EFFECTS OF HIGH-PROBABILITY REQUEST SEQUENCES ON COMPLIANCE TO LOW-PROBABILITY REQUESTS FOR A HIGH SCHOOL STUDENT WITH AN INTELLECTUAL DISABILITY

by

Larry Blaine Fisher

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Approved by:

_____
Fred Spooner

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Charles Wood

_____
Ya-yu Lo

_____
Amy Good

ABSTRACT

LARRY BLAINE FISHER. Effects of high-probability request sequences on compliance to low-probability requests for a high school student with an intellectual disability. (Under the direction of DR. FRED SPOONER)

Using a reversal design, the current study evaluated the effects of the high-probability request sequence (HPRS) on the compliance to low-probability requests for a high school student with a moderate intellectual disability. The participant was given three simple discrete prompts to complete tasks with which she had a history of complying (i.e., high-*p* requests) immediately before given a prompt to engage in requests with she had a history of not complying (e.g., low-*p* requests). In addition, reinforcement in the form of social praise and attention was provided contingent on compliance with each high-*p* and low-*p* request. This study also examined whether the effects observed during each phase of the study would be generalized if conditions were replicated by the classroom special education teacher. In addition, a social validity questionnaire was completed by the participant's teacher. The results indicated that a functional relation exists between the implementation of the HPRS on both the increase of compliance with low-*p* requests and a decrease in the latency to respond to these requests. The findings also demonstrated that the participant engaged in similar levels of compliance when the intervention was implemented by either the investigator or the special education teacher. Limitations, recommendations for future research, and implications for practice are provided.

DEDICATION

First, I dedicate this dissertation to Guy, and all of the other residents that impacted my life many years ago, as I first started my journey in the field of special education. Thank you for the memories, the love, and all you taught me about humanity. Second, I would like to thank all of my former students and their families. Thank you for challenging me to be the best educator I could be and holding me accountable for making sure every decision I made was in the best interest of the students involved. Third, I would like to thank Tonia, Cindy, Amy, Stephanie, Judi, Ann-Marie, Jessica, Andy, Katie, and all the other paraeducators, colleagues, cross-word puzzle solvers, and friends who shared a similar passion for public education. You were and still are my family. Thank you for providing me with much needed support through a chapter in my life that I will never forget. I would also like to thank the Oaks. I could not have hoped for a better group of people to go on this journey with. I look forward to a lifetime of friendships and collaboration. Finally, I would like to thank my husband, Terry. Without all of your encouragement and support, this dream would not have become a reality.

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CHAPTER ONE: INTRODUCTION

Compliance is considered one of the most important school-readiness skills for children to develop (Hains, Fowler, Schwartz, Kottwitz, & Rosenkoetter, 1989). Episodes of noncompliance are common and occur at varying levels as children go through the stages of development. Noncompliance is especially common with younger students and often occurs when asked to terminate a preferred activity or requested to engage in a nonpreferred activity (Wilder, Zonneveld, Harris, Marcus, & Reagan, 2007).

Noncompliance, as defined by Kalb and Loeber (2003), refers to instances when a child purposefully does not perform a specific request given to him or her by an adult. It is considered a broad term that includes defiance but is not limited to instances of saying no for the sake of doing so. Mace et al. (1988) suggest that a variation of noncompliance also includes a slowness to respond to the request (i.e., latency), as well as an increased duration to complete the task. Although it should be expected that children are noncompliant from time to time, increased levels and intensity of noncompliant behavior can have a lasting and negative effect. Frequent noncompliance can negatively affect the personal, social, academic, and vocational success of children (Lee, 2005) and can also lead to more serious behavioral problems as children get older (Cipani, 1998). Noncompliance has been identified as one of the most frequent causes for parents and caregivers to make psychiatric referrals (Kalb & Loeber, 2003) and it is ranked high on the list of problematic behaviors for which both parents and teachers request assistance (Majdalandy, Wilder, Allgood, & Sturkie, 2017).

Noncompliance in the classroom is problematic for many teachers, and can be especially problematic for teachers of students with developmental disabilities including

autism spectrum disorders (ASD) and moderate to severe intellectual disability. According to Fischettie et al. (2012), compliance with directions is particularly important for children with autism due to the high number of adult directions given during early intensive behavioral intervention programs. When students are frequently noncompliant in the school setting, it can (a) lead to more serious behavior problems (e.g., aggression, property destruction, elopement), (b) prevent teachers and other staff members from providing instruction, and (c) negatively affect decisions made about the student's educational placement within the general education setting (Cipani, 1998). In addition, if students are slow to respond to directions or to complete requests, they may receive less reinforcement while receiving increased punitive social responses from their teachers and peers (Mace et al., 1988). Also, noncompliance impairs the noncompliant student's daily interactions with peers and adults, reducing the quality of those relationships (Kalb & Loeber, 2003).

Effective interventions for addressing noncompliance have been a targeted focus for researchers since the 1970s (Kalb & Loeber, 2003). Teachers and clinicians have used various methods for addressing noncompliance. In order to identify the most appropriate interventions to use with children who are noncompliant, it is necessary to accurately identify the antecedent and consequence variables responsible for the child's noncompliant behavior (Majdalany et al., 2017). Antecedent refers to the environmental condition or stimulus change that occurs prior to the targeted behavior (e.g., noncompliance), whereas consequence refers to the stimulus change that follows the targeted behavior (Cooper, Heron, & Heward, 2007). Majdalany et al. (2017) suggested several possible causes of noncompliance related to antecedent variables. One possible

cause includes the child having a skill deficit, making it challenging, if not impossible, for him or her to perform the task requested. In other cases, a child may have the skills necessary to perform the skill requested; however, he or she may lack the verbal behavior skills necessary to understand what is being asked of him or her.

Majdalany et al. (2017) also provided possible causes of noncompliance related to consequence variables. For example, it may be possible for a child to have the skills necessary to understand and perform the task that has been requested; however, noncompliance may still occur due to insufficient reinforcement (i.e., magnitude, quality) provided contingent on the completion of the specific request. Another possible explanation is that the child's noncompliant behavior may produce a greater amount of reinforcement (e.g., noncompliance to the request of cleaning up toys results in longer engagement with the toys) than engaging in the compliant behavior produces (e.g., verbal praise for cleaning up preferred items). Regardless of the reason, it is necessary to identify these variables in order to determine the most appropriate intervention for the specific student and the targeted noncompliant behavior.

Examples of interventions addressing noncompliance include changing the antecedents that occasion noncompliance, using differential reinforcement techniques, implementing punishment techniques, or using an intervention that includes a combination of antecedent, reinforcement, and punishment techniques (Lee, 2005). According to Lee (2005), there are many problems associated with reinforcement and punishment techniques. First, to implement reinforcement strategies, the person delivering the reinforcer must wait until the student engages in the appropriate behavior. This is problematic if the student already has a history of not complying with the targeted

request. Second, punishment techniques (e.g., time out) would only work if the function of the student's noncompliant behavior was not avoidance or escape motivated. In addition, verbal reprimands would not be appropriate if the function of the student's noncompliant behavior was attention seeking.

Due to the problems associated with consequence-based interventions, it may be more beneficial for teachers and other caregivers to focus on antecedent-based interventions which are considered to be more proactive and preventative methods for addressing noncompliance (Harrower & Dunlap, 2001). Antecedent interventions have been defined as behavior change strategies that manipulate contingency-independent antecedent stimuli, also known as motivating operations (Cooper et al., 2007). According to Miltenberger (2006), antecedent interventions can be divided into four categories (a) altering instructional activities, (b) providing choice, (c) providing non-contingent escape, and (d) alternating setting events that are distal to the occurrence of the problem behavior.

Several interventions involving alternating instructional activities have been evaluated with participants with developmental disabilities including ASD and ID. These include, but are not limited to, fading demands (Knox, Rue, Wildenger, Lamb, & Luiselli, 2012), interspersing easy tasks with difficult tasks (Horner, Day, Sprague, O'Brien, & Heathfield, 1991), and teaching students to ask for assistance (Carr & Durand, 1985). One antecedent-based intervention involving altering instructional activities that has empirical evidence supporting its use to increase participant's compliance with requests he or she has a history of not complying is the use of high-probability request sequence (HPRS) procedure.

The HPRS intervention was first defined by Mace et al. (1988) as issuing a series of three to four high-probability (high-*p*) requests immediately preceding the presentation of a low-probability (low-*p*) request. High-*p* requests were defined as those requests with which the targeted individual had a history of complying, whereas low-*p* requests were those requests with which the targeted individual was unlikely to comply based on the experimenter's history with the individual. Mace and colleagues developed their intervention based on the theory of behavioral momentum (Nevin, Mandell, & Atak, 1983). Nevin et al. (1983) defined the theory of behavior momentum as the relative tendency for behavior to persist when challenged by competing behaviors or external variables. According to Mace et al., the HPRS establishes a "momentum" of compliant behavior by increasing the rate of reinforcement provided to a participant, and that this momentum will continue when asked to perform a low-probability request.

Since Mace et al.'s (1988) seminal study, many researchers have attempted to replicate the HPRS intervention with mixed results. Most of the literature on HPRS has focused on students with and without disabilities and has targeted low-*p* requests related to food selectivity, medical examinations, academic instructions, and social instructions (Lipschultz & Wilder, 2017a). According to Lipschultz and Wilder (2017a), who conducted a brief review of recent research on the use of HPRS, this intervention has advantages (e.g., does not require physically guiding the individual through the low-*p* tasks; it has been socially validated in early childhood settings), but it has also been shown to be ineffective in several studies (Rortvedt & Miltenberger, 1994; Wilder et al., 2007). It was suggested that the inconsistent effects of HPRS may be due to the variations in the implementation of the procedure (Lipschultz & Wilder, 2017a; Lipschultz, Wilder,

& Enderli, 2017). Variations of HPRS that have been examined in the literature include variations in the inter-response interval (i.e., the time between each high-*p* instruction and the time between the last high-*p* request and low-*p* request; Houlihan, Jacobson, & Brandon, 1994; Mace et al., 1988; Pitts & Dymond, 2012), variations in the quality of the reinforcement following compliance with high-*p* instructions (Mace, Mauro, Boyajian, & Eckert, 1997; Pitts & Dymond, 2012), and variations in the topography of the high-*p* instructions (Dawson et al., 2003; Esch & Fryling, 2013).

One of the first studies to examine the effects of varying inter-response time (also referred to as interprompt time) was conducted by Houlihan et al. (1994). Houlihan and colleagues specifically compared the effects of a 5-s and a 20-s interprompt time (IPT) on the rate of compliance for one 5-year-old boy with autism. Results indicated that the participant experienced an increase in his rate of compliance when the HPRS was implemented with a 5-s IPT and that there was no improvement on the rate of compliance when the HPRS was implemented with a 20-s IPT.

Although Houlihan et al. (1994) demonstrated that a shorter IPT was more effective than a longer IPT (e.g., 20 s), researchers have sought to determine the specific time that HPRS are most effective. Pitts and Dymond (2012) compared a shorter IPT of 5-s to a longer IPT of 10-s. Results again indicated that the shorter IPT was more effective than an IPT of 10-s. However, unlike Houlihan et al. who found that a 20-s IPT was not effective, Pitts and Dymond found that a 10-s IPT did increase compliance with high-*p* requests, but not at the same rate as a 5-s IPT. Houlihan et al. determined that a possible explanation for a shorter IPT being more effective is that the shorter IPT

increases the rate of reinforcement for compliance, creating a momentum of compliance that persists even when the participant is challenged by a low-*p* request.

Wilder, Majdalany, Sturkie, and Smeltz (2015) extended the research on IPT by examining the use of a 1-2 s IPT. Wilder et al. examined the effects of the HPRS on the compliance to low-*p* request for two boys who were typically developing and had age-appropriate language skills. Results indicated that a 1-2 s IPT could be effective if implemented with programmed reinforcement. This supported previous findings that suggested the quality of reinforcement provided contingent on the compliance with high-*p* requests may impact the participant's willingness to comply with low-*p* requests (Mace et al, 1997).

Programmed reinforcement is another variable that has been considered in several studies that have investigated the effects of HPRS on noncompliance with participants with and without disabilities. Pitts and Dymond (2012) conducted a study that investigated the effects of HPRS on noncompliance for participants diagnosed with ASD. The authors found that programmed reinforcement and a shorter inter-instruction interval of 5-s were two important components of the HPRS. The authors suggested that future research should focus on similar procedures as part of interventions implemented to increase a child's compliance to low-*p* requests.

In order for programmed reinforcement to occur, it is necessary to identify the reinforcers that are most effective. Where previous researchers may have relied on consequences that were assumed to be effective (e.g., proving verbal praise contingent on compliance), programmed reinforcement relies on conducting formal preference assessments prior to implementing the HPRS to determine the most effective

reinforcer(s) to embed into the HPRS (Pitts & Dymond, 2012). Pitts and Dymond first conducted a multiple presentation preference assessment without replacement to identify preferred stimuli that could be potentially used as reinforcement for compliant behavior. Next, brief multiple presentation preference assessments without replacement were conducted weekly to select appropriate stimuli for use as reinforcers. The two most highly preferred items identified during each week's preference assessment were presented to the participants prior to each session. Each participant then selected one of the two items to be used as reinforcers. The authors suggested that future studies should use stimulus preference assessments in determining which stimuli should serve as high quality preferred reinforcers.

A third variation that has occurred in the research on HPRS is variations associated with the topography of the high-*p* instructions used in the sequence. Researchers have suggested that dissimilarity between high-*p* and low-*p* instructions may negatively impact the effectiveness of the HPRS intervention (Dawson et al., 2003). Dawson et al. (2003) found that high-*p* instructions were not effective when implemented without escape extinction procedures with one participant who had a history of food refusal. One possible explanation provided was that the high-*p* instructions were simple fine motor responses (e.g., clap your hands) not related to the low-*p* instructions to take a bite of food. Esch and Fryling (2013) examined two variations of the high-*p* sequence including maintenance high-*p* instructions (i.e., instructions that the participant had previously learned through direct instruction but were not necessarily considered highly-preferred instructions) and leisure-based high-*p* instructions (i.e., previously identified highly-preferred leisure tasks). Results indicated that both types of high-*p* instructions

increased compliance, however, the largest increase in compliance with low-*p* instructions occurred after the presentation of leisure high-*p* requests. The authors noted that the HPRS was most successful with the two low-*p* requests that were topographically similar to the high-*p* requests.

In addition to varying the components of the interventions (i.e., the independent variable) researchers in studies related to HPRS have also examined varying ways to measure the effects the intervention can have on noncompliance (i.e., the dependent variable). A majority of studies have examined the effects of a HPRS intervention on the percentage of compliance with low-*p* requests (Houlihan et al., 1994; Riviere, Becquet, Peltret, Facon, & Darcheville, 2001). Other studies have examined additional measures of changes in compliance. Banda and Kubina (2006) examined the effects of a teacher implemented high-*p* sequence on transition related behaviors of a 13-year-old male with autism. Unlike the majority of studies, Banda and Kubina measured the total number of minutes it required the participant to complete three targeted low-*p* transition behaviors. Results indicated that the intervention had clear positive effects on the duration of completing the targeted tasks. The authors concluded that by decreasing the participants' task completion consistently by 1 to 1.5 min less than levels observed during baseline, the participant would gain three or more hours of instructional time within a school year of 180 days.

A third measure that has had a minimal presence in the research on HPRS is the measurement of latency to compliance. Latency to compliance was defined by Pitts and Dymond (2012) as the interval between the end of the experimenter's low-*p* request and initiation of the requested task. The authors measured the latency to compliance in

addition to measuring the percentage of compliance with low-*p* request and task completion time. A stopwatch was used to record the number of seconds that lapsed between the end of the request given and the participant's initiation to complete the request. Results indicated that along with increasing the percentage of compliance and decreasing task completion time, the HPRS intervention was also effective in decreasing the latency to compliance.

There are several limitations to the research that have been conducted on the use of HPRS and students with developmental disabilities including ASD and ID. First, there has not been a specific criterion set for the exact IPT that requires the least amount of time necessary while making the maximum impact. Research is needed to determine the specific IPT that is most effective. Second, researchers have examined whether the topography of the high-*p* requests influence the effectiveness of the high-*p* sequence. Esch and Fryling (2013) found the HPRS was most successful when the high-*p* leisure instructions were topographically similar to the low-*p* instructions. Additional research is needed in determining the impact that the topography of the high-*p* instructions in relation to the low-*p* instructions can have. Third, researchers have varied in the quality of reinforcement that is contingent on compliance with high-*p* instructions. Several researchers have examined the effects of programmed versus non-programmed reinforcement embedded in the HPRS intervention and have concluded that HPRS with programmed reinforcement produces more desirable results. Methods for determining reinforcers have varied; however, recent research has suggested using stimulus preference assessments to determine specific stimuli to use as reinforcement contingent on compliance (Pitts & Dymond, 2012).

The previously mentioned limitations have led researchers to make recommendations of what variables should be considered when implementing a HPRS intervention. Lipschultz and Wilder (2017a) suggested the following recommendations for implementing a HPRS: (a) high-*p* instructions should be empirically identified before using the procedure; (b) intertrial intervals should be between 1 and 5-s; (c) high-quality reinforcement should be delivered contingent on compliance with high-*p* instructions; (d) when a participant does not comply with high-*p* instructions, stimuli associated with the low-*p* instruction should be identified and removed; (e) reinforcement should be delivered contingent upon compliance with the low-*p* instruction; and (f) if the procedure is ineffective, adding additional intervention components should be considered.

The current study proposes to address the limitations previously mentioned by following the recommendations suggested by Lipschultz and Wilder (2017a). The purpose of this study is to investigate the effects of a HPRS intervention (i.e., including a inter-response time of less than 5-s, programmed reinforcement, & topographically similar high-*p* and low-*p* requests) on the percentage of compliance with low-*p* requests for students with developmental disabilities including ASD and ID. In addition, this study also will examine the effects of a HPRS on the response latency to low-*p* requests. This study will answer the following questions:

1. What is the effect of a HPRS on the percentage of compliance with low-*p* requests for students with moderate ID?
2. What is the effect of a HPRS on the response latency with low-*p* requests for students with moderate ID?

3. In what ways do teachers perceive the effectiveness of the intervention in relation to the effects on the percentage of compliance with low-*p* requests?
4. In what ways do teachers perceive the effectiveness of the intervention in relation to the effects on response latency with low-p requests?
5. What are staff member's (e.g., teachers, paraprofessionals) perceptions of the feasibility of implementing the HPRS within the classroom setting?
6. What are the perceptions of the teachers who work with the participants on the outcomes of the intervention?
7. How are results of the HPRS generalized across phases when implemented by a staff member (e.g., teacher, paraeducator) familiar with the participant?

Significance of the Study

This study will contribute to the body of literature that has examined the effect of HPRS on the compliance to low-*p* requests for students with moderate ID. One of the factors that is believed to be a cause to the inconsistent outcomes associated with HPRS are the variations of the components of how the HPRS is implemented in specific studies. This study will target three specific components of the HPRS, including reinforcement provided, inter-response time, and the topography of the high-*p* requests. If successful, this study will provide practitioners with specific guidelines for implementing HPRS with students with moderate ID.

Recent literature has examined whether or not behavior momentum interventions could be considered an evidence-based practice (EBP) for individuals with ASD. In a study conducted by Wong et al. (2015), behavior momentum interventions could not be considered an EBP due to not meeting the criteria set for single-case design studies by

Horner et al. (2005). There were sufficient studies (i.e., at least five) conducted across sufficient research groups (i.e., at least three); however, there were not sufficient participants across studies (i.e., at least 20).

More recently, Brosh, Fisher, Wood, and Test (in press) updated the work conducted by Wong et al. (2015) by including additional articles published between 2012-2016 on the use of the HPRS with students with ASD. Brosh et al. found that with the addition of six additional studies, that HPRS interventions could be considered an EBP. Although these results are promising, results have not been consistent across researchers. Cowen, Abel, and Candel (2017) published a meta-analysis on single-case research on behavioral momentum interventions and concluded that HPRS could not be identified as an EBP based on the specific rating system unique to their study. These discrepancies suggest additional research is needed that addresses all quality indicators necessary to be considered methodologically sound in order to consistently be included in EBP reviews. This study will add to such research.

Delimitations

There are several delimitations to this study. First, this study is specifically targeting participants with ID in the high school setting and who have been identified by their special education teacher as being consistently noncompliant with specific requests. Due to the specifics of the participants included in this study, results cannot be generalized to students without ID who are not high school age students.

A second delimitation of this study is that compliance is focused on school related requests that occur in the classroom setting. This study will not target noncompliance and food selectivity or requests that occur in the home or community setting. Again, these

characteristics of this study will limit the generalization of the findings. Results will only add to the literature on compliance with school specific behaviors.

