intervention such as NCR is matched with the function of the student's problem behavior (i.e., peer attention), the frequency of the problem behavior is reduced. Matching the function of a student's problem behavior can be aided by schools utilizing data-based decision making teams within their Multi-Tiered Systems of Support practices, having all staff trained on function-based behavior, and ensuring that office discipline referrals have an area for staff to mark perceived function of problem behavior.

Many rural schools do not have enough adult staff to run an intervention with fidelity therefore, the results of this study indicate it may be possible to have peer confederates deliver the NCR to a target student with fidelity. Noncontingent reinforcement in the form of attention on a fixed-interval schedule has been shown to be a simple intervention where any individual in the school could help implement it depending on the target student's function of problem behavior. However, it is not always feasible to sustain a high level of NCR and therefore, a fading procedure is necessary to increase the practicality of the use of NCR.

### **Limitations**

There are limitations to note in the current study. First, the distance from the school district from the research team was a limitation. Due to the distance being so great, only the primary investigator was able to travel to the school district for daily observations. Therefore,



video recordings were utilized for inter-observer agreement. However, at times the participants or the confederate peers went out of the camera's frame on the iPad and sometimes the camera did not pick up on some of the sounds the participants were making. Due to this limitation, inter-observer reliability was not at 100%. Second, due to the unforeseen circumstances surrounding the COVID-19 pandemic, this study was not able to be conducted in the way it was proposed. Data was only able to be collected on two of the three participants of which, Participant 1 completed four of the seven proposed phases and Participant 2 completed three of the seven proposed phases. Further, no data was able to be collected on the use of Weber's Law to systematically fade the intervention.

### **Future Research**

Future research should investigate the application of a fading procedure for NCR in the form of peer attention based on Weber's Fraction. While the current study aimed to investigate this, data were unable to be collected due to the COVID-19 pandemic. Further, replication of this study is necessary in order to verify the results found as well as to extend the application of NCR in the form of peer attention to more than two participants. Additionally, peer delivery of Differential Reinforcement of Other Behaviors (DRO) and Differential Reinforcement of Alternative Behaviors (DRA) should be investigated to see if there are similar effects to the peer delivery of NCR that was found in the current study.

Future research into peer attention should seek to determine if there are ideal characteristics for a student to have in order to be an effective Confederate Peer. Some of these characteristics could include age and grade. The current study demonstrated that the utilization of a confederate peer can reduce the disruptive behavior of a target student in both fourth and sixth grades, however, future research should determine if there is a similar effect in younger grades and older grades, such as high school. Additionally, this study should be replicated with target students who are

identified as needing special education services to determine if this could be an effective intervention with that population of students.

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## APPENDICES

### **Examples of Peer Attention**

1. You're doing a great job, (student).
2. Keep up the hard work (student).
3. Great job paying attention (student).
4. Great job, (student).
5. Keep working hard (student).
6. Nonverbal Options:
  - a. Thumbs up
  - b. Fist bump
  - c. High five

**Inter-Observer Instructions Form**

**Operational Definitions of Problem Behavior**

<b>Participant 1</b>	<b>Participant 2</b>
<p><b>Talking to a Peer:</b> Orients self to right/left or turns around in seat and converses with a peer</p> <p><b>Talking Out:</b> Speaking to class or teacher without prior permission</p> <p><b>Playing with Objects:</b> No longer looking at task demand and instead looking at object (i.e., floor, shoe, pencil, bag, etc.) and using object not as intended with either one or both of hands</p> <p><b>Dancing:</b> No longer looking at task demand or instruction and instead using hand(s) or feet to do movements in the air that do not correspond to task demand</p> <p><b>Out of Seat:</b> Leaving seat without permission</p> <p><b>Sleeping/Head Down:</b> Putting head on desk, closing eyes for longer than 3 seconds</p>	<p><b>Talking to a Peer:</b> Orients self to right/left or turns around in seat and converses with a peer</p> <p><b>Talking Out:</b> Speaking to class or teacher without prior permission</p> <p><b>Playing with Objects:</b> No longer looking at task demand and instead looking at object (i.e., pencil, digging in desk, etc.) and using object not as intended with either one or both of hands</p> <p><b>Dancing:</b> No longer looking at task demand or instruction and instead using hand(s) or feet to do movements in the air that do not correspond to task demand</p> <p><b>Out of Seat:</b> Leaving seat without permission and/or when sitting on the ball, starts to bounce or rock back and forth with legs not properly underneath him</p>

When teacher asks class an open-ended question this DOES NOT count as problem behavior

When talking to teacher when teacher is at her desk this DOES NOT count as problem behavior

Record as a new behavior if the initial behavior has stopped for at least 3 seconds

Data Entry:

1. For Session #, record what was assigned on the calendar. For example, B.Baseline1.30
2. For frequency, record the frequency of problem behavior from your tally sheet

**Inter-Rater Record Form**

<b>Session #</b>	<b>Frequency</b>



**Parent/Guardian Consent Form**

**PARENT/GUARDIAN PERMISSION FORM  
OKLAHOMA STATE UNIVERSITY**

**PROJECT TITLE:** Utilization of Noncontingent Reinforcement to Reduce Problem Behavior and the Application of Weber's Law to Fade

<b>INVESTIGATOR(S):</b> Kortney Rist, M.S. Graduate Student Oklahoma State University	Gary Duhon, Ph.D Associate Professor Oklahoma State University
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**PURPOSE:**

The purpose of this study is to determine whether confederate peer 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 confederate peer 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 confederate peer 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 confederate peer, the student will be less likely to engage in problem behavior in order to obtain attention. Further, positive confederate peer attention will be gradually reduced until the student is receiving the same amount of positive attention from the confederate peer 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 confederate peer.