A third and final delimitation is that this study is that the implementing a specific variation of the HPRS intervention that includes an IPT of less than 5-s. Recent research (Lipschultz & Wilder, 2017a) has suggested that a shorter IPT between 1 and 5-s be used in HPRS interventions. The current study seeks to develop a specific variation of the HPRS intervention that can be replicated in future studies and does not seek to identify the shortest interval that can be effective within the HPRS sequence. Instead, an IPT of 5-s has been selected based on consistently being successful in previous research (e.g., Belfiore, Basile, & Lee, 2008; Pitts & Dymond, 2012).

Definitions of Terms

Antecedent: An environmental condition or stimulus change existing or occurring prior to a behavior of interests (Cooper et al., 2007).

Antecedent Interventions: A behavior change strategy that manipulates contingency-independent antecedent stimuli (Cooper et al., 2007).

Autism Spectrum Disorders: According to the Diagnostic and Statistical Manual of Mental Disorders, 5th edition, (DSM-5; American Psychiatric Association, 2013), Autism Spectrum Disorders (ASD) is a neurodevelopmental disorder with the following features: (a) persistent impairment in reciprocal social communication and social interactions; (b) restricted, repetitive patterns of behavior, interests, or activities; (c) features are present from early childhood, and (d) limit or impair everyday functioning.

Behavior Momentum: A metaphor to describe a rate of responding and its resistance to change following an alternation in reinforcement conditions (Cooper et al., 2007).

High-probability Requests: The definition of high-probability requests have varied throughout the literature. For the purposes of this study, high-probability requests will refer to those requests that the participant's compliance was 80% or higher during presession assessments (Pitts & Dymond, 2012).

High-probability Request Sequence: Providing a sequence of three to four high-probability commands prior to issuing a low-*p* command (Mace et al., 1988).

Intellectual Disability: Intellectual disability (ID) refers to a neurodevelopmental disorder and includes both intellectual and adaptive functioning deficits in conceptual, social, and practical domains. The diagnostic criteria set by the DSM-5 includes: (a) deficits in intellectual functions (e.g., reasoning, problem solving, planning, abstract thinking, judgement, academic learning, learning from experience) that is confirmed by conducting clinical assessments, as well as, standardized intelligence testing; (b) deficits in adaptive functioning that result in failure to meet developmental and sociocultural standards for personal independence and social responsibility; and (c) onset of intellectual and adaptive deficits occurs during the developmental period (American Psychiatric Association, 2013). In addition, individuals diagnosed with an ID are further classified into one of four severity levels (i.e., mild, moderate, severe, profound). Individuals with intellectual disabilities have historically been placed within four subcategories of intellectual disability primarily based on their performance on intellectual evaluations (Westling, Fox, & Carter, 2015); however, updates made in the

DSM-V make these classification decisions based on adaptive functioning (American Psychiatric Association, 2013).

Inter-Response Time: Inter-Response Time (IRT) refers to the time between each high-*p* instruction as well as the last high-*p* instruction and the low-*p* instruction (Lipschultz & Wilder, 2017a). IRT is also identified as Inter-response Time.

Latency to Compliance: The interval between the end of the experimenter's low-*p* request and initiation of the requested task (Pitts & Dymond, 2012).

Low-probability Requests: Instructions with which the participant has a history of not complying. Similar to Pitts and Dymond (2012), low-probability requests will refer to those requests that the participant's compliance was 40% or less during presession assessments.

Noncompliance: The failure to follow an instruction within a specified period of time (Fischetti et al., 2012).

Programmed Reinforcement: Providing reinforcement contingent on the compliance with each high-probability request (Pitts & Dymond, 2012).

Punishment: Occurs when a stimulus change immediately follows a response and decreases the future frequency of that type of behavior in similar conditions (Cooper et al., 2007).

Reinforcement: Occurs when a stimulus change immediately follows a response and increases the future frequency of that type of behavior in similar conditions (Cooper et al., 2007).

Stimulus Preference Assessments: Refers to a variety of procedures used to determine (a) the stimuli that the participant prefers, (b) the relative preference values of

those stimuli, and (c) the conditions under which those preference values change when task demands, deprivation states, or schedules of reinforcement are modified (Cooper et al., 2007)

Topography: The physical form or shape of a behavior (Cooper et al., 2007).

CHAPTER TWO: LITERATURE REVIEW

The purpose of this chapter is to discuss HPRS, an antecedent intervention that has been utilized to increase compliance to low-probability requests for students with ASD and moderate to severe ID. First, a review on compliance and the use of antecedent-based and consequence-based interventions for increasing compliance is provided. This is followed by defining HPRS as an antecedent-intervention. Third, the theoretical explanation of the effects of the HPRS is explained through the lens of applied behavior analysis and the behavioral momentum theory. Applied research applications of the behavioral momentum theory are also discussed. Fourth, reviews of the literature on the use of the HPRS are provided along with attempts to identified behavior momentum interventions including HPRS as evidence-based practices for individuals with ASD. Finally, a detailed review of the literature on the use of the HPRS to increase compliance for students with moderate to severe ID and ASD was provided by looking within the various domains of compliance targeted by this line of research. These domains include compliance with basic requests, compliance and escape motivated behaviors, compliance related to food selectivity, compliance with medical related requests, compliance with social and communication implications, compliance with transitions between activities, and compliance within academic activities. This chapter includes a discussion of the literature as it relates to participants with a diagnosis of moderate to severe ID, participants with a diagnosis of ASD, and students with a combination of the two. Studies that include participants without disabilities or with disabilities other than ASD and moderate to severe ID are not discussed in detail in this chapter.

Operationalizing Noncompliance

In order to understand noncompliance, it is necessary to understand the types of commands that are typically given to children by adults. This section provides a brief description of command types identified in the literature. In addition, researchers' attempts at operationally defining both compliance and noncompliance are discussed.

Commands. According to Patterson (1982), there are four types of commands (i.e., commands, commands negative, aversive commands, and command prime). When a direct, reasonable, and clearly stated instruction is presented (e.g., "please push in your chair"), it is called a command. When a child is given an instruction to stop or to not do something (e.g., "don't stand on your chair"), Patterson referred to it as a command negative. When a command is paired with a threat of an aversive consequence contingent on noncompliance (e.g., "get off the chair or go to time-out"), it is called an aversive command. The fourth type of command is called a command prime, referring to instructions that compliance cannot be determined (e.g., "be good").

Peed, Roberts, and Forehand (1977) suggested there are only two types of commands (i.e., alpha commands and beta commands). For a command to be categorized as an alpha command, a motoric response has to be appropriate or feasible (e.g., "clean up your blocks"). If the child has no opportunity to demonstrate compliance, it is considered a beta command. Beta commands include (a) requests that are so vague that the child cannot determine the appropriate behavior required for compliance (e.g., be good), (b) requests that are interrupted by additional verbal responses from the person making the request before enough time (i.e., 5-s) has elapsed for the child to comply, or

(c) requests that are carried out by the person making the request before the child has the opportunity to comply.

Compliance. Just as researchers have found various ways to define commands, there are many definitions of compliance and noncompliance found in the literature (e.g., Forehand & King, 1977; Schoen, 1983; Walker, Ramsey, & Grensham, 2004). Most definitions are operationalized by two components (a) the initiation or completion of a command, and (b) a time frame that the initiation or completion of the task should occur. For example, Forehand and King (1977) operationally defined compliance as the child's initiation of obedience to the parental command within 5-s. In another example, Schoen (1983) suggested that compliance could be operationalized as appropriately following an instruction to perform a specific response within a reasonable and/or designated time. Mace et al. (1988) defined compliance as the subjects in their study initiating the response called for by the command within 10-s of the stated command and eventually completing the response. In these examples, the child is required to either initiate (Forehand & King, 1977), engage in (Radley & Dart, 2016), or initiate and complete (Mace et al., 1988) a stated task. The time frame required to initiate the request is either explicitly stated (within 5-s, Forehand & King, 1977; within 10-s, Mace et al., 1988) or vaguely ("immediate acceptance & execution", Radley & Dart, 2016; "within a reasonable or designated time," Schoen, 1983).

Some researchers have attempted to operationally define compliance by identifying various subgroups of compliance. Schaffer and Crook (1980) suggested that there are three different types of compliance (i.e., orientation, contact, task). Orientation compliance involves the child directing his or her visual attention towards a stimulus

after being directed to do so (e.g., look at the paper). Contact compliance refers to the child making physical contact with a stimulus after being directed to do so (e.g., play with your trains). The third type, task compliance, refers to the child accurately completing the specific request given to him or her (i.e., write your name on your paper).

Noncompliance. Researchers also have offered an array of operational definitions for noncompliance. Kalb and Loeber (2003) suggested that the noncompliant individual purposefully (actively or passively) does not perform a specific request given to him or her by a parent or adult authority figure. Radley and Dart (2016) add that noncompliance can take many forms which may include screaming, or simple inaction on the part of the child.

According to Kuczynski, Kochanska, Radke-Yarrow, and Girnius-Brown (1987), noncompliance can be divided into four types (i.e., passive, simple refusal, direct defiance, negotiation). The first type, passive compliance, refers to a child choosing not to perform the requested behavior by simply ignoring the request and does not include acts of anger, hostility, or defiance. The second type of noncompliance is called a simple refusal. This type of noncompliance involves the child acknowledging but not complying with the specific request. Unlike passive compliance, a simple refusal may be accompanied by anger or hostility if the adult is persistent with the request. Kuczynski et al. defined direct defiance as noncompliance accompanied by hostility, anger, a negative affect, overt resistance, or even attempts at intimidating the person making the request. The fourth type of noncompliance refers to negotiation. Negotiation noncompliance is when the child attempts to deflect the direction given by an adult by reframing the nature or condition of the request. This may take the form of bargaining, proposing alternative

solutions, attempting to redefine the behavior being requested, coming up with a compromise, or offering explanation or excuses to why the behavior cannot be performed.

Regardless of the definition used to define compliance and noncompliance, issues surrounding noncompliant behaviors have been the focal point of many researchers and educators for over four decades (e.g., Forehand & King, 1974; Lipschultz & Wilder, 2017b; Mace et al., 1988, Walker, 1993). Noncompliant behavior is exhibited by all children at some point in time (Kalb & Loeber, 2003), but for students with disabilities, noncompliance can occur at higher rates and is considered a common problem (Walker, 1993). Due to the importance of compliance in children, there have been over 1,000 empirical studies focusing on effective interventions for addressing either increasing compliant behavior or decreasing noncompliant behavior in children, adolescents, and adults (Lipschulz & Wilder, 2017b).

Strategies for Noncompliance

Although there have been over 1,000 empirical studies focusing on compliant or noncompliant behaviors of participants, there have been few systematic reviews on behavioral interventions for addressing noncompliance. Three reviews addressing the broad topic of noncompliance (Houlihan, Sloane, Jones, & Patten, 1992; Lipschultz & Wilder, 2017b; Walker, 1993) are discussed below. In addition, a systematic review of a selected group of consequence-based strategies (Owen, Slep, & Heyman, 2012) and a review of the literature on antecedent strategies promoting child and adolescent compliance (Radley & Dart, 2016) are discussed.

General reviews. Houlihan et al. (1992) included a total of 29 studies published between 1968 and 1990 in a review of the literature on treating childhood noncompliance. No inclusion criteria were provided and there was no mention of methods used for conducting the literature search. Participants ranged from children as young as two to adults in their mid to late 40s. The authors found that the majority of studies on interventions focused on manipulation of behavioral antecedents of noncompliance, manipulation of behavioral consequences of noncompliance, or approaches involving the generalization of treatment effects. Antecedent related topics included investigating variations of command form (e.g., effects of alpha instructions; effects of positive versus negative commands on compliance), investigating the command context (i.e., relationship between noncompliance and the number of maternal commands issues), and controlling and manipulating antecedent behaviors (e.g., eye contact, investigating the effects of behavioral momentum on compliance, rate of commands). Consequence related topics included the use of reinforcement contingent on compliance, differential reinforcement of nondisruptive behavior, treatments provided in laboratory settings, training parents on strategies, or the use of more aversive techniques (e.g., overcorrection, time-out). The authors found only a few studies that reported treatment generalization. Treatment generalization discussed in the literature could be divided into four categories: (a) temporal generality (i.e., maintenance of treatment effects following the termination of the treatment); (b) setting generality (i.e., gains in compliance are generalized from one natural treatment condition to another similar condition); (c) behavioral generality (i.e., changes in behaviors not targeted for treatment); and (d) sibling generality (i.e., effects generalized from the participant receiving treatment to a

sibling not participating in treatment). The authors found that ethical considerations in compliance training with children included concerns with possible side effects of treatment, determining whether increasing compliance is always desirable, concerns with monitoring commands given to children by parents, and concerns regarding the social validity of the specific compliance behaviors targeted for treatments. The authors also noted that there appeared to be a diminishing focus on noncompliance in research as compared to the 1970s. In addition, concerns were noted in the failure of many studies to document generalization across settings and time.

One year later, Walker (1993) compared the noncompliance literature focusing on children without disabilities but who were considered "oppositional" with the noncompliance literature on children with developmental disabilities. Walker had a particular interest in the treatment literature pertaining to the instructions that were refused, the types of tasks that were refused, and the consequences of refusals. No specific inclusion criteria or methodology was provided. The authors of studies that focused on participants without disabilities suggested that compliance was maximized when clear directions were given (i.e., a specific action is requested and ample time is provided for the participant to respond). In addition, compliance could be increased by presenting tasks in a fairly rapid format and by increasing classroom structure through planned activities. Walker concluded that the only consistent findings on the investigation of consequences of noncompliance with students without disabilities was the efficacy of contingent timeout and response cost procedures.

Walker (1993) found that for children without disabilities who were considered oppositional, the behavioral focus in the literature ranged from the participant's failure to

implement a given command to active refusal of compliance including simultaneously engaging in disruptive behaviors. In contrast, noncompliance in participants with disabilities typically focused on failure to follow directions. Walker also found that data associated with antecedent variables for children with disabilities were similar to those of children without disabilities. It was suggested that children with ID were less likely to be expected to comply with instructions that were interrupted or considered ambiguous. In addition, it was recommended that special attention should be placed on clarifying instructions and providing additional prompting (e.g., physical, verbal) as needed. Research focusing on participants with disabilities also found that one could increase compliance by providing several requests with which the participant would likely comply with prior to the targeted request (i.e., HPRS). Investigations on the effects of consequent variables found that the use of positive reinforcement had more of a positive effect on compliance with participants with ID than when used on with participants without disabilities. Walker concluded that noncompliant behavior exhibited by individuals with ID could be treated using behavioral interventions.

Over two decades later, Lipschultz and Wilder (2017b) conducted a review of the literature on the assessment and treatment of noncompliance. The authors found over 1,000 articles that met the inclusion criteria of being an empirical article focusing on interventions aimed at increasing compliance or decreasing noncompliance published in peer-reviewed journals between 1970 and 2016. Due to the high number of articles ($n >$ 1,000), Lipschultz and Wilder (2017b) decided to highlight 42 articles. Each article was selected based on being the first study to focus on a specific assessment or intervention procedure, or because the study added to the existing literature on a specific assessment

or intervention procedure the authors found to be important. Similar to Houlihan et al. (1992), Lipschultz and Wilder (2017b) found that the behavioral interventions shown to be effective at reducing noncompliance could be grouped into two categories: antecedent-based interventions (i.e., advance notice, *n* = 3; form of the instruction, *n* = 10; high-probability instructional sequence, *n* = 6; precursor behaviors, *n* = 5; response effort manipulation, *n* = 2) and consequence-based interventions (i.e., differential reinforcement of compliance, *n* = 4; extinction, *n* = 1; guided compliance, *n* = 4; reprimands, *n* = 1; time-out, *n* = 1). Lipschultz and Wilder (2017b) discovered that more research has been conducted on the use of antecedent-based interventions than on the use of consequence-based interventions. In addition, they suggested that the most effective interventions focused on the link between assessment and intervention, placing an emphasis on the function of the noncompliant behavior.

Consequence-based interventions. Consequence-based strategies apply environmental modifications following the occurrence of either the targeted compliant or noncompliant behavior. These strategies focus on reducing the future occurrence of the targeted behavior (i.e., noncompliance) or future occurrence of targeted behavior (i.e., compliance) after it has already occurred (Lipschultz & Wilder, 2017b).

Owen et al. (2012) conducted a systematic review of literature published between 1970 and 2012 focusing on the effect of praise, reprimand, positive nonverbal consequences, and negative nonverbal consequences (i.e., consequence-based interventions) on child compliance. A total of 41 studies met the authors' inclusion criteria and included studies incorporating an experimental design *(n* = 19), parent training guides *(n* = 9), studies implemented in a naturalistic-home setting *(n* = 7), and

studies implementing an observational design in a laboratory setting (*n* = 6). The majority of participants were diagnosed as being noncompliant or not having a specific diagnosis. One study included participants with ASD (Lomas, Fisher, & Kelley, 2010) and three studies included participants identified as having developmental disabilities (Ducharme, Harris, Milligan, & Pontes, 2003; Marchant, Young, & West, 2004; McIntyre, 2008). Results indicated that reprimand and negative nonverbal responses were associated with compliance in the naturalistic studies and consistently resulted in greater compliance in the experimental and training studies. Negative nonverbal responses included signals of negative emotion (e.g., body language, facial expressions) and the use of backup contingencies (e.g., removing preferred items, time-out). Applying the concept of operant conditioning, the authors concluded that if reprimands and negative nonverbal responses work immediately to increase compliance, it is due to their punishing effect being more powerful than the reinforcing effect of the noncompliant behavioral response.

Owen et al. (2012) found the relation between praise and positive nonverbal responses to compliance was not as straight forward as the relation between reprimands and negative nonverbal responses to noncompliance. It was suggested that the use of praise had less of an immediacy of effect on compliance. There was a lack of consistent connection between receiving praise and engaging in the compliant behavior prior to the praise found in the reviewed studies. The authors suggested that one possible explanation for these findings is that children who are identified as noncompliant engage in fewer positive exchanges with adults, contingent on compliance. In addition, Owen et al. found that praise alone can have a negative effect on children including negatively impacting motivation to comply.

Antecedent-based interventions. In contrast to consequence-based interventions, which manipulate the variables following the occurrence of a targeted behavior, antecedent-based interventions manipulate the environmental conditions that occurs prior to the targeted behavior (Cooper et al., 2007). In terms of noncompliance and other undesired targeted behaviors, antecedent interventions are concerned with preventing the targeted behavior from occurring in the first place.

Radley and Dart (2016) conducted a systematic review of compliance literature specifically to identify antecedent strategies that were effective in increasing compliant behavior or reducing noncompliant behavior in children. Forty-two single subject studies published in peer-reviewed journals between 1975 and 2014 were included in their review; these studies included 135 children. Nine specific antecedent-based interventions were identified in the review. These interventions included: high-probability request sequence (HPRS) with 14 studies (33.3%) and 32 participants, errorless compliance training with 12 studies (28.5%) with a total of 60 participants, command form with eight studies (16.6%) including a total of 27 participants, eye contact in isolation of other procedures with two studies (4.8%) and a total of six participants, time-in with a total of six studies (14.3%) and 20 participants, precorrection with three studies (7.1%) and 12 participants, choice with only one study (2.4%) and one participant, differential reinforcement of other behavior and noncontingent reinforcement with two studies (4.8%) and four participants, and altering the rate of directives with one study (2.4%) and one participant.

One of the most thoroughly researched interventions for increasing child and adolescent compliance was HPRS. The 14 studies utilizing a HPRS in the review

included a total of 32 participants ranging in age from two to 19 *(M* = 6.8). The authors found that these studies included participants with a diagnosis of Down syndrome *(n* = 4), attention deficit hyperactive disorder (ADHD; *n* = 1), ASD *(n* = 6), ID *(n* = 3), developmental disabilities *(n* = 1), language disorder *(n* = 1), tuberous sclerosis *(n* = 1), or unidentified severe disabilities *(n* = 2). Thirteen out of the total 32 participants had no diagnosis. The authors suggested that HPRS could be considered a "probably efficacious" treatment of noncompliance based on criteria established (i.e., at least three single-case studies employing a good design and that have compared the intervention to other treatments; Chambless et al., 1998).

Summary. Empirical studies on strategies aimed at increasing compliance or decreasing noncompliance in children is not rare with over 1,000 studies found in peer-reviewed literature (Lipschultz & Wilder, 2017b). These interventions can easily fit into the two categories of consequence-based or antecedent-based interventions. Where consequence-based interventions are concerned with preventing future occurrences of noncompliant behavior, antecedent-based interventions focus on keeping noncompliant behavior from occurring in the first place. Both categories of interventions have empirical support (Lipschultz & Wilder, 2017b; Owen et al., 2012; Radley & Dart, 2016) and include a broad range of interventions that have shown to be effective with young children and adolescents with and without disabilities when implemented by therapists, parents, teachers, and paraeducators. Although both consequence-based and antecedent-based interventions have been shown to be effective in reducing noncompliant behavior in children and adolescents, antecedent-based interventions may be the preferred method for educators and parents. Radley and Dart (2016) suggested that antecedent strategies,

have the potential to prevent the target behavior from ever occurring and may be more accepted and considered more socially valid to parents. It was suggested some parents may not be willing to have the participant engage in the targeted low-*p* behavior again in order to implement a consequence-based strategy. The literature reviews that targeted antecedent interventions (Radley & Dart, 2016) or targeted treatments for noncompliance including antecedent interventions (Lipschultz & Wilder, 2017b) identified the specific antecedent intervention, known as HPRS, as a highly researched intervention found to be effective in the majority of studies at decreasing noncompliant behaviors in young children, adolescents, and adults.

Defining High-Probability Request Sequence

The HPRS has been referred to my many names in the literature including high-probability command sequence (HPCS; e.g., Austin & Agar, 2005; Axelrod & Zank, 2012), high-probability requests sequence (HPRS; e.g., Houlihan et al., 1994; Mace et al., 1988), high-probability instructional sequence (HPIS; e.g., Ardoin, Martens, & Wolfe, 1999; Esch & Fryling, 2013; Lipschultz & Wilder, 2017a; Smith & Lerman, 1999), interspersed requests (e.g., Sprague & Horner, 1990), and pretask requests (e.g., Singer, Singer, & Horner, 1987). For the purposes of this dissertation, the intervention is referred to as HPRS.

HPRS involves implementing a series of easy to follow requests (i.e., high-probability requests; high-*p* requests) within a relative short amount of time between requests prior to presenting a request to the participant to engage in a behavior with which they have a history of not complying (i.e., low-probability request; low-*p* requests). Although there are many interpretations of this intervention, most researchers

agree on a common set of characteristics necessary for the HPRS to be successful. First, there is consensus that the HPRS should include between three and four easy to follow requests. Second, the requests should occur in rapid succession from each other. Consensus has been that a shorter interval between the last high-*p* request and the presentation of the low-*p* request (i.e., inter-response time) is more effective than a longer IPT, with 5-s being a common suggested IPT (e.g., Lipschultz & Wilder, 2017a; Pitts & Dymond, 2012). In addition, reinforcement should be provided for each instance of compliance with high-*p* and low-*p* requests.

Applied Behavior Analysis and Behavioral Momentum Theory

There have been a couple of explanations of the theoretical framework that makes the HPRS intervention successful. For example, Brandon and Houlihan (1997) suggested that the HPRS procedure could be explained as being a concurrent chain schedule of reinforcement where two concurrently available sources of reinforcement are available to the participant (i.e., reinforcement controlled by therapist, intrinsic reinforcers available to the participant). Both sets of reinforcers are contingent on the occurrence of some behavior. In this scenario, compliance with high-*p* requests and the reinforcement that follows effectively establishes the therapist (or other adult) as an effective source of reinforcement, therefore, increases the likelihood of the participant complying with the low-*p* requests. Although this explanation has merit, the most widely accepted explanation of why the HPRS is effective is based on the theory of behavioral momentum (Mace et. al., 1988; Nevin et al., 1983). The following section provides a brief review of research in the field of applied behavior analysis leading up to the development of the theory of behavior momentum.

Applied behavior analysis. According to B. F. Skinner, in order to adequately articulate an interaction between an organism and its environment, it is necessary to specify three things: (a) the occasion upon which a response occurs, (b) the response itself, and (c) the reinforcing consequences (Skinner, 1969). Skinner (1953) suggested that consequences of behavior provide feedback to the organism emitting the behavior and in return affect the probability of the organism producing the same behavior again. When a consequence that follows a behavior increases the future frequency of that behavior under similar conditions, reinforcement has occurred (Cooper et al., 2007).

The concept of reinforcement has been studied for over 100 years and one of the earliest attempts at defining reinforcement was Thorndike's law of effect (Plaud & Gaither, 1996; Skinner, 1938; Thorndike, 1911). According to Thorndike, a response can be strengthened in the future if it is followed by a pleasant event in a given situation. In contrast, if a response is followed by an aversive event, the association would weaken the strength of the response, reducing the likelihood of the response being emitted in the future under similar conditions. Thorndike used the terms satisfier and annoyer to refer to these pleasant and aversive events. Skinner (1938) went on to use the terms positive and negative reinforcement and punishment to refer to the consequences that followed a given response.

To further explain behavior, Skinner used the term discriminated operant to describe behavior that occurs more frequently under some antecedent conditions than it does in others (Cooper et al., 2007). In behavioral terms, the discriminated operant is under stimulus control, meaning that when certain conditions are present (i.e., discriminative stimulus), the discriminated operant will occur at a higher rate than when

those same conditions are not present. Skinner (1969) use the three-term contingency to explain this relation. According to Cooper et al. (2007), the three-term contingency is the "basic unit of analysis in the analysis of operant behavior [and] encompasses the temporal and possibly dependent relations among an antecedent stimulus, behavior, and consequence" (p. 706). An example of the three-term contingency is provided in Figure 1 using the response class of compliance.

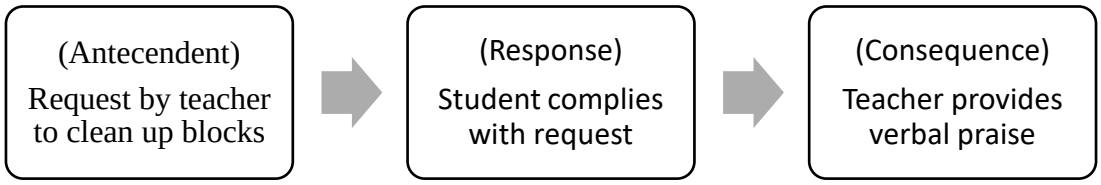

Figure 1. Three-term contingency applied to the response class of compliance.

There are two separate aspects of discriminated operant behaviors that have been the focus of researchers of behavioral momentum, including (a) the rate of occurrence of a given response and (b) the resistance to change a response has under given conditions. The rate of occurrence is concerned with the relation between the response (the behavior) and the consequence that follows. The resistance to change a response has is concerned with the relation between the discriminative stimulus (S^D; antecedent) and the consequence variables (i.e., reinforcement, punishment).

Response rate. Response rate can be defined as the "frequency with which the behavior under investigation is emitted in a fixed amount of time under constant conditions" (Plaud & Gaither, 1996, p. 189). According to Skinner (1938), response rate is the best measurement of the principal strength of an operant behavior. The relationship between the response rate and the consequence that follows can be conceptualized through the work of David Premack.

Premack (1959) suggested that the nature of reinforcement (i.e., the consequence that follows the behavior) could be understood through the analysis of two responses (e.g., X and Y) if the experimenter arranges both of the possible contingencies between the two responses and notes the differences between the contingences in which reinforcement does or not occur. In his hypothetical rat example, Premack suggested collected preliminary measures to determine the independent rate of occurrence of response X (bar pressing when made available) and response Y (pellet consumption when made available). Once the experimenter establishes the independent rate for each response, the experiment could continue to the next phase. Next, the experimenter would arrange both contingencies (a) making the pellets contingent on bar pressing and, (b) making bar pressing contingent on eating pellets. Premack stated that, "reinforcement results when [a response] of a lower independent rate coincides, within temporal limits, with the stimuli governing the occurrence of [a response] of a higher independent rate" (p. 219). In other words, if there is an observed increase in bar pressing (lower independent rate) when consumption of pellets (higher independent rate) are made available contingent on bar pressing, then access to pellets positively reinforced the bar pressing behavior of the rat. This is summed up in the Premack principle, that states that "making the opportunity to engage in a behavior that occurs at a relatively high free operant rate contingent on the occurrence of a low-frequency behavior will function as reinforcement for the low-frequency behavior" (Cooper et al., 2007, p. 271).

Resistance to change. Another aspect of discriminated operant behavior important to behavioral momentum is the behavior's resistance to change, also known as response strength (Nevin, 1974). Unlike response rate, which is concerned with the

relation between the response and the consequence that follows, resistance to change (i.e., response strength) depends on the contingencies between the stimulus presented prior to the response (the S^D or antecedent) and the consequence following the response (Nevin & Grace, 2000).

Development of the behavioral momentum theory. According to Nevin et al. (1983) learned behavior varies in its resistance to change. In addition, a behavior's resistance to change is dependent on the rate of reinforcement across a variety of procedures. Nevin and colleagues suggested that due to the persistence in behavior to continue after faced with a change in conditions, a learned behavior could possess momentum. Newton's law of motion was used to explain this notion. First, in physics, momentum is defined as the product of mass and velocity. If two stones of differing weights are rolling down a hill at the same speed (i.e., velocity), they would possess different momentums. The difference in momentums of the two stones would not be evident until there was an external force that opposed the motion. In this scenario, the external force could be visualized as a limb laying across the stone's path. The difference in momentum would be evident by observing the difference in change in velocity of the two stones after hitting the limb (i.e., the external force). The larger stone's velocity would change less than the lighter stone, giving the larger stone more momentum. The change of velocity (the stone's speed) of a body (the stone) is proportional to the impressed force (the limb).

This understanding of momentum as described in physics has been applied to understanding behavior using the two separate aspects of discriminated operant behavior (i.e., response rate, resistance to change). According to the theory of behavioral

momentum, reinforcement generates both velocity-like and mass-like properties of behavior (Podlesnik & DeLeon, 2015). The velocity-like properties refer to the effect that reinforcement has on the frequency of a target behavior, or response rate. The mass-like properties refer to the underlying factors that are influencing how persistent the behavior is after being exposed to an external force, also known as resistance to change. The external force would be any disruption condition or external variable applied after the behavior has occurred. According to the behavioral momentum theory, response rates (that are established and maintained by the contingencies of reinforcement) and resistance to change (when responding is challenged or disrupted) are independent and separable dimensions of behavior (Nevin, 1996). Nevin et al. (1983) defined behavioral momentum as the relative tendency for behavior to persist when challenged by competing behaviors or external variables. According to Nevin (1996), if one of the primary goals of applied behavior analysis is to establish a desirable, adaptable behavior through the use of interventions that ensure the behavior will persist after the intervention ends, then a successful intervention would endow behaviors with high levels of momentum. Figure 2 illustrates the conceptual framework of the theory of behavioral momentum and the HPRS.

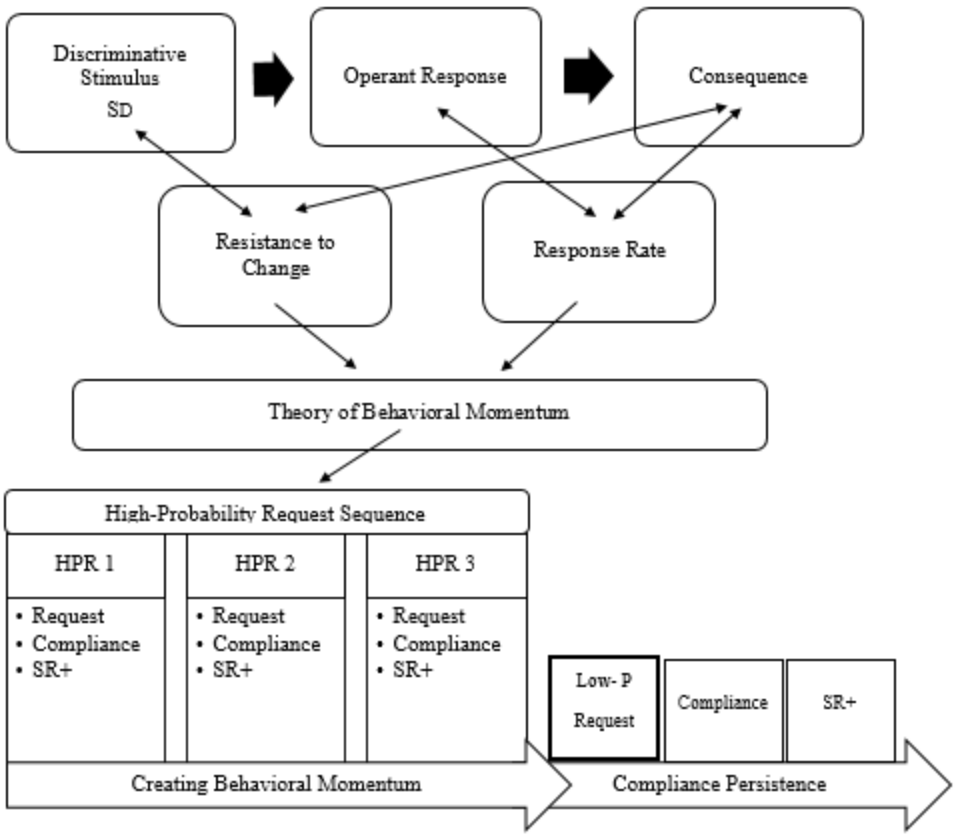

Figure 2. Conceptual framework of the theory of behavioral momentum and of the high probability request sequence. Reinforcement contingent on compliance to high-*p* requests creates behavioral momentum increasing the likelihood that compliance will persist when challenged with a low-*p* request.

Behavior Momentum and HPRS Early Applications

In the 1980s, several researchers developed strategies to target noncompliant behavior. These strategies were similar in nature and would come to be known collectively as behavioral momentum interventions. The following section provides an early description of a direct instruction strategy for addressing noncompliance (i.e., hard-task procedure) and the first two research studies examining the effects of the behavioral momentum interventions on noncompliance.

Without mention of the concept of behavioral momentum and five years prior to Mace et al. (1988) use of the term “high-probability request sequence,” Engelmann and

Colvin (1983) described a technique referred to as the hard-task procedure in the direct instruction program, *Generalized Compliance Training*. The authors suggested that a task would be easier to comply with if it immediately follow a series of familiar and firm tasks. It was proposed that in order to maximize the probability that a learner would respond to a task that was difficult, the adult should present a series of six familiar and firm tasks in random order. This first phase of the hard procedure is almost identical to what would become known as behavioral momentum interventions (e.g., HPRS). The second phase involves moving the order of the tasks so that the targeted behavior occurs near the beginning of the series of requests. This phase is similar to interspersed requests, which is another behavioral momentum intervention similar to the HPRS.

Singer et al. (1987) implemented ABA and BAB reversal designs to investigate whether an intervention modeled after Engelmann and Colvin's (1983) hard task procedure would increase compliance to teaching instructions for four elementary students diagnosed with moderate to severe disabilities. The authors used the term "pretask requests" to refer to their intervention that included four distinct steps. First, the interventionist had to identify three to five "pre-requests" that required less than 3 s to complete and had a high-probability of compliance. Second, three of these commands had to be delivered in rapid succession. Third, verbal praise had to be delivered contingent on compliance with each of the requests. Finally, the target request had to be delivered immediately after compliance with the last pre-request. The intervention had an immediate effect on two of the participants and a slightly delayed effect on the remaining two. Results indicated that there was a functional relation between the implementation of

the pre-task procedure and an increase in the compliance of following a request that signaled transitioning from play to work.

Mace et al. (1988) conducted a series of five experiments in their seminal study that first used the term high-probability command sequence (HPCS; also referred to as high-probability request sequence or HPRS) in reference to the intervention created based on the theory of behavioral momentum. According to the authors, the HPRS "indirectly manipulates rate of reinforcement to establish what appears to be 'momentum' of compliant behavior that may persists when subjects are asked to perform a task with a low probability of compliance" (p. 124).

The purpose of Mace et al.'s (1988) first experiment was to evaluate the effectiveness of the HPRS in increasing compliance to "do" and "don't" commands. "Don't" commands were similar to what Patterson (1982) termed as aversive commands (e.g., "don't put your feet on the table"). A multielement design was used to evaluate the effects of the HPRS on the percentage of compliance to low-*p* commands with an adult participant with a severe ID and a history of noncompliance. Similar to procedures described by Engelmann and Colvin (1983) and Singer et al. (1987), Mace and colleagues' intervention involved issuing a series of three to four high-probability commands immediately preceding the presentation of a low-*p* command. Low-*p* commands were defined as commands that the participant was unlikely to comply based on the experimenter's prior experience with the participant. On the contrary, high-*p* commands were those with which the participant had a history of complying. During baseline conditions, the experimenter randomly selected a low-p command from a pool of 20. On day seven, the participant was prescribed medication for aggression. The

experimenter considered this a “return-to-Haldol” phase of the study. Baseline procedures remained in effect. Both types of commands would be issued during the next three phases, with HPRS procedures being applied to either the “do” (ABA design) or “don’t” (BAB design) requests. During the last phase, the HPRS was applied to both types of requests. Results indicated that the HPRS was effective in increasing compliance with low-*p* requests. When the HPRS was applied to “don’t” instead of “do” commands, “don’t” commands were complied with at higher rates than “do” commands as well as at higher rates than baseline conditions with and without medication. During phase six, when the HPRS was applied to both types of commands, levels of compliance were higher than baseline levels for both types of commands.

The purpose of Mace et al.’s (1988) second experiment was to evaluate whether the HPRS’s effects in the first experiment would be generalized to a second participant as well as to examine the possible effects of positive attention alone on compliance. Unlike the first experiment, where high-*p* and low-*p* commands were selected based on previous experiences alone, more systematic procedures were implemented. Ten separate trials occurred prior to experimental conditions involving the delivery of 25 tasks to the participant. If the participant complied with a command four or fewer times across the 10 trials, the command would be identified as a low-*p* command. A similar procedure was implemented to identify high-*p* commands with criteria set at 80% or higher. An ABAB reversal design was implemented to evaluate the effects of the HPRS on compliance with low-*p* commands for one adult participant identified as having a severe ID. In addition to the implementation of the HPRS procedure, an ongoing attention control condition was alternated with either the baseline or the HPRS condition using a multielement design.

Results indicated that compliance occurred at a higher percentage during phases when the HPRS was implemented and remained at lower percentages during baseline and return to baseline conditions. In addition, attention alone was not sufficient in increasing percentage of compliance with low-*p* requests.

The third experiment in Mace et al.'s (1988) article investigated the effects of increasing or decreasing the interval duration between each high-*p* command in the HPRS and between the last high-*p* command and the presentation of the low-*p* command. By changing this duration between prompts (i.e., inter-response time), the experimenters were directly manipulating the rate of reinforcement delivered to the participant, directly impacting the momentum of the compliant behavior (Nevin et al., 1983). A multielement design was used, alternating in random order the "do" and "don't" command sessions. The effects of a 5-s IPT and 20-s IPT were alternately applied to the "do" or "don't" command sessions using a reversal design. Results indicated that the type of command that were under the 5-s IPT condition had higher percentages of compliance in each phase as compared to the type of command under the 20-s IPT condition. This finding was the first to demonstrate that the momentum-like effects created by the HPRS appeared to be effected by the time between the HPRS and the low-*p* command.

In the first three experiments of Mace et al.'s (1988) series of studies examining the effects of the novel intervention, HPRS, the dependent variable was the percentage of compliance to low-*p* commands. For the final two experiments, additional dimensions of behavior were measured. In experiment four, a multielement design was implemented to examine the effects of the HPRS on the latency (in seconds) to initiate a low-*p* task following staff directions with two participants with moderate ID. Latency was defined as

the total time between the ending of the experimenter's instruction to complete a low-*p* command and the participant's initiation of the specific task.

For the first participant, one of the three conditions (i.e., baseline, HPRS, attention control) were randomly presented per day over a period of 9 days. This was followed by presenting the three conditions in a random and balanced order for days 10 through 27. For the second participant, two of three tasks (i.e., empty trash, sweep floor, clean mirror) were presented one at a time alternating between baseline and HPRS conditions. Results demonstrated that when low-*p* commands were preceded by a HPRS, both participants demonstrated a reduced latency to comply with instructions as compared to baseline conditions. In addition, for participant two, it was determined that the momentum-like effects of the HPRS were consistent across all three requests issued.

In the final experiment, Mace et al. (1988) compared the effectiveness of the HPRS with the use of simple prompts and a contingency management procedure. A four-phased multielement design was used to measure the varying effects the three independent variables had on the time it took a participant with moderate ID to complete three task segments relating to his shower routine (i.e., shower preparation, showering, getting dressed). The conditions across the four phases included (a) baseline conditions, (b) contingency management conditions where the experimenter would present a contingency statement (i.e., "Mitch, if you finish by the time the buzzer sounds you can have your choice when you're done with your shower," p. 135), (c) prompts condition where the experimenter presented additional vocal and gestural prompts to resume a task contingent on each episode of off-task behavior, and (d) the HPRS condition. During phases one and three, baseline conditions were in effect for all three task segments.

During phase two, task segments were randomly assigned one of the three independent variables (contingency management, vocal prompts, HPRS). During phase four, the HPRS was assigned to all three task segments per session. The results of the fifth experiment, demonstrated that the participant demonstrated faster performance of tasks during all three experimental conditions as compared to baseline and return to baseline conditions. In addition, results indicated that the HPRS was the most effective procedure for decreasing task completion time.