**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



Approved: 09/11/2019  
Protocol #: ED-19-91

of the study: Kortney Rist, M.S., Willard Hall, Dept. of Education Oklahoma State University, Stillwater, OK 74078, (405) 466-5059. 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](mailto: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

**Peer Assent Form**

**PEER ASSENT FORM  
OKLAHOMA STATE UNIVERSITY**

**PROJECT TITLE:** Utilization of Noncontingent Reinforcement to Reduce Problem Behavior and the Application of Weber's Law to Fade

<b>INVESTIGATOR(S):</b> Kortney Rist, 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 attention from a peer when given regardless of the target 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 peer 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 confederate peer 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 confederate peer, the student will be less likely to engage in problem behavior in order to obtain attention. Further, positive confederate peer attention will be gradually reduced until the student is receiving the same amount of positive attention from the confederate peer 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 learn how to positively cheer their peers on.

**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



Approved: 09/11/2019  
Protocol #: ED-19-91

of the study: Kortney Rist, M.S., Willard Hall, Dept. of Education Oklahoma State University, Stillwater, OK 74078, (405) 466-5059. 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](mailto: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.

**ASSENT DOCUMENTATION:**

I have been fully informed about the procedures listed here. I am aware of what 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 assent for myself \_\_\_\_\_ (insert name here) \_\_\_\_\_ participation in this study.

\_\_\_\_\_  
Signature of Individual

\_\_\_\_\_  
Date

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

\_\_\_\_\_  
Signature of Researcher

\_\_\_\_\_  
Date



Approved: 09/11/2019  
Protocol #: ED-19-91

Parent/Guardian Media Release 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: \_\_\_\_\_



Approved: 09/11/2019  
Protocol #: ED-19-91



## IRB Approval Letter



### Oklahoma State University Institutional Review Board

Date: 09/11/2019  
Application Number: ED-19-91  
Proposal Title: Utilization of Noncontingent Reinforcement in the Form of Peer Attention for the Reduction of Problem Behavior and the Application of Weber's Law to Fade

Principal Investigator: Kortney Rist  
Co-Investigator(s):  
Faculty Adviser: Gary Duhon  
Project Coordinator:  
Research Assistant(s):

Processed as: Expedited  
Expedited Category:

**Status Recommended by Reviewer(s): Approved**

Approval Date: 09/11/2019

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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.

This study meets criteria in the Revised Common Rule, as well as, one or more of the circumstances for which continuing review is not required. As Principal Investigator of this research, you will be required to submit a status report to the IRB triennially.

The final versions of any recruitment, consent, and assent documents bearing the IRB approval stamp are available for download from IRBManager. 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 approved by the IRB. Protocol modifications requiring approval may include changes to the title, PI, adviser, other research personnel, 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 status report to the IRB when requested
3. Promptly report to the IRB any harm experienced by a participant that is both unanticipated and related per IRB policy.
4. Maintain accurate and complete study records for evaluation by the OSU IRB and, if applicable, inspection by regulatory agencies and/or the study sponsor.
5. Notify the IRB office when your research project is complete or when you are no longer affiliated with Oklahoma State University.

If you have questions about the IRB procedures or need any assistance from the Board, please contact the IRB Office at 405-744-3377 or [irb@okstate.edu](mailto:irb@okstate.edu).

Sincerely,  
Oklahoma State University IRB

VITA

Kortney Rist

Candidate for the Degree of

Doctor of Philosophy

Dissertation: THE USE OF NONCONTINGENT REINFORCEMENT DELIVERED BY PEERS FOR THE REDUCTION OF PROBLEM BEHAVIOR AND THE APPLICATION OF WEBER'S LAW TO A FADING PROCEDURE

Major Field: School Psychology

Biographical:

Education:

Completed the requirements for the Doctor of Philosophy in School Psychology at Oklahoma State University, Stillwater, Oklahoma in July, 2021.

Completed the requirements for the Master of Science in Educational Psychology at Oklahoma State University, Stillwater, Oklahoma in 2017.

Completed the requirements for the Bachelor of Arts in Psychology at the University of Kansas, Lawrence, Kansas in 2015.

Experience:

120 Hour Education Field Experience at Skyline Elementary

320 Hour Shadow Practicum Experience at Sangre Ridge Elementary

335 Hour School-Based Practicum at Wynona and Hominy Elementary

600 Hour Clinic-Based Practicum at OSU School Psychology Clinic

2,000 Hour Pre-Doctoral Internship at Marcus Autism Center

Professional Memberships:

Oklahoma School Psychology Association (Fall 2016 – Present)

National Association of School Psychologist (Fall 2016 – Present)

Association for Behavioral Analysts International (Spring 2018 – Present)

Georgia Association of Behavior Analysts (Fall 2020 – Present)