Summary. Both Singer et al. (1987) study utilizing a pretask request sequence modeled after the hard task procedure (Engelmann & Colvin, 1983) and the series of five experiments in Mace et al.'s (1988) study demonstrated that the likelihood of compliance to low-*p* requests could be increased by preceding a low-*p* request with a series of three to four easier and previously mastered requests. In addition, Mace et al. determined that the HPRS could also decrease the latency between the issuing of the request and the initiation of beginning the task, as well as reduce the time it takes to complete the low-*p* request. Mace et al. added to the research by being the first to examine the effect of varying IPTs and determined that a shorter duration between compliance of high-*p* request and the issuing the low-*p* request had a positive effect on the behavioral momentum aspects of the HPRS procedure. These two studies demonstrated the effectiveness of the intervention with both young children (ages 7-10) and adults (ages 34-45) with moderate to severe ID and could be administered in the special education classroom or group home setting. In addition, these two studies demonstrated that the HPRS could be used to increase compliance with directions related to transitioning from

a preferred to a non-preferred activity (Singer et al., 1987) and directions related to compliance with self-care routines or daily household chores (Mace et al., 1988).

HPRS Reviews

Since the initial studies conducted in the 1980s on the HPRS, several reviews of the antecedent intervention have been published. The following section provides a look at these reviews.

Davis and Brady (1993) were the first researchers to publish a review on the use of HPRS and compliance. The term, "behavioral momentum," was used to refer to a group of techniques that involved issuing a set of simple requests prior to issuing the request identified as the stimulus for problem behaviors (i.e., pre-task requests, interspersed requests, high-probability requests). The seven applied momentum research studies discussed in the review included the first two applications (i.e., Mace et al., 1988; Singer et al., 1987) and six replications and extensions of the HPRS procedure (i.e., Davis, Brady, Hamilton, McEvoy, & Williams, 1994; Davis, Brady, Williams, & Hamilton, 1992; Harchik & Putzier, 1990; Horner et al., 1991; Mace & Belfiore, 1990; Sanchez-Fort, Brady, & Davis, 1995). Davis and Brady concluded that behavioral momentum strategies had been an effective and proactive strategy for improving compliance. It had been effective in children ages four to 14 and with adults ages 23 to 45. The authors found that the intervention had been limited in its application (i.e., task compliance) and that future researchers needed to expand and replicate the existing research in areas representing all areas of learning and development.

Six years later, Killu (1999) conducted a review of the literature on HPRS. Sixteen articles were included and were categorized in one or more of the following

categories: (a) early applications of the high-*p* request research, (b) methodological extensions of the HPRS procedure, (c) focused on challenging behaviors, (d) focused on social skills, (e) focused on communication, (f) focused on academics, or (g) included generalization or maintenance measures. Killu found that the focus of responding in HPRS intervention studies was limited to increasing simple, isolated requests that occurred outside of a functional context. Like Davis and Brady (1993), Killu concluded that there was a need in the literature to expand the use of the HPRS beyond simple compliance.

Banda, Neisworth, and Lee (2003) conducted a review of the literature on HPRS, but unlike previous studies, the review focused solely on enhancing compliance with young children. The authors conducted a computer search using keywords associated with the various HPRS intervention names and located 16 studies that met inclusion criteria. Results indicated that the studies included a total of 33 children, 20 months to 8 years of age. Twenty-eight of the 33 children were diagnosed with having disabilities and the majority of participants were boys *(n* = 24). The majority of studies were conducted in self-contained classrooms, within regular schools, or within inclusive classrooms with interventionists being parents, teachers, psychologists, therapists, graduate assistants, or peers. Other settings included home, group home, or hospital settings. Similar to the findings of Killu (1999), the majority of the studies (63%) focused on increasing participant's compliance with general requests. Additional areas began to emerge including complying with social, communicative, transition, medical care, and food intake requests. Banda et al.'s review also determined that 11 of the 16 studies operationally defined high-*p* requests as those complied with 80% of the time and that 13

% of the studies had a criterion of 50% compliance for defining low-*p* requests. In addition, the IPT used by most researchers (56%) was set at 5-s. Only four of the 16 studies reported generalization measures and five of the 16 reported social validation of the intervention by teachers and parents. Banda et al. suggested that future studies needed to focus on specific characteristics of the HPRS technique including types and topographies of requests, its application for building math and reading fluency, and the use of the procedure with groups of participants. In addition, it was suggested that future research was needed to address concerns related to maintenance, generalization, and social validity measures.

Lee (2005) conducted a quantitative analysis of applied research on HPRS. Unlike Banda et al.'s (2003) review, Lee included all studies pertaining to the use of the HPRS intervention in applied settings. The author's review included studies published in peer-reviewed journals between 1987 and 2001 and included a total of 28 studies. Results indicated that participants with severe to profound disabilities accounted for 23.50% of the total 68 participants across all studies. Other classifications of participants included "other or not specified" (22.10%), "behavior disorders" (14.70%), "mild and moderate ID" (14.70%), "ID and autism" (13.20%), "no disabilities" (7.40%), "autism" (2.90 %), or "learning disabilities" (1.50%). Request categories across the 28 studies included combination of request types *(n* = 21; 30.90%), other *(n* = 15; 22.10%), communication and social *(n* = 14; 20.60%), not specified *(n* = 7; 10.30%), academic requests *(n* = 5; 7.40%), domestic skills *(n* = 3; 4.40%), and self-care *(n* = 3; 4.40%). The majority of interventions were conducted in segregated settings versus more inclusive settings. Results of follow-up analysis indicated that the interventions delivered in segregated or

inclusive classrooms were more effective than interventions delivered in residential placements.

Summary. All four reviews concluded that the HPRS procedure was found to be effective in increasing compliant and decreasing noncompliant behaviors for both children and adults. In addition, the procedure was found to be effective for young children, school-aged children, and adults. The intervention has been implemented with success in various settings, although Lee (2005) found that the intervention was more effective in school settings versus residential settings.

Behavioral Momentum and HPRS as an Evidence-Based Practice

Even though the previously mentioned reviews have found that the HPRS has been successful with students with and without disabilities, various age ranges, various settings, and across various types of requests, there is question to whether or not HPRS should be considered an evidence-base practice. The following section includes a brief description of evidence-based practices (EBPs) as well as a description of the studies who sought to make this determination.

Evidence-based practices. In order to meet the accountability demands required in education (Every Child Succeeds Act, 2015; Individuals with Disabilities Education Act, 2004), educators are in need of effective, evidence-based interventions (Kratochwill et al., 2013). According to the Council for Exceptional Children (CEC), reviews of practices whose purpose is to identity EBPs should set clear parameters on both a specific outcome and a targeted population. To date, HPRS and behavioral momentum strategies have been evaluated by four research teams to determine whether these interventions could be considered an EBP for meeting the educational needs of children with autism.

No attempts to identify the HPRS as an EBP for individuals with moderate to severe ID or other disabilities other than ASD have been published.

National Autism Center. The National Autism Center (NAC) released the National Standards Report in 2009 which was considered one of the most comprehensive analysis at the time focusing on interventions for children and adults with ASD (National Autism Center, 2015). The NAC used a strength of evidence classification system to identify practices as established (i.e., sufficient evidence; two group design or four single-case design studies & a minimum of 12 participants), emerging (i.e., one or more studies producing favorable outcomes; additional high quality studies are needed), unestablished (i.e., little to no evidence about treatment effectiveness with ASD), or ineffective or harmful (i.e., sufficient evidence determining intervention has been ineffective or harmful to individuals with ASD). Results from phase one of NAC's National Standard Project indicated there were 11 treatments that could be classified as "established treatments" for individuals with ASD. One of the establishing treatments was called "Antecedent Package" and included 99 studies. Antecedent packages were defined as, "interventions [involving] the modification of situational events that typically precede the occurrence of a target behavior." (NAC, 2009, p. 12). Antecedent package was an umbrella term encompassing several treatments including behavioral momentum interventions.

NAC launched the second phase of the National Standards Project in 2011 (NAC, 2015). The purpose of this second phase was to include an updated summary of ASD intervention literature that included studies published between 2007 and 2012. In phase one, antecedent and behavioral package interventions were separated into two broad

categories of established treatments; however, the decision was made in phase two to combine both of these categories into one (i.e., behavioral interventions). The second phase found behavioral interventions to be an established practice for children, adolescents, and young adults with ASD. This category included both antecedent-based (e.g., behavioral momentum strategies) and consequence-based interventions.

National Professional Development Center. The National Professional Development Center on Autism Spectrum Disorders (NPDC) was funded by the Office of Special Education Programs (OSEP) in 2007 in order to identify and promote the use of EBPs with infants through young children with ASD and their families (Odom, Collet-Klingenberg, Rogers, & Hatton, 2010). The NPDC conducted its own review of the literature published between 1997 and 2007. Research design quality indicator criteria established by the Council for Exceptional Children (CEC) Division of Research was used to evaluate articles for inclusion in the review. A total of 175 articles were identified that met criteria and were divided into intervention categories. At the time of the review, 24 focused intervention practices were identified having sufficient evidence to be classified as EBPs. Unlike the findings from NAC, the NPDC did not include a broad category (i.e., antecedent interventions; behavioral interventions) that included behavioral momentum strategies.

In 2014, NPDC released an updated review that expanded the time frame to include articles published between 1990 and 2011 (Wong et al., 2014, 2015). In addition, a broader and more rigorous review process was utilized in the identification of EBPs. A total of 456 studies were included in the review that included a total of 542 participants with a diagnosis relating to ASD (autism, $N = 382$; PDD/PDD-NOS, $N = 64$; Autism

Spectrum Disorder, *N* = 56; Asperger Syndrome/HFA, *N* = 40). Criteria for an intervention to be considered an EBP included (a) having two high-quality experimental or quasi-experimental designs conducted by two different research groups or (b) having at least five high-quality single-case design studies conducted by three different research groups and including a total of 20 participants across all studies (Horner et al., 2005; Wong et al., 2014). Results indicated that 27 practices met criteria for being considered an EBP. Like NAC initial report in 2009, NPDC identified the category of antecedent-based interventions as an EBP for children, adolescents, and young adults with ASD. Unlike the NAC report, NPDC did not include behavioral momentum interventions in this category. Instead, behavioral momentum was evaluated on its own and was placed in the category of "other focused intervention practices with some support." Although there were nine SCD studies using behavioral momentum interventions that met inclusion criteria, there were only 16 participants across the studies that did not meet criteria (i.e., 20) for being considered an EBP. Even though the term "behavioral momentum interventions" was used, the definition provided described the HPRS procedure. The NPDC defined behavior momentum interventions as the "organization of behavior expectations in a sequence in which low probability/preference behaviors are embedded in a series of high probability/preference behaviors to increase the occurrence of the low probability/preference behaviors" (Wong et al., 2014, p. 25).

Brosh et al. (in press) expanded the findings of Wong et al. (2014) by conducting a comprehensive review of the literature on the effects of HPRS on outcomes for individuals with ASD published between 2012 and 2016. Using a direct replication of Wong et al., six additional studies were found that could be added to the evidence

supporting HPRS as an EBP for increasing compliance with participants diagnosed with ASD. When combined with the findings of Wong et al., HPRS interventions had a total of 26 participants, across 14 high-quality single-case design studies conducted by 12 different investigators or research groups, meeting the established criteria (Wong et al., 2014) to be considered an EBP.

Meta-Analysis. Cowan, Abel, and Candel (2017) conducted the most recent meta-analysis on single-case research on behavior momentum that focused on participants with autism. The authors included two behavioral momentum interventions (i.e., HPRS; task interspersal). Cowan et al. conducted a comprehensive database search, manual searches through six journals relevant to the topic, and conducted ancestral searches from several articles. A total of 16 studies including a total of 40 participants (aged 3-13; $M = 5.7$) were included in the meta-analysis. Of the 16 studies, 69% utilized the HPRS procedure and 31% used task interspersal as the independent variable. Cowan and colleagues developed their own rubric to determine whether a study met criteria associated with 10 critical elements of single-case research designs (SSRD) based on a review of the literature on quality indicators for SSRD (CEC 2014; Horner et al., 2005; Kratochwill et al., 2013). In addition, effect sizes and confidence intervals were calculated (Parker et al., 2009). Of the 16 studies included in the review, only four studies adequately addressed all of the 10 quality indicators. These four studies utilized the HPRS. The authors followed the recommendation set by CEC (2014) that only studies meeting all quality indicators should be used to determine the overall effectiveness of an intervention (Cowan et al). Horner et al. (2005) and Kratochwill et al. (2013) suggested that in order for a practice to be considered evidence-based, there needs to be at least five single-case

design studies across three different geographic locations that include at least 20 participants. Based on the recommendation and criteria set by Horner et al. and Kratochwill et al., HPRS interventions could not be considered an EBP for students with ASD. Cowan et al. found only four studies from three different research groups that included outcomes for seven participants.

Summary. The reports by NAC and NPDC add to the evidence that interventions grounded in the science of applied behavior analysis and behavioral psychology are among the most effective approaches for individuals with ASD (Cowan et al., 2017). Early EBP reports (NAC 2009, 2015) found that when HPRS (behavioral momentum intervention) was included in a broader category of antecedent interventions or behavioral interventions, it could be classified as an EBP across ages for individuals with ASD. Later studies that evaluated the effect of HPRS in isolation (Cowan et al., 2017; Wong et al., 2014, 2015) found insufficient evidence to support HPRS as an EBP with one review (Wong et al., 2014) considering it an emerging practice due to not meeting the 5-3-20 criteria (CEC, 2014; Horner et al., 2005, Kratochwill et al., 2013). Brosh et al. (in press) did find that HPRS interventions could be considered an EBP for individuals with ASD when considering research published after Wong et al.'s (2014) review.

Applications of the HPRS

Since the early applications of the HPRS, several replications and variations of the antecedent-based intervention have been attempted in applied behavioral research. The HPRS has been used to increase compliance with (a) general tasks, (b) medical related tasks, (c) social and communication related requests, (d) requests relating to transitioning between activities, (d) transitions within academic activities, and (e)

requests used as a means to increase compliance in the presence of escape-motivated behaviors. In addition, the HPRS has been studied in isolation, in comparison studies, and has been included as one component in treatment packages. The following section reviews the research that has been conducted in each of these domains.

HPRS and general task compliance. Mace et al. (1983) demonstrated that the HPRS could be used to increases compliance with general tasks within the group home setting with adults with moderate to severe ID. Since then, the largest body of research in the use of the HPRS has related to general task compliance and has included individual diagnosed with moderate to severe ID (e.g., Belfiore, Basile, & Lee, 2008; Ducharme & Worling, 1994; Kennedy, Itkonen, & Lindquist, 1995), ASD (e.g., Houlihan et al., 1994), mild disabilities (e.g., Axelrod & Zank, 2012; Zuluaga & Normand, 2008), and students without disabilities (i.e., Austin & Agar, 2005; Bullock & Normand, 2006; Lipschultz et al., 2017; Normand, Kestner, & Jessel, 2010; Rortvedt & Miltenberger, 1994; Wilder et al., 2007; Wilder et al., 2015). Results are presented below for those studies focusing on participants diagnosed with moderate to severe ID, ASD, or participants diagnosed with both an ID and ASD. Studies that only included participants without disabilities, mild disabilities, or participants diagnosed with ASD in the high functioning range (e.g., Ray, Skinner, & Watson, 1999) are not discussed in detail.

Davis et al. (1992) used a multiple baseline design across trainers to investigate the effects of HPRS on the percentage of responses to low-*p* requests for two participants diagnosed with severe ID including one participant with ASD. In addition to measuring compliance, Davis and colleagues used multiple trainers to evaluate the impact on participants' ability to generalize compliance to other adults with no past history of

HPRS implementation with the participants. During baseline conditions, four adults (i.e., two special education teachers, one instructional aide, & one graduate student) delivered the low-*p* request to each participant. In addition, two to three of the adults delivered the high-*p* sequences during the intervention phase. Results indicated there was a functional relation demonstrated between the implementation of the HPRS procedure and increased compliance with low-*p* requests for both participants. In addition, both participants generalized responding to low-*p* requests across multiple adults who did not implement the HPRS procedure.

One noticeable characteristic of the HPRS in early research studies (Horner et al., 1991; Mace et al., 1988; Singer et al., 1987) is that although the intervention had been successful in increasing compliance levels when implemented, compliance returned to baseline levels when the intervention was withdrawn. Ducharme and Worling (1994) extended the research on HPRS in two ways. First, they implemented stimulus fading procedures to investigate the effects on the maintenance of compliance gains. Second, unlike previous studies that utilized teachers, teacher aides, or clinical staff as interventionists, Ducharme and Worling evaluated the ability of parents to implement the HPRS within the home setting. An ABAB and multiple baseline design across subjects and "do" and "don't" requests were used to evaluate the effects of HPRS on two participants with mild to severe ID (results are only provided for the participant with severe ID). After the last intervention phase, fading and follow-up phases were implemented. In addition, a multielement design was embedded into the second baseline and high-*p* sequence phase of the symmetrical "don't" series with one of the participants. Symmetrical requests were defined as "do" request that required that same behavior as

the “don’t” requests. Results demonstrated that the HPRS could be successfully faded for both participants without a loss in compliance gains. Second, results demonstrated that parents were able to implement the intervention and achieve similar results as previous studies that included teachers or clinical staff as the interventionists. Finally, follow up data collected 1-, 3-, 6-, 8- and 16-weeks after the fading phase of the study demonstrated that gradually fading the procedure versus abruptly removing the HPRS procedure could produce a durable change in compliance levels. In addition to positive findings, this study found the HPRS was more successful for compliance with “do” request than it was for “don’t” requests. The authors suggested that the behavioral momentum effects may be disrupted more by the shift across stimulus classes that occur when issuing high-*p* “do” requests prior to “don’t” low-*p* requests.

One of the first studies comparing the effects of HPRS on compliance with another antecedent intervention (i.e., social comments) was conducted by Kennedy et al. (1995). A multielement design with A (baseline), B (interspersed requests; HPRS), C (social comments with 2 s IPT), and D (social comments with 15-s IPT) phases was implemented with two adolescents (18, 19) diagnosed with severe disabilities (IQ not specified) and who had histories of noncompliance. Results demonstrated that both the interspersed requests (HPRS) and social comments conditions increased levels of compliance compared to baseline conditions. In the second experimental sequence, the results were replicated; however, compliance for both participants was slightly higher under interspersed requests conditions compared to social comments conditions.

Mace et al. (1997) conducted a series of experiments to examine the impact that reinforcer quality had on the effects of HPRS procedures on noncompliance. For the first

experiment, Mace et al. implemented a reversal design replicated across instructions for two adolescent males diagnosed with moderate ID (IQ not specified). Unlike previous studies, Mace and colleagues measured the cumulative frequency of compliance to low-*p* instructions as the dependent variable. Also differing from previous studies, three variations of the HPRS were included: high-*p* treatment with praise, high-*p* treatment with food, and high-*p* treatment with both praise and food. These conditions represented phases B, C, and D, respectively. An ABAB design was implemented for instructions that the high-p treatment with praise was effective for both participants (instructions 1-5 for participant one; instructions 1-6 for participant two). For instructions that praise was not effective, additional phases were added. For participant one, an ABABDBC design was implemented for instructions six through eight. An ABABCBC design was implement for instructions seven through eight for participant two. Results indicated that compliance for both participants was low during baseline conditions. Both participants demonstrated an increase in compliance with the implementation of the high-*p* with praise condition for five to six out of the eight requests. For participant one, compliance to requests six through eight increased at a higher frequency once the high-*p* with food phase was implemented. Likewise, participant two demonstrated a higher cumulative frequency of compliance once the reinforcer offered included food versus praise alone. The authors concluded that the efficacy of the HPRS can be improved by providing a presumably higher quality reinforcer.

Mace et al. (1997) further examined the relation between reinforcer quality and the resistance to change effects of a HPRS in the second experiment of the study. Four phases were presented in an ABAB reversal design with one participant diagnosed with

moderate ID (from experiment one). The first phase included the HPRS with food as the reinforcer contingent on compliance with low-*p* requests. The second and final phases included two forms of the HPRS being alternated: (a) compliance reinforced with praise, and (b) compliance reinforced with food. Phase three involved similar conditions as phase one except that praise and food was alternated across sessions. Results from phase one indicated that percentage of compliance to low-*p* instructions was high *(M* = 96.4%) after the implementation of a HPRS with food used as the reinforcer. Phase two results demonstrated that compliance to low-p instructions decreased across successive low-*p* instructions with greater persistence in compliance occurring following HPRS involving food versus praise. Phases three results demonstrated that percentage of compliance to one low-*p* request was high following HPRS with either food (M= 100%) or praise *(M* = 95%). Similar to phase two, phase four showed a decrease in compliance when successive low-*p* commands were given *(n* = 5). Compliance persisted more under the food conditions *(M* = 92%) than with praise *(M* = 64%). These findings provided additional support that the effects of HPRS could be improved by providing a higher-quality reinforcer.

Like Kennedy et al. (1995), Smith and Lerman (1999) sought to compare the effects of HPRS with another intervention commonly used to address noncompliance (i.e., guided compliance). The authors implemented both multielement and multiple baseline across participants designs to compare effects of HPRS and guided compliance on compliance to low-*p* requests for two participants. Participant one had a diagnosis of ASD and a moderate ID and the second participant had a diagnosis of pervasive developmental disorder (not otherwise specified) and a mild ID. For the guided

compliance condition, a direct request was given. If the participant complied with request within 5-s, reinforcement (i.e., praise) was provided. If the participant did not comply after 5-s, a gestural prompt was given followed by the delivery of physical guidance as needed. The HPRS condition followed traditional procedures. Results indicated that both procedures increased the percentage of compliance with low-*p* requests; however, guided compliance procedures resulted in higher rates of compliance when compared to the HPRS (70-71% and 25-56%, respectively).

A study by Romano and Roll (2000) was the first to examine the effect of presenting HPRS that have a history of occurring at different levels. Researchers have typically identified high-*p* requests as requests that participants have had a history of compliance for 80% or higher percentage of the time. Romano and Roll suggested that a second category, medium-*p* requests should be considered. Medium-*p* requests were defined as requests that resulted in compliance levels of 50-70% by each participant. A simultaneous treatment design (i.e., high-*p* and medium-*p*) with a reversal component was implemented to determine the effect of both sequences on percentage of compliance of low-*p* (i.e., compliance history of less than 40%) requests. Results indicated that both high-*p* and medium-*p* requests increased the compliance levels for the three participants (i.e., two diagnosed with ASD and a severe/profound ID). The authors concluded that a larger pool of requests could be used within HPRS interventions by broadening the definition of what types of requests (i.e., high-p; medium-p) should be implemented prior to low-*p* requests.

Belfiore et al. (2008) extended the research on HPRS with one participant diagnosed with Down syndrome, a moderate ID, and ADHD. An ABAB reversal design

was administered to investigate the effects of a HPRS on percentage of compliance to low-*p* commands. In addition, a follow up phase using the same procedures as the intervention was conducted one week after the end of the intervention occurred. Return to baseline, return to intervention, and fading conditions were implemented two weeks after the intervention initially ended. Results of the ABAB phases of the study indicated that a functional relation existed between the implementation of the HPRS procedures and an increased percentage of compliance with low-*p* requests. Compliance remained high during the two follow-up sessions. When the intervention was removed, compliance returned to baseline levels. When the intervention was reintroduced during the fading phase (i.e., issuing only one high-*p* command), compliance remained as high as when the HPRS with 3-5 high-*p* commands was used. These results suggested that the number of high-*p* requests could be faded and still be effective while reducing the time required for implementing the procedure.

Pitts and Dymond (2012) investigated the effects of implementing a HPRS with and without programmed reinforcement for high-*p* requests on compliance to low-*p* requests for three children with ASD. Unlike several of the previously mentioned studies, Pitts and Dymond, conducted preference assessments prior to implementation of the intervention to identify stimuli to serve as reinforcers for compliance with both high-*p* and low-*p* requests. Multiple variations of a reversal design were implemented across participants and across behaviors (e.g., ABACABACABAB and ACABACABAB designs were both implemented with one participant but across two behaviors). Phases included A (baseline conditions), B (HPRS with programmed reinforcement), and C (HPRS without programmed reinforcement). HPRS with programmed reinforcement

involved presenting the participant with praise and a preferred edible after compliance with high-*p* and low-*p* requests. For phases implementing a HPRS without programmed reinforcement, praise and an edible were only presented to participants after compliance to low-*p* requests. Results indicated that compliance to low-*p* requests increased for all three participants when the completion of high-*p* requests resulted in reinforcement. In addition to an increase in compliance, latency between requests and initiation of the request by the participant improved during the intervention sessions including HPRS procedures with programmed reinforcement.

The most recent study examining in the effects of the HPRS on general task compliance was conducted by Esch and Fryling (2013). The authors implemented a concurrent multiple baseline design across three low-*p* tasks and alternating treatment design with one 6-year-old male diagnosed with autism (IQ not specified). The two alternating treatments included: (a) HPRS including maintenance instructions and (b) HPRS only including leisure instructions. Maintenance instructions were defined as requests with which the participant was compliant at high levels but were not necessary highly-preferred (e.g., “clap your hands”), whereas the leisure instructional sequence included requests to perform tasks that both elicited high levels of compliance and were highly-preferred (e.g., “drive your monster truck down the ramp”). Both leisure and maintenance HPRS increased the levels of compliance with low-*p* requests compared to baseline levels; however, the leisure condition produced higher levels of compliance with low-*p* requests *(M* = 97%) when compared to the maintenance conditions *(M* = 92%).

Summary. These nine studies added to Mace et al.’s (1988) seminal study on the effectiveness of the HPRS to increase compliance to low-*p* requests. Evidence of the

effectiveness of the HPRS across ages (i.e., ranged from 4 to 20), across settings (i.e., home, group home, special education classroom), and when implemented by various adults (i.e., experimenter, graduate assistants, group home employees, paraeducators, parents, and teachers) was provided. These studies provide support that the HPRS can be implemented to increase compliance with general task requests for individuals diagnosed with moderate to severe and profound ID as well as students diagnosed with ASD either in isolation or concurrently with ID.

In addition to demonstrating the overall effectiveness of the HPRS sequence, these studies add to the literature on HPRS in other ways. First, although the HPRS has been successful in many studies, compliance levels have been observed to decrease and even return to baseline levels once the HPRS procedures are removed. Ducharme and Worley (1994) demonstrated that by fading the number of high-*p* requests given over time could result in durable change levels. In addition, several of these studies demonstrated that you could improve the overall effectiveness of the HPRS on increasing compliance levels by improving the quality of reinforcers used (Mace et al., 1997) or by using high-preferred leisure requests instead of high-*p* maintenance requests (Esch & Fryling, 2013).

HPRS and escape motivated behavior. Even when an individual is engaging in passive noncompliant behavior (Kuczynski et al., 1987), it can have a negative academic and social impact on both the individual who is not complying with the request as well as the individual given the request. This impact is even greater when the individual is actively refusing or engaging in direct defiance. For individuals with developmental disabilities, high rates of escape-motivated behavior can occur when presented with

challenging tasks. Engaging in aggressive and self-injurious behaviors have been found to be effective strategies for individuals with disabilities to escape or avoid difficult instructional situations (Horner et al., 1991). It can be challenging to implement strategies that provide positive reinforcement for compliance due to competing with the negative reinforcement that can occur when individuals engage in various escape behaviors (Zarcone, Iwata, Mazaleski, & Smith, 1994). The following section provides a review of the literature on the use of HPRS when implemented with participants with moderate to severe disabilities including ASD who have a history of noncompliance paired with engaging in escape-motivated behavior.

Two years after Mace et al.'s (1988) study identifying the HPRS as a viable intervention for addressing noncompliance, Mace and Belfiore (1990) extended the application of HPRS by examining its effect on a participant who engaged in high rates of stereotypic touching. A multiple schedule design with reversal components was implemented with a 38-year-old woman diagnosed with severe ID (IQ not specified) to examine the effects of the HPRS on stereotypic touching responses (STR). Unlike previous studies, Mace and Belfiore included both compliance to low-*p* requests and STR as dependent variables. STR was defined as any nonadaptive repetitive contact (i.e., interresponse time of 15-s or less) between the participant's hand or foot and an object or person. Results from a descriptive analysis conducted prior to the intervention suggested two possible explanations for the function of the participant's STR: (a) the STR was being positively reinforced by social disapproval, and (b) the STR was being negatively reinforced by escape from task demands. Three analogue experimental conditions were implemented to test the validity of Mace and Belfiore's two hypotheses. First, a social

disapproval condition was implemented where the participant was free to engage in an activity where a disapproving comment contingent on an STR was implemented using a variable ratio (VR) 4 schedule. The second condition (demand condition) involved the experimenter randomly issuing a selected low-*p* request on a fixed ratio (FR) 1-min schedule. If the participant complied, praise was given. If the participant engaged in a STR within 20-s of a low-*p* request, the task was terminated. The third condition involved implementing the HPRS under similar conditions as the demand condition with the exception that STRs no longer produced escape from a task. Results indicated that STRs occurred most frequently when the consequence was a discontinuation of task-related instruction. When the HPRS was introduced, mean compliance levels increased from 22-34% during baseline to 52-88% during intervention conditions. Mace and Belfiore suggested that this was possibly that due to the response class of "compliance to instructions" and behaviors constituting aberrant actions being topographically incompatible. This would mean compliance occurring at high rates could compete physically with high rates of inappropriate behavior and that the HPRS was able to establish compliant behavior at a high enough rate that persisted when confronted with a low-*p* request.

Like Mace and Belfiore (1990), Horner et al. (1991) extended the work of Mace et al. (1988) to target individuals with severe disabilities who engaged in escape motivated behavior in a series of two experiments. Horner et al.'s study differed due to the inclusion of participants who engaged in more aggressive and self-injurious behaviors than stereotypic touching (Mace & Belfiore, 1990). In the first experiment, an ABABCBCDE within-subject reversal design was replicated across three participants

(ages 12 to 14) with a diagnosis of severe ID (IQ = 12, 14, 23) and a history of self-abuse, aggression, or destructive behavior during instruction. The first four phases (A representing easy task only; B representing hard tasks only) represented a functional analysis assessment implemented to determine if the aggressive or self-injurious behaviors functioned as escape-motivated responses. Phases four through seven provided a BCBC (B representing hard tasks; C representing HPRS) analysis of the effect of the HPRS procedure on the attempts made to complete low-*p* requests and on targeted inappropriate behavior. Two months after the intervention had ended, the extent that the effects were consistent across time, trainers, and tasks were evaluated with the implementation of D (new trainer) and E (new trainer and new tasks) phases. Both percentage of attempts to complete the low-*p* task (initiating the first response in the requested response chain) and percentage of trials with aggressive or self-injurious behavior were the dependent variables. The results from the functional analysis assessment (phases ABAB) indicated that the participants targeted behaviors were being maintained by negative reinforcement (i.e., escape from low-*p* demands). Results from phases four through seven (BCBC) provided evidence of a functional relation between the implementation of the HPRS and a reduction in the percentage of aggressive and self-injurious behaviors for all three participants. Phases seven and eight (D, E) demonstrated that the effects of the HPRS could be generalized after two months to a new trainer and task providing support that the initial changes in behavior was not specific to the features of the given task, the time of year, or the specific characteristics of the trainers whom implemented the intervention at that time.

One of the major limitations of Horner et al.'s (1991) first experiment was that it was implemented in a relatively short period of time (2 days) that made it difficult to know whether the HPRS would continue to be appropriate if implemented across longer training sessions and in typical school settings. The authors designed the second experiment to address this limitation that included the implementation of an ABABCBC design with one 14-year-old participant identified as having a diagnosis of moderate ID (IQ not specified). The seven phases were replications of the first seven phases of experiment one. The first four phases demonstrated that low levels of aggressive behavior occurred when asked to engage in easy tasks and that levels increased when asked to perform harder tasks (low-*p* requests). In addition, phases four through seven demonstrated that a pattern of aggressive behavior occurred at higher levels when asked to engage in hard tasks and decreased when presented with the HPRS prior to low-*p* request. The authors cautioned that the HPRS should not only be implemented after an undesirable behavior has occurred as this could lead the student to learn that engagement in aggressive behavior results in the presentation of easier, more preferred tasks. Instead, Horner et al. reiterated the importance of ensuring that the HPRS procedure is delivered prior to the presentation of a low-*p* task (i.e., used as an antecedent-based intervention).

Building off of the work of Mace et al. (1988) and Mace and Belfiore (1990), Zarcone, Iwata, Hughes, and Vollmer (1993) wanted to further examine the utility of the HPRS with self-injurious escape behavior (SIB) by implementing the HPRS with and without extinction. Zarcone et al. first conducted a functional analysis confirming that the 33-year-old participant diagnosed with a profound ID was engaging in SIB as a means to escape from instruction. After the functional analysis was completed and analyzed, four

phases were implemented in an ABCBD design. The four phases included phase A (baseline conditions; only low-*p* requests given), B (HPRS conditions), C (HPRS plus escape extinction conditions), and D (escape extinction without HPRS). When escape extinction was included (phase C, phase D), the participant's SIB did not result in termination of the task like it did in HPRS only conditions (phase B). Both latency to the first occurrence of SIB and percentage of compliance were used as the dependent variables. Results for latency to SIB, indicated that during baseline conditions, where the participant was asked to engage in low-*p* requests, the mean latency to SIB was 4.7 min. The implementation of the HPRS resulted in the participant engaging in SIB in a relatively shorter amount of time (latency; $M = 2.4$ for set 1; $M = 1.3$). When escape extinction procedures were added to the HPRS in phase C, latency increased to a mean of 8.4. This improvement decreased *(*$M = 0.8$) when conditions returned to HPRS only and increased to a higher rate *(*$M = 8.2$) again when extinction only procedures (phase D) were implemented. These results demonstrated that the HPRS alone was not successful in increasing latency to engagement in SIB when the participant was asked to engage in low-*p* requests. The second dependent variable (compliance to low-*p* requests) saw similar results in that the HPRS was not successful in increasing compliance *(*$M = 6\%$) to low-*p* requests in the presence of escape-motivated behaviors but was more successful when implemented concurrently with escape extinction procedures ($M = 51\%$). Like with latency, compliance was also high *(*$M = 48\%$) when escape extinction procedures where implemented without the HPRS.

Zarcone et al. (1994) suggested that the HPRS might have been shown highly effective when addressing noncompliance alone, but that Zarcone et al.'s (1993) study

suggested that the effects of the HPRS on competing escape behavior in addition to noncompliance was not as clear. Zarcone et al. (1994) extended the previous research by examining the effects of the HPRS on escape-maintained SIB and compliance with two male adults (ages 38, 45) with a diagnosis of profound ID (IQ not specified) who lived in a state facility for individuals with developmental disabilities. A functional analysis of SIB provided evidence that SIB occurred at higher rates during demand versus alone, attention, and play conditions that supports the hypothesis that the occurrence of SIB was being maintained by negative reinforcement. A reversal design was then implemented including baseline, HPRS, and HPRS plus extinction phases. Results indicated that both participants exhibited high rates of SIB and low rates of compliance during baseline conditions. The HPRS phase had little to no effect on either SIB or compliance with low-*p* requests when SIB continued to be negatively reinforced; however, when extinction procedures were added to the HPRS procedures, the intervention was more successful. Both the results of Zarcone et al. (1993) and Zarcone et al. (1994) demonstrate that the HPRS may not be effective alone in increasing compliance when escape-motivated behaviors are present.

The previously mentioned studies focused on participants ranging in age from adolescents (ages 12-14) to adults (ages 33-45) with a diagnosis of moderate to profound ID who consistently engaged in escape-motivated behaviors concurring with noncompliance. Killu, Sainato, Davis, Ospelt, and Paul (1998) added to the literature by examining the effects of the HPRS on both compliant responding to low-*p* requests and the occurrence of disruptive behaviors with three preschool aged participants (ages 4-5) diagnosed with developmental delays including one diagnosed with autism. A multiple

baseline design across subject design was used to determine the effects of the HPRS intervention. Like the previous studies (Horner et al., 1990; Mace & Belfiore, 1990; Zarcone et al., 1993, 1994), Killu et al. conducted presession assessments to determine possible functions of each of the participants' noncompliant behavior. Results indicated that all three participants demonstrated an increase in the number of compliant responses after the implementation of the HPRS intervention. Participants were also able to maintain high rates of compliance after the HPRS was withdrawn during the maintenance phase of the intervention. In addition, one of the three participants engaged in disruptive behaviors at high levels during baseline conditions. Unlike previously mentioned studies, this participant's inappropriate behaviors drastically decreased in the HPRS conditions and remained low during maintenance and follow-up phases. These results provide limited evidence that the HPRS may be effective in reducing escape-motivated behaviors without extinction procedures when working with younger participants.

Summary. The previous studies conducted between 1990 and 1998 added to the literature on the use of HPRS for general task compliance when escape-motivated behaviors are present. Unlike Killu et al. (1998) who found the HPRS procedure successful at reducing disruptive behaviors for a young participant with a developmental delay, the studies conducted by Horner et al. (1991), Mace and Belfiore (1990), Zarcone et al. (1993), and Zarcone et al. (1994) found that extinction procedures in conjunction with HPRS were necessary. It should be noted that the participants in the later studies were adolescents (ages 12 to 14) and adults (ages 33 to 45) and had a diagnosis in the moderate to profound range of ID. It is possible that the older participants had a longer

history of negative reinforcement that would decrease the resistance to change effects of the behavioral momentum intervention.

HPRS and medical related compliance. In addition to the HPRS being utilized to increase compliance with general task compliance with and without individuals engaging in escape-motivated behaviors, a few researchers have investigated its use to help increase medical related compliance for participants diagnosed with developmental delays, moderate to severe ID, and ASD.

One of the earliest studies on the use of HPRS was conducted by Harchik and Putzier (1990). An ABAB reversal design was used to investigate what effects the HPRS had on compliance to take medication for one 23-year-old female participant diagnosed with a severe ID (IQ not specified). Results indicated that the HPRS procedure was successful in increasing the number of times the participant took her medication. In addition, the participant decreased attempts to spit out her medication and decreased episodes of vomiting. This early study in HPRS added to the research by demonstrating that the HPRS procedure could be implemented by direct care staff within a group home setting to address compliance with medical related tasks.

A second application of the HPRS to increased medical related compliance was conducted 8 years later with a 22-month-old toddler diagnosed with developmental delays and severe SIB. McComas, Wacker, and Cooper (1998) randomly implemented two treatment packages within a multiple schedule design to investigate the effects on compliance to low-*p* requests. For this participant, the low-*p* request was to hold still while his mother sterilized his central-venous line site. The first treatment package consisted of differential reinforcement of alternative behavior with escape extinction

(DRA/ESC EXT), while the second treatment consisted of the delivery of HPRS in addition to DRA and ESC EXT (HIGH-P/DRA/ESC EXT). A total of eight sessions occurred including a total of 74 requests. Thirty-eight requests included the DRA/ESC EXT treatment package and 36 requests were delivered during the HIGH-P/DRA/ESC EXT conditions. Results indicated that the participant had a higher percentage of compliance during the HIGH-P/DRA/ESC EXT condition *(M* = 78%) than with just the DRA/ESC EXT condition *(M* = 44%). The authors noted that their findings were important due to previous researchers (e.g., Zarcone et al., 1994) suggesting that escape extinction may be the more important intervention component when noncompliance is paired with an escape-motivated behavior.

Riviere et al. (2011) added to the literature by evaluating the effectiveness of a HPRS to increase compliance with medical examination requests for two young males (ages 6 and 8) diagnosed with developmental delays including autism. Low-*p* requests were divided into three categories (i.e., requests related to looking in participant's mouth, requests related to looking in the participant's ears, and requests related to cutting toenails). High-*p* requests were established by asking the mother to generate a list of potential high-*p* requests. Each participant was then presented with the identified requests three times a day over a 5-day period. If a request was performed with 80% or greater compliance, it was included in the list of behaviors used to create the high-*p* sequence. An ABABCB' design was implemented with A representing baseline conditions, B representing HPRS, C representing HPRS conducted by medical professional, and B' representing HPRS with a low rate of reinforcement (i.e., reinforcement provided after compliance with three high-*p* requests). Results indicated that the use of a HPRS

increased the compliance with medical examination tasks for both participants. Participants increased compliance during the HPRS phase, the medical examiner phase, and the last phase where low rates of reinforcement were provided. The authors noted that prior to the implementation of the HPRS, both participants were given medication to make medical examinations easier. With the HPRS in place, the medical examiner was able to complete examination without the use of medication.

Summary. The previous three studies demonstrated that the HPRS could be implemented with toddlers (McComas et al., 1998), young children (Riviere et al., 2011) and adults (Harchick & Putzier, 1990) to increase medical related tasks. These findings are significant in that refusing to take medication, potentially infecting or pulling a central-venous line out of the heart, and refusing to be compliant during medical visits can have meaningful life-changing and even life-saving (McComas et al., 1998) effects.

HPRS and Food Selectivity. An area of research that emerged in the early 2000s was the use of HPRS procedures to increase compliance with participants diagnosed with food disorders or who were engaging in food selectivity behaviors. This is especially true for students diagnosed with ASD. No studies were found in the published literature on food selectivity and individuals diagnosed with moderate to severe ID, whereas a few studies were reported with participants identified as having a mild disability or developmental delay (Dawson et al., 2003; McComas et al., 2000; Patel et al., 2006). The following section discusses the research relating to high-*p* request sequences on increasing compliance to low-*p* foods for participants diagnosed with ASD.

Patel et al. (2007) conducted one of the first studies to examine the effects of a HPRS on the feeding-related compliance behaviors of a 4-year-old boy diagnosed with

pervasive developmental disorder. Prior to the introduction of the high-*p* sequence, a compliance assessment was conducted revealing that the acceptance of an empty spoon would be the high-*p* response and acceptance of a spoon with pureed table foods would be the low-*p* response. A reversal (ABAB) design was used to evaluate the effects of the high-*p* sequence on compliance of taking a bite when presented with a spoon with food. During the baseline, the participant was presented with a spoonful of food and requested to take a bite (low-*p* request) every 30-s. During the intervention phase, three rapid presentations of an empty spoon (high-*p* request) were presented prior to the presentation of the low-*p* request (i.e., spoon with food). Results indicated there was a functional relation between the implementation of the HPRS and the percentage of compliance with low-*p* requests. During both baseline and return to baseline phases, compliance was 0% for low-*p* requests presented in isolation. During both intervention phases, compliance was 100% for low-*p* requests that immediately followed high-*p* requests. The results from Patel et al.'s study were unlike results from previous work investigating the use of a HPRS on compliance related to food selectivity (Dawson et al., 2003) that found HPRS to be ineffective. One notable difference between the two studies is that the participant in Patel et al.'s study did not have co-occurring escape-related problem behaviors during feeding interventions whereas the participant in Dawson et al.'s study did engage escape-motivated behaviors.

Meier, Fryling, and Wallace (2012) examined the effects of a high-*p* request sequence on low-*p* feeding behaviors for one 3-year-old girl with autism. Like Patel et al. (2007), the participant in Meier et al.'s study did not demonstrate escape-related problem behaviors. The authors implemented a non-concurrent multiple baseline and reversal

design. The participant in this study had a history of refusing fruits and vegetables. Parents were interviewed to identify foods that would serve as low-*p* compliance foods as well as foods that would be considered high-*p* compliance foods. For the multiple baseline component, the first food used as a low-*p* request was plums, followed by raspberries, and then eggplant. In addition to evaluating the effects of a high-*p* sequence on compliance with low-*p* behaviors, Meier et al. also wanted to determine the effect of fading the instruction. Using a reversal design embedded within the multiple baseline design, the authors systematically faded the number of high-*p* requests across phases. The following phases were implemented: baseline (A), HPRS with three rapid high-*p* requests prior to low-*p* request (B), return to baseline (A), HPRS with three rapid high-*p* requests prior to low-*p* request (B), HPRS with two rapid high-*p* requests prior to low-*p* request (C), HPRS with one rapid high-*p* requests prior to low-*p* request (D), return to baseline (A), and then a follow up session occurring 12 and 15 days after the last sessions for plums and raspberries. Results indicated that the high-*p* sequence was effective in increasing the participant's acceptance of all three low-*p* foods in the absence of escape extinction. In addition, the authors found that fading the number of high-*p* requests given was effective for two of the three foods attempted.

Penrod, Gardella, and Fernand (2012) extended the research on the use of HPRS and demand fading in increasing compliance with low-*p* behaviors related to food selectivity for two young boys diagnosed with ASD. A multielement design was used that alternated between two food groups to examine the effects of combining a HPRS with demand fading. Demand fading consisted of providing low-*p* requests that were gradual approximations of the targeted behavior (i.e., shaping). In previous studies, researchers

would ask participants to take a bite of a low-*p* food immediately after taking a bite of a high-*p* food (Meier et al., 2012) or after imitating taking a bite from an empty spoon (Patel et al., 2007). Penrod and colleagues asked participants to engage in low-*p* instructions that were approximations of taking a bite (i.e., touch the food, smell the food, kiss the food, lick the food, balance the food on tongue, bite the food, eat the food, chew the food, and swallow the food). Once a participant engaged in a low-*p* behavior for three consecutive sessions with 100% compliance, the low-*p* request became the high-*p* request in the following phase. Results indicated that both participants increased food consumption.

In a more recent study, Ewry and Fryling (2016) examined a variation of the high-*p* sequence on the compliance of low-*p* behaviors related to food consumption. Unlike the previously mentioned studies that included young children, Ewry and Fryling examined the effect of the HPRS on a 15-year-old adolescent male with autism who had a history of selective eating and who did not engage in escape behaviors. Using a reversal design to measure the impact of the high-*p* request sequence (i.e., bites of preferred noodles) on the compliance of low-*p* requests (i.e., bite size bites of cauliflower and hard boiled eggs), results indicated a functional relation between HPRS and an increase in percentage of low-*p* requests. Ewry and Fryling's findings also added to previous findings (e.g., Riviere et al. 2011) that found parents could implement the intervention with fidelity.

Summary. It is important to note that all the previously described studies relating to food selectivity, share a similar characteristic when selecting behaviors for the participants' HPRS. In all four studies, the high-*p* commands were topographically similar to the low-*p* commands. Participants in all studies were asked to engage in

mimicking the process of eating with an empty spoon (i.e., Patel et al., 2007), were provided with bites of preferred food items prior to low preferred items (i.e., Ewry & Fryling, 2016; Meier et al, 2012), or shaping was embedded in the intervention by asking participants to engage in approximations of the target low-*p* behavior (Penrod et al., 2012). This body of research differs from the other domains where it is more common for the high-*p* requests to differ in topography compared to low-*p* requests (e.g., Singer et al., 1987). In addition, the findings in the literature on food selectivity are similar to those found in general tasks compliance in that the intervention in isolation has produced more successful outcomes when implemented with individuals not engaging in escape-motivated behaviors.

HPRS and communication and social skills related compliance. Early researchers of the utility of the HPRS (e.g., Horner et al., 1991; Mace et al., 1988) suggested that future investigators of the HPRS should explore the use of the HPRS beyond compliance. One area of research on the use of the HPRS that emerged outside of "compliance" is its use in social and communication domains. Six studies predominately conducted in the 1990s *(n* = 5) have been published that focus on responding to social requests, peer interactions, and other social or communicative demands. Four of the studies that include participants with moderate to severe ID and/or ASD are discussed below. A study conducted by Davis and Reichle (1996) is not discussed due to only including participants diagnosed with behavioral emotional disorders. A second study was excluded from this review based on only including young children diagnosed with developmental delays but no indication of the severity of the participants' disabilities (Santos & Lignugaris/Kraft, 1999).

One of the earlier studies evaluating the applicability of HPRS with students with severe disabilities including students with a diagnosis of ASD was conducted by Davis et al. (1994). The authors used a multiple baseline across participant design to evaluate the effects of high-*p* requests on social interactions of three young boys (i.e., age range, 5-6). All three participants were diagnosed with ASD, an ID, and a speech delay. Similar to previously mentioned studies, the authors conducted pre-baseline interviews and observations to identify the targeted high-*p* and low-*p* requests. Davis et al. was one of the first studies to use peers without disabilities in their HPRS intervention. Peers were divided into two groups of four with one group designated as training peers and one group designated as generalization peers. The training peers were involved in the HPRS intervention. Low-*p* requests were related to social requests that the participants had a history of low compliance (i.e., less than 50% compliance on presession requests). Three to five high-*p* requests were delivered rapidly (i.e., within 10-s of each other) prior to delivery of the low-*p* request. Results indicated that the HPRS increased participants' compliance to low-*p* requests to initiate social interactions with peers. The authors concluded that high-*p* requests could be added to the list of effective strategies for increasing social skills in children with severe disabilities including students diagnosed with ASD. It was suggested that future researchers should consider having peers without disabilities implement the HPRS to investigate whether the intervention could effectively be used as a peer-mediated strategy to increase social interactions.

Sanchez-Fort et al. (1995) continued Davis et al.'s (1994) investigation into the use of the HPRS to increase communicative behavior. The authors implemented a multiple baseline across low-*p* target responses with two participants diagnosed with

moderate to severe ID. The dependent variable was the percentage of correct low-*p* communication responses. These responses were limited to single communicative function of making a request (e.g., help, more, water). Results indicated that both participants gradually increased the percentage of correct use of the low-*p* target words once the HPRS was applied. It was suggested that these findings could expand on the phenomenon of behavioral momentum including the use of the procedure to increase word and sign communication targets with children with more severe disabilities.

Davis, Reichle, Southard, and Johnston (1998) used a multiple baseline across three different communication partners research design to evaluate the effects of using a HPRS to enhance the probability that two participants would participate in simple conversation maintenance. Participant one was a 15-year-old girl with a diagnosis of Down syndrome and was identified as having severe ID (IQ = 46). Participant two was a 15-year-old boy who was nonverbal and had a diagnosis of spastic quadriplegic cerebral palsy. No intellectual assessment had been completed with participant two. Both participants used alternative/augmentative communication (AAC) devices as their primary mode of communication, however, neither used their devices to initiate conversational exchanges. The authors referred to the high-*p* requests as, “obligatory utterances” that required participants to respond (e.g., “What are you doing tonight?”). Low-*p* requests, called “nonobligatory utterances” were those that did not require a response but typically elicit response from communication partners (e.g., “I’d like to go shopping”). Three different communication partners were used to issue both the high-*p* and low-*p* utterances during logical points within conversations. Results indicated that both participants responded at low rates to low-*p* utterances during baseline conditions

across all three communication partners. As each communication partner implemented the high-*p* intervention, the participants percentages of responses increased. Davis et al.'s study demonstrated that a HPRS could be used to enhance conversational participation with participants who use AAC devices as their primary mode of communication.

Ten years later, Jung, Sainato, and Davis (2008) used a multiple baseline across participants design to investigate the effects of HPRS with embedded peer modeling on the compliant responding to social requests for three young students (i.e., ages 5 to 6) with ASD. Like Davis et al. (1994), Jung et al. included peers without disabilities in the study. Six students without identified disabilities were selected to be peer partners. Three students were selected to receive training and participate in the intervention and three students were selected to be present during the implementation of the intervention and during generalization settings but did not directly participate in the intervention. Similar to previously mentioned studies, presession data were collected through observations, examining the participants' IEPs, and surveying teachers and parents to determine the high-*p* and low-*p* targeted behaviors for each participant. Unlike Davis et al., where peers were used for target participants to socially engage with, Jung et al. delivered the high-*p* and low-*p* requests to the trained peers first, so they could model the appropriate response to the target students. Results indicated that all participants had relatively low levels of compliance to low-*p* request during baseline. Visual analysis of the graph indicated an immediacy of effect and a change in levels with the implementation of the HPRS with peer modeling. When peer modeling was removed in the following phase but the HPRS continued, all three participants maintained high levels of compliance to low-*p* requests. The authors concluded that this study adds to the literature in three ways. First, the results

supported the use of peers without disabilities as effective intervention agents for observational learning. Second, by demonstrating that disruptive behaviors could be decreased with the introduction of the high-*p* interventions. Finally, this study demonstrated that compliant responding could be maintained at high levels even after the removal of the high-*p* intervention.

Summary. Early applications of the HPRS found the procedure to be effective in increasing compliance to low-*p* requests with participants with moderate to severe ID as well as with individual with ASD. The five previously discussed articles added to the literature on the use of the HPRS by expanding its utility to communicative and social domains. Researchers demonstrated that it could be applied to participants using AAC devices to increase responses to nonobligatory responses that naturally occur in conversations (Davis et al., 1998). In addition, a few of the studies demonstrated how peers without disabilities could be used as communication partners (Davis et al., 1994), as peer models, or as intervention agents during the intervention (Jung et al., 2008).

HPRS and between-tasks transitions. The first published study applying Engelmann and Colvin's (1983) hard task procedure was conducted by Singer et al. (1987). Most of the early research on the use of HPRS had focused on task compliance; however, Singer et al.'s study targeted transitioning from one task (i.e., a preferred, more desirable activity) to another (i.e., a less preferred, less desirable activity). Some researchers (e.g., Lee, 2005) have divided transition related studies into two categories: (a) transition between activities, and (b) transition within activities. The later, refers to transitions that occur within academic tasks and is discussed in the following section on academics. Only a few researchers have expanded the literature on the use of the HPRS

to increase compliance with requests related to between-tasks transition. This section will describe two studies conducted with participants with disabilities including participants with ASD. One study that only included participants without disabilities (Ardoin et al., 1999) is not discussed in this section.

Davis, Reichle, and Southard (2000) implemented an alternating treatment design to compare the effects of the use of a HPRS and the use of a preferred item as a distractor procedure on the percentage of successful transitions made by two 6-year-old participants diagnosed with disabilities (Downs syndrome; EBD & mild ID). Successful transitions were defined as the participant independently walking from point A (i.e., the place where the request occurred) to point B (i.e., the requested activity or area) without engaging in challenging behaviors. During baseline conditions, each participant was given a low-*p* request to transition from one activity to another during naturally occurring times within the school day. For the intervention phase, the interventionist was instructed to either deliver a HPRS or provide a preferred item as a distractor immediately prior to giving the low-*p* request. Results indicated that both participants had low levels of successful transitions during baseline conditions. Once the interventions were implemented, the percentage of compliance for both participants increased to acceptable levels. One limitation of the study was that it was unclear which intervention was more effective due to a reversal not being conducted with one of the participants. Social validity measures conducted indicated that when given the opportunity to implement the distractor procedure, the HPRS procedure, or to implement neither, the interventionist elected the HPRS nine out of the 15 transition opportunities (distractor = 4; none = 2). Additional social validity measures found that when service providers gave a forced choice rating of

the two interventions, the HPRS was rated as the intervention they would most likely use in the future even though it required more effort than the use of a distractor.

The first study that focused on the use of a HPRS on transition behavior for a participant with ASD was conducted by Banda and Kubina (2006). This study was set apart from many of the previous studies in that the dependent variable was measured by duration of minutes required to complete three targeted low-*p* transition behaviors whereas much of the research on HPRS have measured latency, percentage of compliance, or frequency of compliance as primary dependent variables. The participant in this study was a 13-year-old male with ASD. Teacher interviews were conducted to identify 12 high-*p* questions that would evoke verbal responses from participants and to identity the three targeted low-*p* requests (i.e., requests that had a delay of more than 5-s in responding). The teacher was the primary interventionist and was trained to provide the participant with two to three rapid high-*p* requests immediately followed by a request to perform a low-*p* transition behavior (i.e., empty backpack, set up visual schedule for day, and go to locker). Total number of minutes to complete the three low-*p* requests were measured and recorded. Results from the ABAB design indicated that the intervention had clear positive effects on the time it took the participant to complete the targeted low-*p* requests as well the number of verbal prompted needed to complete requests. The authors noted that although the change in duration was only 1 to 1.5 min less during intervention phase of the study than during baseline conditions, this change could potentially provide the participant with an additional three hours or more of instructional time within an academic school year (i.e., 180 school days). Since this was the first study that focused on using a HPRS to increase transition behaviors for a student

with ASD, Banda and Kubina suggested future research on effects on transitioning should be conducted with participants with ASD.

Summary. The studies conducted by Banda and Kubina (2006) and by Davis et al. (2000) provide some support to Singer et al.'s (1987) conclusion that the HPRS could be a viable option for increasing compliance to transition related request between activities. Increasing successful transitions with the use of the HPRS decreases the amount of time special education teachers or paraeducators have to spend attempting to gain compliance as well as increases the time participants get to engage in instructional activities across various environments (Davis, Reichle, & Southard, 2000).

HPRS and academics. Lee (2005) identified facilitating transitions within academic tasks as a possible application of the HPRS intervention. Lee specified that discrete academic tasks were composed of many cycles of transitions. The authors provided the example of a social studies assignment that would include transitioning to the first question when asked to complete the assignment, completing the question, transitioning to the second question, completing the question, and so on, until the student has completed the entire assignment. Lee found that several researchers had examined the effect of the HPRS on making transitions more effective in the areas of mathematics and language arts. Due to the nature of this domain, all studies conducted have either been with participants without disabilities (Belfiore, Lee, Vargas, & Skinner, 1997; Burns, Ardoin, Parker, Hodgson, & Klingbeil, 2009; Lee et al., 2006; Lee, Belfiore, Scheeler, Hua, & Smith, 2004; Lee & Lapse, 2003; Lee, Lylo, Vostal, & Hua, 2012; Wehby & Hollahan, 2000), students with mild disabilities (Belfiore, Lee, Scheeler, & Klein, 2002; Lee et al., 2004; Lee & Lapse, 2002), or students with ASD without mention of an ID

(Banda & Kubina, 2009; Kelly & Holloway, 2015; Leach, 2016). Since no studies on the utility of the HPRS with academics have been conducted with students with moderate to severe ID or with ASD and ID, no studies are discussed in detail.

Summary

The research on the use of HPRS interventions as an antecedent intervention for increasing compliance with low-*p* requests for participants with a diagnosis of moderate to severe ID or with ASD has produced promising results. This literature has focused on the use of HPRS to increase compliance with general tasks, medical related tasks, social and communication related tasks, tasks relating to food selectivity, and transition-related requests. No studies have been implemented with individuals with moderate to severe disabilities related to academics but studies including individuals with ASD have provided promising results. Table 1 provides examples of the HPRS requests within each of the domains. This body of research demonstrates that HPRS interventions can be implemented with minimal presession preparation, can be implemented by various interventionists, and that the intervention itself can be modified or included as part of an intervention package and still produce desirable results.

Table 1

Examples of High-p Request Sequences across Domains

Academics (Banda & Kubina, 2009)	
High-*p*	Low-p
936 + 852 = _____ 485 + 746 = _____	865 + _____ = 1,420
Communication/Social (Davis et al., 1998)	
High-*p*	Low-p
What are you doing tonight? What are you doing this weekend? Who are you going with?	I'd like to go shopping.
Food Selectivity (Ewry & Frying, 2016)	
High-*p*	Low-p
Bite of noodles Bite of noodles Bite of noodles	Bite of cauliflower
General Task Compliance (Mace et al., 1988)	
"Do Commands"	
High-*p*	Low-p
Give me five Come here and give me a hug Show me your wallet	Please put your lunch box away
"Don't Commands"	
High-*p*	Low-p
Give me five Come here and give me a hug Show me your wallet	Please don't leave your lunch box on the table
Medical-Related (Riviere et al., 2011)	
High-*p*	Low-p
Clap your hands Turn Do this	Requests related to looking in mouth or ears during medical examinations
Transition Between Activities (Singer et al., 1987)	
High-*p*	Low-p
Give me five Shake hands Say your name	Go to group now

The majority of the studies implemented HPRS interventions with minimal presession preparation. Several of the studies conducted presession parent or teacher interviews to determine targeted low-*p* and high- p requests (e.g., Jung et al., 2008; Meier et al., 2012; Riviere et al., 2011) or collected data through direct observations (e.g., Houlihan et al., 1994; Killu et al., 1998). Ewry and Fryling (2016) and Patel et al. (2007) conducted a compliance assessment as a more formal means of determining targeted high-*p* and low-*p* requests. In Pitts and Dymond's 2012 study, the authors conducted a stimulus preference assessment to identify preferred stimuli to serve as reinforcers for compliance with high-*p* and low-*p* requests. The implication of these findings is that once it has been determined that a HPRS intervention should be implemented with a participant, it can be done so in a relatively short amount of time.

A second implication to emerge from the literature on the use of HPRS interventions and participants with moderate to severe ID and ASD is that the intervention has produced effective results when implemented by interventionists with varying backgrounds and relationships to the participants as well as across various settings. In the non-academic related studies, the interventionists have included members of the research team (e.g., Patel et al., 2007), therapists (e.g., Meier et al., 2012), parents (e.g., Ewry & Fryling, 2016), group home staff (Mace et al., 1988), and medical staff (e.g., Riviere et al., 2011). These studies were conducted in either the home (e.g., Ewry & Fryling, 2016; Meier et al., 2012), clinical (e.g., Patel et al., 2007; Penrod et al., 2012), or medical settings (e.g., Riviere et al., 2011). In the classroom related studies, the interventionists also included members of the research team as well as teachers (e.g., Banda & Kubina, 2006), paraeducators, and school-aged peers (e.g., Jung et al., 2008).

These results are promising in that they support HPRS as an intervention that can be implemented relatively easily by various members within a participant's life as well as across settings. As a result, HPRS interventions can be implemented in the environment that the low-*p* requests behaviors occur and by individuals who are naturally part of that environment.

One consistent theme that has emerged in the literature on utilizing the HPRS either in isolation or as a component in a treatment package to address compliance is that there are many variations of the procedure being implemented with some more successful than others. HPRS methodological extensions have included variations in the operational defining of low-*p* and high-*p* requests. Some researchers have even suggested the concept of medium-*p* instructions being able to increase the pool of possible requests used in developing the intervention (Romano and Roll, 2000). Variations in the IPT time have been tested (e.g., Mace et al., 1988, experiment 3; Houlihan et al., 1994) with a general overall consensus that a shorter IPT (e.g., 3-5-s) is more likely to produce the desired momentum effects of the procedure. In addition to components relating to the types of requests used and the IPT, a few researchers have also examined the quality of reinforcement used and have suggested that the HPRS procedure can be strengthened by including higher quality (Mace et al., 1997) or programmed reinforcement (e.g., Pitts and Dymond., 2012). Concerns about the ability of the effects of the procedure to be maintained after the intervention has ended have been addressed through the application of fading procedures (e.g., Belfiore et al., 2008; Ducharme & Worling, 1994; Meier et al., 2012; Penrod et al., 2012).

These findings demonstrate that HPRS interventions can be used as an antecedent intervention with little preparation time, across interventionists, and across settings. In addition, modifications can be made to the intervention to be individualized to a participant's specific needs. Although these results are promising, there are many applications of HPRS with students diagnosed with moderate to severe ID and/or ASD that should continue to be explored in future research. In addition, studies that meet the quality indicators of single-case designs (CEC, 2014; Horner et al., 2005; Kratochwill et al., 2013) continue to be needed in the area of behavioral momentum interventions in order for it to be considered an EBP (Cowan et al., 2017; NAC, 2015; Wong et al., 2015).

CHAPTER THREE: METHODOLOGY

In this study, a reversal design (ABAB; Cooper et al., 2007) was used to examine the effects of a HPRS procedure on the compliance to low-*p* requests for a high school student with moderate ID. The sections to follow describe the participant, as well as the selection criteria and the intervention setting. In addition, the specific methodology of the study is explained in detail including the research design, measurement of dependent variables, implementation of the intervention, data analysis procedures, and potential threats to validity.

Participant

Initially, three high school students were recruited to participate in this study. A purposeful sampling procedure was used to identify each participant. After principal consent was obtained, potential teachers were nominated based on (a) having known students included in his or her classroom who were frequently noncompliant with instructions during classroom activities, and (b) the noncompliant behavior was negatively impacting the student's educational performance. The interventionist met individually with each teacher and explained the following inclusion criteria: (a) receiving special education based on the IDEA in the area of eligibility of ASD and/or ID, (b) having a history of not complying with clear directions given to him or her in the school setting, and (c) having demonstrated the ability to perform the request either through direct observation or through completing other behaviors that were topographically similar to the requests with which he or she does not comply. Teachers identified potential participants and parental consent forms were sent home. Once parental consent was obtained, the experimenter observed each potential participant

within the classroom setting to (a) increase the experimenter's familiarity with the participant and within the classroom, and (b) to determine what behaviors could be targeted as high-*p* and low-*p* requests. The experimenter determined that two of the participants were not appropriate candidates for this study due to the severity of inappropriate behaviors displayed when asked to complete tasks within the classroom setting. In addition, these two participants either had a behavioral plan already in place or a plan was being developed which would interfere with the implementation of the intervention within the study's time frame. For example, one potential participant would flip a heavy 30 in.-by-48 in. table over when engaged by staff members and would begin to scream. The behavioral plan in place was to have this student go to a separate area of the classroom for periods of 30-45 min at a time until the student indicated that she was ready to return to the designated work area. A second potential participant was on a reduced school day schedule and staff members were reluctant to ask him to engage in any non-preferred activity due to his history of physical aggression towards both adults in the classroom and other students. It was clear that both of these participants were initially selected by staff due to needing support with meeting the behavioral needs of each participant. The third candidate was selected as a participant in the current study. During observations, she would actively engage with staff members, and perform many requests given to her in the classroom setting while frequently refusing to complete simple tasks asked of her during both instructional and leisure settings.

Julie was a 16-year-old Caucasian female in the 10th grade who received special education services under the IDEA area of eligibility of ID. Based on her most recent evaluation data, Julie had an abbreviated Battery IQ (ABIQ) score of 47 on the Stanford-

Binet Intelligence Scales, 5th edition (SB5; Roid, 2003). An ABIQ score is calculated based on one noverbal and one verbal subtest and according to the SB5; it is a quick reliable assessment used to verify the general cognitive status of an individual. An IQ score of 45 is more than three standard deviations below the mean and is considered to be in the moderate range of ID. Julie's adaptive behavior skills were in the very low range according to results from her most recent adaptive behavior assessment, the Adaptive Behavior Assessment System, 3rd edition (ABAS-III, Harrison & Oakland, 2015). It was reported that she required a significant amount of support and supervision from adults throughout her school day. Julie received all of her academic and non-academic instruction from a special education teacher in a self-contained classroom, and did not participate in any activities within the general education setting. She received instruction on the state's extended content standards and participated in the state's alternative assessment program.

A noticeable strength of Julie's was her verbal and social skills. She initiated social interactions with her teacher, the paraeducators in the classroom, and her peers with and without disabilities. Peers without disabilities volunteered in her classroom throughout each school day and she engaged in age appropriate banter with them. According to her most recent individualized education program (IEP), Julie's parents' major concerns with their daughter's education involved increasing her independence. It was stated that an interest skill inventory was attempted; however, Julie refused to participate. In addition, her present level of performance indicated that she would often refuse to do basic tasks (e.g., get her breakfast; clean up her trash), and would engage in avoidance behavior (e.g., put her head down, turn around in her chair, verbally say no)

when asked to complete classroom related tasks. One of her IEP goals specifically targeted participating in instructional sessions for at least 5 min without verbally or physically refusing to do her work. Based on input from Julie's teacher and reviewing her educational record, there was an established need for addressing compliance in the classroom setting.

Setting

The study took place in a separate school setting that was housed within a public high school in a suburban school district in the southeast United States. The high school served 1,584 students, more than double the district average (n = 783) and more than the state average (n = 853). Approximately 68% of students enrolled at the high school were White, 12.6% were Hispanic, 11.3% were Black, 3.1% were Asian, 4.7% were two or more races, 0.3% were American Indian, and 0.1% were Pacific Islander. A total of 36.2% of students were eligible for free (31%; family income below 130% of the poverty line) or reduced (5.2%; family income below 185% of the poverty line) lunch. This was lower than the district average (52.6%) and the state's average (57.3%) of students eligible for free or reduced lunch. The students served in the separate school setting were from all districts within the school system and were served in classrooms located within an elementary, middle, and high school. Although these classroom are taught by teachers hired through the separate school system and have a separate school administrator and office staff, the classrooms are dispersed throughout the regular school campus.

Julie's educational setting was a self-contained classroom located on a wing of the school which included a mix of three self-contained classrooms and four general education classes. Her classroom included one instructor who was in his third year of

teaching, two paraeducators, and one sign language facilitator assigned to a student who was hearing impaired. There were a total of seven students with disabilities included in the classroom.

The classroom was relatively large in size and included two sinks along the wall of the classroom and a private bathroom. Each student had a designated desk that was modified to his or her individual need and all desks were arranged in a half circle facing the front of the room. At the front of the room were the whiteboards, a daily schedule, and an interactive whiteboard which was used throughout the instructional day. Julie's desk was situated at the far end of the semicircle giving her a clear view of the whiteboard, all students, the classroom door, and the teacher's desk. Baseline and intervention sessions took place within the classroom setting, predominantly at Julia's desk. These sessions occurred at the most appropriate times of the classroom routine for the directions to engage in low-*p* request to be given.

Materials

All sessions were videotaped using a Go Pro HERO+™ action camera checked out through the special education department located at the university of the investigator. Parental permission was obtained prior to videotaping any sessions. A built-in stopwatch feature on either a cell phone or Fitbit™ was used to measure latency and duration between trials.

Interventionists

The primary interventionist was a doctoral student in special education. He had 19 years of experience working with individuals with disabilities including working in a group home setting (6 years), a self-contained classroom setting (10 years), and in a

resource setting (3 years). The primary interventionist designed the intervention and was responsible for (a) conducting presession assessments, (b) implementing the baseline and intervention phases, (c) collecting compliance data and procedural fidelity data via watching video-taped sessions, (d) and training the secondary interventionist used for generalization measures.

The second interventionist was the special education teacher and was trained by the interventionist and implemented the intervention during generalization sessions throughout the study. He had a master's degree in special education with a focus on severe and profound disabilities, and was in his third year of teaching.

Data Collection

Dependent variables. In this study, the dependent variables were the percentage of compliance with low-*p* requests and the latency to respond to low-*p* requests. The percentage of compliance was calculated for the participant after each session. The number of compliant responses to low-*p* requests were divided by the total number of low p-requests given, and then multiplied by 100.

The second dependent variable was the latency to respond with low-*p* requests. Pitts and Dymond (2012) defined latency to respond as the interval between the end of the low-*p* request and the participant's initiation of the requested task. A stopwatch was used to measure latency to compliance in seconds. If the participant did not comply with the low-*p* request within 30-s, the interventionist marked the trial as noncompliant and recorded a maximum latency of 30-s. Although a stopwatch was used during baseline and intervention phases to assure the interventionist waited 30-s prior to ending trial, the videotaped sessions were used to accurately measure the latency to compliance to obtain

a more accurate measurement. The mean compliance latency was calculated for each session by adding the total number of seconds recorded for the trials in the session and dividing by the total number of low-*p* requests given within the session.

Experimental Design

A reversal ABAB design was used to examine the effects of HPRS on the participant's compliance with low-*p* requests. An ABAB design was selected because it is one of the most straightforward and powerful within subject designs that can demonstrate a functional relation between manipulating the independent variable and observed changes to the dependent variable (Cooper et al., 2007; Gast & Ledford, 2014). The reversal design has four phases (i.e., A_1, B_1, A_2, B_2). The first phase (i.e., A_1) in the design represents the initial baseline phase. During this phase, data were collected on compliance with low-*p* requests under current conditions within the natural setting for five sessions. Data collection continued until a pattern was established that predicted undesirable future performance of noncompliance. The second phase, B_1, refers to the initial introduction of the HPRS sequence. During this phase, data continued to be collected on compliance to low-*p* requests. The participant continued in this phase for at least five sessions and until an increase in trend or a change in level in a positive direction was obtained. After the initial intervention phase, the participant returned to baseline conditions for phase three (i.e., phase A_2) and the intervention was terminated. The participant stayed in phase three for at least five sessions. Finally, the participant entered the second B condition (i.e., phase B_2), where the intervention was reintroduced.

Each phase implemented in the ABAB design plays an important part in establishing a functional relation between the intervention and change in the dependent

variables. The first A phase establishes a pattern of responding. This pattern can be predicted to continue if conditions were to continue unchanged (Cooper et al., 2007). The second phase, B_1, introduces the independent variable and demonstrates that there were changes in the data (or no changes) that coincided with the implementation of the intervention. At this point, no confident assumption can be made that a functional relation exists between the change in the dependent variable and the implementation of the intervention (Alberto & Troutman, 2013). After introducing the third phase (A_2; return to baseline) and observing a change in the dependent variable to levels similar to the initial baseline phase, verification occurs. The fourth phase, return to intervention condition (B_2), is necessary for replication. If replication occurs, it can be stated that a functional relation exists between the implementation of the intervention and the observed changes in the dependent variables.

Procedures

This study consisted of the following conditions: (a) presession identification of requests, (b) presession identification of possible reinforcers, (b) presession compliance assessment, (c) two baseline conditions, (d) two intervention conditions, and (e) generalization conditions. The following section provides a detailed description of each of these conditions.

Presession identification of requests. Prior to baseline, data were collected to empirically validate requests that were identified as either low-*p* or high-*p* requests (Belfiore et al., 2008; Lipschultz & Wilder, 2017a). The teacher of the participant was asked to generate a list of commands that are typical within the classroom setting, as well as to identify those commands the participant had a history of noncompliance (see *Initial*

High-p and Low-p Request Identification Form located in Appendix A). Each command was randomly given to the participant a total of five times. Percentages of compliance was calculated for each command by dividing the total number of times the participant was compliant within 30-s after a command was given by the total number of times the command was issued and multiplying by 100. Requests that elicited compliant responses of 80% of the time or greater were labeled as high-*p* requests. Requests that elicited compliance responses 40% of the time or lower were labeled as low-*p* requests. Requests that elicited compliance responses between 50% and 70% of the time were not included in the study. In addition, only high-*p* requests that were topographically similar (Esch & Fryling, 2013; Lipschultz & Wilder, 2017a) to the low-*p* request were selected for this study. For example, if the low-*p* request was physical in nature (e.g., required motor movement), then the high-*p* requests was also physical requests (e.g., hand me your ____; stand up). If the low-*p* request was vocal in nature (e.g., tell me your name), then the high-*p* request was also a vocal request (e.g., what is her name?).

Presession identification of reinforcers. A major component of the HPRS procedure involves providing reinforcement contingent on compliance to requests (Lipschultz & Wilder, 2017a). Stimulus preference assessments were conducted to determine possible stimuli that the participant would prefer and the relative preference values of the selected stimuli (Cooper et al., 2007). First, a teacher interview was conducted to identify possible stimuli to use as reinforcers contingent on compliance with both high-*p* and low-*p* requests. Once these items were selected, the teacher was asked a series of questions used to determine the most appropriate type of trial-based preference assessment to implement based on the participant's individual skill level. For example, if

the participant consistently selects between two choices but is unable to select between three or more items without choosing the same side, a paired-stimulus preference assessment could be implemented (Fisher et al., 1992). If the participant is able to select between three or more items without choosing the same side, a multiple stimulus with (e.g., toy selection) or without replacement (e.g., edibles) may be a more appropriate assessment of each participant's preferred stimuli. Reinforcers identified were used as part of the programmed reinforcement component where they were provided contingent on the participant's compliance to high-*p* and low-*p* requests. Due to the nature of the HPRS, selected reinforcers were those that could be provided quickly (e.g., high-five, verbal praise).

Initial Baseline. During the initial baseline (i.e., phase A_1), the interventionist made eye contact with the participant, states the participant's first name, and immediately gave a selected low-*p* request. Once the request was given, a stopwatch was used to measure the latency between the issuing of the low-*p* request and the participant's response. If the participant responds to the low-*p* request, the stopwatch was stopped, and reinforcement was provided via verbal praise. The trial was recorded as compliant and the latency of compliance was recorded in seconds. If the participant did not respond, a minus was recorded, and no reinforcement was provided. Latency was recorded at the maximum of 30-s. The interventionist waited at least one minute before issuing the next low-*p* request. Each session consisted of five low-*p* requests. At least five sessions of baseline were conducted. If the participant had consistently complied with a low-*p* request during baseline procedures, the request would have been exchanged for another low-*p* request identified during presession procedures.

Initial Intervention. Once a trend had been established in baseline and a total of five sessions occurred, the participant moved to the initial intervention phase (i.e., phase B_1). During phase B_1, the HPRS with programmed reinforcement was delivered. Prior to beginning each trial, the interventionist selected the low-*p* request based on its appropriateness within the current activity. For example, asking the participant to get up and wash her hands would not have been appropriate during a typical science lesson but was included when the science topic was hygiene. First, a series of three randomly selected high-*p* requests was presented with a maximum of 5-s between the delivery of the reinforcer and the following high-*p* request (i.e., inter-response time). Reinforcement was contingent on the participant's compliance with each high-*p* request. After the third high-*p* request had been complied with and reinforcement delivered, the low-*p* request was immediately given. Reinforcement was provided contingent on the compliance with the low-*p* request. The participant's response to the low-*p* request was recorded using the *High-Probability Request Sequence Data Sheet* located in Appendix C. If non-compliance to any of the high-*p* request occurred, the trial was terminated. One trial consisted of the three high-*p* requests followed by one low-*p* request. The interventionist waited at least 3 min before beginning the next trial. Each session consisted of five trials.

Presession identification of requests. After the initial phase B and prior to the return to baseline phase, the interventionist repeated the presession identification of requests procedures. These procedures were followed to ensure that after the initial two phases, the requests used continued to meet classification guidelines of high-p or low-p requests.

Return to baseline. After six sessions of the initial intervention phase were conducted and the presession identification of requests occurred, the participant returned to baseline conditions (i.e., phase A_2). Procedures similar to the original baseline phase were implemented for five sessions.

Return to intervention. Just like the initial A-B phases, the participant transitioned from the A_2 phase to B_2 phase. Phase B_2 was conducted for at least five sessions prior to ending the intervention.

Generalization. Generalization probes were conducted one time during each phase, with an additional probe conducted during the return to intervention phase. This resulted in five data points. The classroom special education teacher served as the second interventionist and followed the same procedures as the primary interventionist for the given phase (i.e., baseline; intervention). Generalization probes occur in the natural setting of the low-*p* requests. The primary interventionist observed and collected interobserver agreement and procedural fidelity data. The primary interventionist also reviewed the procedure with the classroom teacher before each session within each phase by (a) reviewing the steps in the process, and (b) modeling the procedure for the special education teacher.

Interobserver Agreement

Data were collected by the interventionist during each session initially in person and then verified by watching the recorded videos of each session. A second observer observed and collected data by watching the recorded sessions. Interobserver agreement (IOA) was calculated using a trial-by-trial method (Cooper et al., 2007) and was conducted on 43% of sessions across all phases of the study (40% of A phases or baseline

condition; 45% of B phases or intervention condition). IOA was calculated by dividing the total number of agreements by the total number of agreements plus disagreements (i.e., total number of trials), and multiplying by 100 (Cooper et al., 2007). In addition, IOA was collected on both dependent variables including percentage correct and mean latency to respond. IOA for mean latency to respond was further analyzed on a trial by trial basis to determine the mean difference between both observers' recording of latency per trial.

Procedural Fidelity

Procedural fidelity was measured for 45% of sessions across both B phases (i.e., when the intervention was implemented) using a *Procedural Fidelity Checklist* (see Appendix D). This checklist was used by a second observer to record whether each component of the intervention had been implemented as intended. Procedural fidelity was calculated for each session by dividing the number of steps implemented correctly by the total number of steps. The mean percentage for procedural fidelity was calculated for both B phases.

In addition to calculating procedural fidelity for A and B conditions, procedural fidelity will also be calculated for all generalization sessions. The primary interventionist directly observed the generalization probes in real time and record procedural fidelity in the same manner previously described.

Social Validity

According to Wolf (1978) social validity is a significant factor in determining whether an intervention and its effects are of social importance. Wolf proposed that the social validity of a given study should be measured in three ways, including (a) the social

significance of its goals, (b) the social appropriateness of the procedures used, and (c) the social importance of the outcomes of the study. One common method for assessing the social validity of studies has been to ask for the opinions of the consumers (Cooper et al., 2007). For this dissertation, the social validity of the intervention was measured using a Likert-type scale for assessing the acceptability and feasibility of the HPRS as a classroom intervention for addressing noncompliance, as well as the social importance of the participants' behavior change. The questionnaire was adapted from *The Behavior Intervention Rating Scale* (Elliott & Treuting, 1991), and included 10 questions about the feasibility of the intervention, the perceived perceptions of the outcomes, whether the respondent would likely use the intervention in the future, and whether the respondent would recommend the intervention to others. In addition, two opened-ended questions were provided. The questionnaire was delivered to the special education teacher. The social validity questionnaire is available in Appendix E.

CHAPTER FOUR: RESULTS

Interobserver Agreement

IOA on the percentage of compliance to low-*p* requests and the mean latency to initiate compliance was collected for 43% of all sessions. IOA was collected for 40% of all phases with the exception of the initial intervention phase (i.e., second B phase), where IOA was collected for 50% of the sessions.

IOA for percentage of compliance was 100% across all sessions. This calculation was based on both observers having 100% agreement across all trials on whether or not compliance occurred within the 30-s time allotment. Two occurrences of compliance occurred during IOA sessions (once during baseline; once during intervention) that took over 30-s for the participant to initiate completion. Both observers agreed that these sessions did not meet criteria for compliance and both trials were recorded as noncompliant. Both observers were in agreement that a trial was noncompliant when the participant was asked to go to the sink to wash her hands and instead threw her trash away (i.e., which was the other targeted low-*p* request). Since the participant did not comply with the directions given to her, this was considered a noncompliant response.

For latency to respond, both the interventionist and the second observer watched the video recordings of each IOA session and measured latency as the duration between the moment that the interventionist completed the low-*p* request (i.e., the end of the utterance of the last word of the request) and the moment that the participant began the first step in the chained task. For example, if the participant was sitting down, the latency measure would end as soon as the participant stood up and took the first step in the direction of where the task had to be completed (i.e., trash can, sink). If the participant

was standing up at the end of the last high-*p* request (i.e., high-*p* request was "stand up"), then the latency measure ended as soon as the participant took the first step in the direction of where the task had to be completed.

IOA for all mean latency in seconds calculation was 100% within a band of plus or minus 1 s. See Table 2 for a complete list of each IOA session and data recorded.

Table 2

IOA Per Session

Phase/ Session	Interventionist Percentage of Compliance	Second Observer Percentage of Compliance	Interventionist Mean Latency in Seconds	Second Observer Mean Latency in Seconds	Difference in Mean Latency in Seconds
A1, Session 3	0	0	30	30	0
A1, Session 5	0	0	30	30	0
B1, Session 3	60	60	14	13.8	.2
B1, Session 4	20	20	25.6	25.8	.2
B1, Session 6	60	60	22.2	22.4	.2
A2, Session 4	0	0	30	30	0
A2, Session 5	0	0	30	30	0
B2, Session 2	100	100	5	5	0
B2, Session 3	100	100	6.2	6.6	.4

In addition to calculating IOA for mean latency in seconds to respond, IOA was also analyzed per trial within each session. For the 16 trials across seven sessions that were analyzed by both the experimenter and the second observer, IOA was 100% within a 2-s band, and 88% within a 1-s band. A trial by trial analyzes is included in Table 3.

Table 3

IOA Latency Per Trial

Phase, Session, Trial	Experimenter Latency	Second Observer Latency	Difference
A1, Session 3, Trial 1	46	45	-1
B1, Session 3, Trial 4	3	2	-1
B1, Session 4, Trial 2	8	9	+1
B1, Session 6, Trial 1	15	16	+1
B1, Session 6, Trial 2	23	22	-1
B1, Session 6, Trial 3	13	14	+1
B2, Session 2, Trial 1	3	4	+1
B2, Session 2, Trial 2	6	7	+1
B2, Session 2, Trial 3	3	2	-1
B2, Session 2, Trial 4	2	2	0
B2, Session 2, Trial 5	11	10	-1
B2, Session 3, Trial 1	9	10	+1
B2, Session 3, Trial 2	12	10	-2
B2, Session 3, Trial 3	1	2	+1
B2, Session 3, Trial 4	1	1	0
B2, Session 3, Trial 5	8	10	+2

Procedural Fidelity

Procedural fidelity was calculated by a second observer to determine the degree to which the HPRS procedure was implemented as designed. A data sheet was created which included (a) getting the participant's attention prior to starting each trial, (b) presenting a total of three high-*p* requests, (c) providing reinforcement for compliance with each high-*p* requests, (d) presenting the second and third high-*p* request within 5-seconds of providing reinforcement for complying with previous request, (e) presenting

the low-*p* request within 5-s of providing reinforcement for complying with the last high-*p* requests, and (f) waiting at least 3 minutes after providing reinforcement for compliance with low-*p* request before starting the next trial. In total, there were 49 possible correct steps for the implementation of five trials of the HPRS procedure within one session. Procedural fidelity was then calculated by dividing the number of correct steps by the number of total steps and multiplying by 100 (Cooper et al., 2007). Procedural fidelity was calculated for 45% of intervention sessions. The mean procedural fidelity for the implementation of the HPRS procedure across both intervention phases was 99.6% with a range of 98 to 100% per session.

Procedural fidelity for the special education teacher's implementation of the HPRS procedure was 94% for the first intervention phase, and 69% for the second intervention phase, with a mean of 81.5% across both phases. Interestingly, the special education teacher would forget to provide reinforcement for compliance with the high-*p* requests. Even with this omission, the participant engaged in high levels of compliance with the teacher during HPRS sessions.

Presession Assessment of Requests

The teacher initially identified throwing trash away as a consistent request that Julie would not comply with. During initial presession assessment of requests, Julie was randomly asked to throw her trash away five times and she refused each time. Throwing trash away resulted in a mean compliance of 0% and was the first request to be identified as a low-*p* request. During this initial presession assessment, following several simple requests (i.e., pick one, put ___ in the ____, hand me, give me a high five, give me a fist pump) were identified as high-*p* requests with 100% compliance across all trials. During

one of the presession assessment trials, the experimenter noticed Julie would not state her name when asked. The experimenter followed up with several staff members who stated that she knew her name and had been observed stating it. This skill was then assessed and resulted in 0% compliance which also made it a low-*p* request. A third low-*p* request (i.e., go to the sink to wash your hands) was identified based on the request being given naturally during a session and Julie refusing to do so. The experimenter then asked Julie to wash her hands on five separate trials, and she had 0% compliance across all trials. By the end of the presession assessment, the experimenter had identified (a) throwing trash away, (b) washing hands, and (c) stating her name as the three targeted low-*p* requests.

During following up sessions, it was determined that the prompts, “scoot your chair back”, and “stand up” could be added to the list of high-*p* requests. See Table 4 for complete list of high-*p* and low-*p* requests.

Table 4

Initial Low-p and High-p Requests

Low-*p* Requests	High-*p* Requests
Throw trash away	High five
Wash hands	Fist pump
What is your name*	Pick item from a selection
	Put ___ in _____
	Hand me
	Take _____
Modified Low-*p* *Requests*	**Additional High-*p* Request added**
Go to the sink to wash your hands	Scoot your chair back
	Stand up

Presession Stimulus Preference Assessment

Prior to beginning the intervention, the teacher was asked to identify potential stimuli that could serve as reinforcement for compliance. Julie's teacher stated that Julie was motivated by gaining social attention from teachers, paraeducators, and peer helpers. The teacher was then asked a series of questions to determine what type of preference assessment should be conducted (Chazin & Ledford, 2016). These questions included (a) having an understanding of stimuli the student likes and dislikes, (b) knowing whether the student was able to consistently select between two items without choosing the same side, (c) knowing whether or not the student was able to select between three or more items without choosing the same side, and (d) knowing whether or not the student engaged in challenging behavior when favorite items were removed (Chazin & Ledford, 2016). According to the teacher, he had a clear understanding of Julie's likes and dislikes, and knew that she could consistently select between two items without choosing the same side, but could not choose between three or more items. Based on these responses, a paired stimulus preference assessment was given using multiple modes of receiving social attention. Five potential stimuli were selected including two verbal phrases (i.e., that's fantastic, good job), one gesture (i.e., thumbs up), and two actions requiring physical contact (i.e., high five, fist pump). Based on a total of 20 trials, Fist pump was the most likely reinforcer, followed by thumbs up. It was also noted that the participant selected the selection on her right for 14 out of the 20 responses.

The experimenter included another paired stimulus preference assessment to determine whether the participant seemed to have a preference of whom she gained attention from in the classroom. She was asked to pick between two individuals to talk to

if she followed directions. On 8 of the 10 trials, the participant selected the name on the right. The experimenter also observed that although she frequently requested “high fives” when she completed a request, she only selected “high fives” as a choice two times during the preference assessment. The experimented concluded that the participant was reinforced by social attention which could be provided in any of the identified modes. In addition, high-fives were also identified as a high-*p* request.

Results for Research Question 1: What is the effect of a HPRS on the percentage of compliance with low-*p* requests for students with ID?

Figure 3 shows the effects of the HPRS on the percentage of compliance with low-*p* request for the participant. During the first baseline condition, the participant had low levels of compliance. When the intervention was introduced in the first intervention phase there was an increase in overall level with some variability. When the intervention was removed and conditions return to baseline conditions, verification of the predicted pattern occurred with levels of compliance decreasing to 0 %. Once the intervention was reintroduced, there was an immediate change in levels of compliance and replication of the effect occurred. Visual analysis of the graph indicates that the experimenter established experimental control and that there was a functional relation between the HPRS procedure and percentage of compliance to low-*p* requests.

During baseline conditions, Julie was asked to comply with up to three different directions given to her randomly for five trials. These directions included, having her throw her trash away, stating her name, and washing her hands. During the initial baseline condition, Julie refused to complete all requests with the exception of two trials. During session three, she complied with throwing her trash away; however she took 46 s

which was 14 s over the maximum of 30-s to meet the definition of compliance. In addition, she complied with throwing her trash away for one of the trials during session four. Her refusals were typically paired with a verbal response (e.g., no; I don't know; stating the experimenter's name). On two trials during initial baseline conditions, Julie responded with, "yes," but did not follow through with completing the requested task. Overall, Julie's level of compliance was low during initial baseline conditions with a range of compliance per session between 0 and 20% and a mean of 4%. These results demonstrated that Julie engaged in low levels of compliance with the targeted common classroom requests. Based on initial baseline results, it could be predicted if current conditions had continued (i.e., asking her to complete these tasks without intervention), Julie's percentage of compliance would have remained at low levels (i.e., between 0 and 20%).

After the fifth session of baseline, Julie entered the initial intervention phase of the study (i.e., first B phase). According to Kratochwill et al. (2010, 2013), the immediacy of effect between phases compares the extent level, trend, and variability of the last three data points in one phase to the first three data points in the next phases. Using this method, an immediacy of effect was demonstrated between the last three sessions of initial baseline (M = 6.67%) and the first three sessions of the initial intervention phase (M = 40%). Overall, Julie demonstrated an overall increase level in percentage of compliance with a mean compliance of 43.33% (range 20% to 60%) across the initial intervention phase of this study. This change in responding demonstrated that there was an increase in Julie's willingness to comply with low-*p* requests that corresponded with the implementation of the intervention. After five sessions occurred, a

prolonged break of one week occurred due to student absences, the weekend, and the experimenter's schedule. If a phase change occurred during this break, it could potentially be difficult to rule out the break's impact on any change that occurred between phases. To control for this threat to internal validity, an additional intervention session (i.e., session 11) occurred prior to beginning the return to baseline condition.

After six sessions of intervention, Julie was presented with return to baseline conditions (i.e., given the low-*p* requests only). There was an immediacy of effect between the last three sessions of the initial intervention phase (*M*=46.67%) and the first three sessions of return to baseline conditions (*M*=0%). There was no variability during the second baseline phase with Julie demonstrated 0% compliance throughout the phase. These results provided verification of the prediction that if an intervention was not introduced, Julie's levels of compliance would remain low.

The final phase (second B phase; return to intervention) was introduced with an immediate change in level. Julie's compliance for the last three sessions of the return to baseline condition was 0%. Once the intervention was reintroduced, her compliance increased to a mean of 86.67% for the first three sessions of the phase and a mean of 88% across all five sessions (range 60-100%). Two trials were marked as noncompliant due to the participant's latency to respond taking more than the allotted 30-s. This return to higher levels of compliance with the implementation of the intervention demonstrated a replication of the effect verified in the previous phase. This replication is necessary to demonstrate experimental control and provides evidence that there was a functional relation between Julie's level of compliance to low-*p* requests and the implementation of the HPRS procedure.

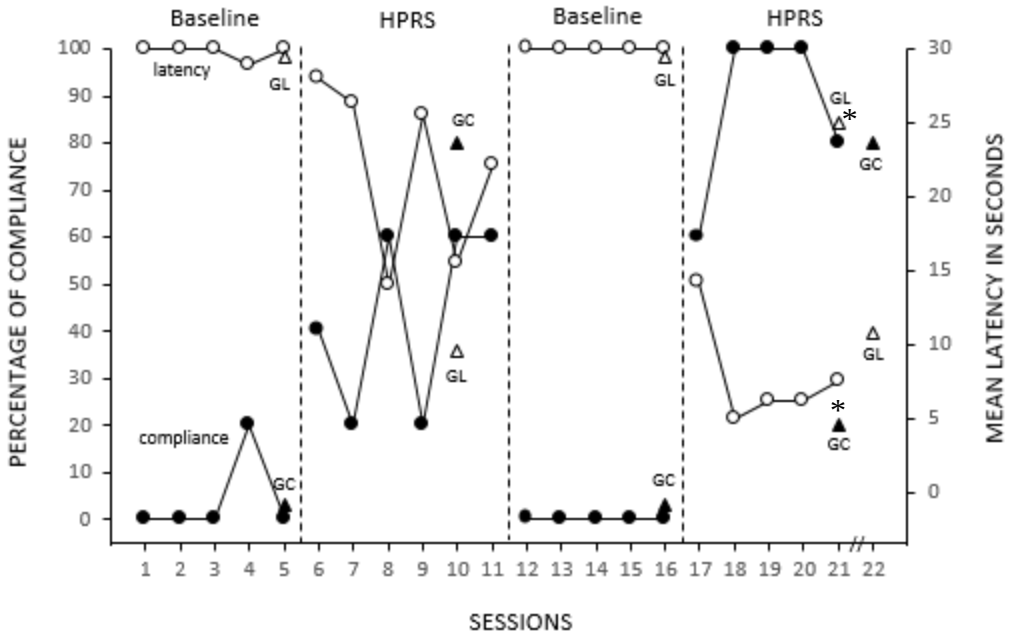

Figure 3. Results for percentage of compliance and latency to respond. Generalization percentage of compliance (GC) and mean latency in seconds (GL). * Data from session 21 is based on only two trials. The participant was compliant with first trial and the session was stopped after second trial.

Results for Research Question 2: What is the effect of a HPRS on the response latency with low-*p* requests for a student with ID?

Across all phases, if the participant did not respond within 30-s after the end of the verbal prompt, the trial was marked as noncompliant and a maximum of 30-s was recorded for latency. During baseline conditions, Julie was compliant with two trials. For one trial, it took Julie 25-s to initiate completing the request (i.e., throw trash away), and this trial was recorded as compliant. A second trial could not be counted as compliant due to Julie taking over 30-s to initiate the first step. For this trial, the maximum of 30-s was recorded and the trial was recorded as noncompliant. There was little variability in latency in seconds across this initial baseline phase (*M* = 29-s; range 25 to 30-s). Based

on initial baseline results, it could be predicted if current conditions had continued (i.e., asking her to complete these tasks without intervention), Julie's mean latency in seconds would have remained high (e.g., 25 to 30-s). See figure 3 for the graph of latency to respond data.

Unlike initial baseline conditions, which saw only one trial of compliance across all sessions, the initial intervention phase saw compliance across all trials. The mean latency in seconds across all sessions had a considerable about of variability (M = 21.97, range 14 to 28 s). The mean latency for the last three sessions of the first baseline phase was 28.33 s and the mean latency for the first three sessions of the initial intervention phase was 22.8 s. This demonstrates a decrease of 5.53 s for mean latency to respond. Comparing these two initial phases, it was clear a change had occurred in mean latency to respond that coincided with the introduction of the intervention.

Once the intervention was removed and conditions returned to baseline conditions, there was an immediacy of effect on the level of mean latency to respond. The mean from the last three sessions of the intervention phase was 21.13-s. The mean for the first three sessions of return to baseline conditions was 30-s (a decrease of 8.87-s). There was no variability during the return to baseline conditions, as the participant did not comply with any of the trials across the five sessions. All trials in the return to baseline condition were marked as noncompliant due to the participant not complying with any of the requests and no trials were marked as noncompliant for taking over 30-s to respond. This return to baseline condition provided verification of the prediction that was made during initial baseline conditions. If the participant had continued to be asked

to engage in low-*p* requests without the implementation of an intervention to address noncompliance, her latency to respond would remain high.

After five sessions of return to baseline conditions occurred, the intervention was reintroduced in the last intervention phase. There was an immediacy of effect on the mean latency to respond. The last three sessions of return to baseline condition had a mean latency of 30-s. The first three session of the return to intervention had a mean latency of 8.47-s (a decrease of 21.53-s). There was some variability across the sessions, and this was primarily due to one trial taking over 30-s for the participant to respond. The range of mean latency across this last phase was 7.84-s, with a range of 5 to 14.2-s. This last phase, provided replication of the effect that the HPRS had on the mean latency to respond to low-*p* requests. With this replication, there is evidence that the experimenter had demonstrated experimental control and that there was a functional relation between the participant's changes in mean latency to respond to low-*p* requests and the implementation of the HPRS procedure.

Results for Research Question 3: In what ways do teachers perceive the effectiveness of the intervention in relation to the effects on the percentage of compliance with low-*p* requests?

The teacher was asked to complete a social validity questionnaire that asked him to rate each question based on his observations of the intervention being implemented and the observed outcomes for the participant. In addition, he was given the opportunity to provide open-ended responses to two questions. When asked to rate the question on whether or not he felt the change in the percentage of compliance was of significant magnitude, the teacher indicated that he strongly agreed that the change to percentage of

compliance was significant based on his observations of the intervention being implemented in his classroom.

Results for Research Question 4: In what ways do teachers perceive the effectiveness of the intervention in relation to the effects on response latency with low-p requests?

The teacher was asked whether or not he felt that the changes in the latency to respond to requests was of significant magnitude. He responded that he strongly agreed that the changes in latency were significant based on his direct observations of the intervention and based on his review of the data shared with him by the interventionist.

Results for Research Question 5: What are staff members (e.g., teachers, paraprofessionals) perceptions of the feasibility of implementing the HPRS within the classroom setting?

Five questions were asked that related to the teacher's perceptions of the feasibility of implementing the intervention within the classroom setting. He indicated that he strongly agreed that most of his colleagues would find the intervention appropriate for addressing noncompliant behavior, that the amount of time needed to implement the intervention was appropriate for the classroom setting, that he would likely continue using the intervention with the participant as a means for addressing noncompliant behavior, that he was likely to use the intervention with other students as a means for addressing noncompliant behavior, and that he was likely to share the outcomes of the intervention with others and suggest the use of the HPRS as a means for addressing noncompliance with others. In addition, when provided the opportunity to provide additional feedback on the feasibility and appropriateness of the HPRS, the teacher stated that the "intervention is easy to incorporate into daily routines."

Results for Research Question 6: What are the perceptions of the teachers who work with the participants on the outcomes of the intervention?

The teacher indicated that he strongly agreed that the intervention was an acceptable intervention for addressing the participant's noncompliant behavior. He also strongly agreed that the amount of time it took to see a change in the participant's behavior was appropriate. He indicated that he agreed (but did not strongly agreed) that the participant's noncompliant behaviors had decreased to a point, that they are no longer a problem within the classroom setting. In addition to the rating scale, the teacher was provided the opportunity to respond to an open-ended question in regards to the outcome of the intervention. The teacher stated that the, "student's noncompliant behaviors have decreased significantly since the beginning of the intervention, even when not using the intervention. [Julie] used to miss school regularly due to refusal to get on the bus, but her attendance has become more consistent." It is also important to note that a paraeducator, also commented that he has seen an increase in Julie's willingness to respond during group activities since the implementation of the intervention, and both the teacher and paraeducator reported that her correct responses on individual and group activities have increased. A possible rationale for this is provided in chapter five.

Results for Research Question 7: How are results of the HPRS generalized across phases when implemented by a staff member (e.g., teacher, paraeducator) familiar with the participant?

Generalization was measured by having the teacher implement baseline and intervention conditions, once per phase. During the initial baseline phase, the teacher implemented the generalization measure on the same day as session five. Julie was not

compliant with any of the five requests asked of her during this session. When the teacher implemented the intervention during the initial intervention phase, Julie was compliant with 80% of trials and had a mean latency of compliance of 9.6-s. This was the highest of all compliance sessions during the initial intervention phase. Once conditions returned to baseline and the teacher once again asked her to complete the series of requests without using the HPRS procedure, her compliance was again at 0% with a maximum latency of 30-s recorded. When the teacher implemented the intervention during the return to intervention phase, Julie's compliance increased to only 20% with a mean latency of 25-s. It should be noted, that the teacher implemented the procedure later than anticipated which put the second trial occurring at lunch time. This trial ended in noncompliance and with the participant refusing to engage with the teacher. It was determined that the generalization measure should end with the second trial due to the circumstances. This is discussed further in chapter five. See figure 3 for the graph of the generalization data.

One week and two days after the last attempted generalization measure, the experimenter returned to conduct another generalization session with the teacher implementing the HPRS procedure. During this session, Julie's compliance was 80% and her mean latency to respond was 10.8-s. She did not comply with the last request to go to the sink to wash her hands. This last trial also occurred prior to a transition of leaving the room.

CHAPTER FIVE: DISCUSSION

The purpose of this study was to evaluate the effects of using a proactive, antecedent intervention (i.e., the HPRS procedure), on the compliance to low-*p* requests for a high school student with a moderate ID. The effects on compliance were measured by determining both (a) the percentage of compliance with low-*p* requests, and (b) the mean latency to respond to low-*p* requests. Using a reversal design, the interventionist began by asking the participant to comply with a series of low-*p* requests identified during presession assessments. This initial baseline phase was followed with an intervention phase that included asking the participant to engage in three consecutive high-*p* requests, providing reinforcement for compliance with each request, and immediately providing a prompt to complete the low-*p* request (i.e., the HPRS procedure). Following the guidelines of a reversal design, the participant was once again provided with baseline conditions followed by intervention conditions. A generalization measure implemented by the classroom special education teacher was conducted once per phase. In addition, a social validity questionnaire was completed by the teacher. Themes related to the findings for each research question are presented in addition to a discussion of limitations, implications for practice, and recommendations for future research.

Percentage of Compliance with Low-*p* Requests Outcomes

Percentage of compliance has been a consistent measure of behavior change found in the literature on HPRS (e.g., Lipschultz et al., 2017; Mace et al., 1988; Pitts & Dymond, 2012). Based on a visual analysis of the results for this study, a functional relation exists between the implementation of the HPRS procedure and the participant's increase in percentage of compliance with low-*p* requests. The participant engaged in low

levels of compliance during baseline conditions with only one session across both baseline phases that had compliance levels above 0 %. When the intervention was introduced during the first intervention phase, levels of compliance increased with some variability and overlap with baseline conditions. During the second intervention phase, compliance increased to even higher levels than produced during the first intervention phase, including three sessions of 100% compliance.

Noncompliance definitions often include the following two components (a) the targeted individual not doing what is asked of them, and (b) not doing what is asked within a specific time frame (Kalb & Loeber, 2003; Lipschultz & Wilder, 2017b). In addition to this definition, it is necessary to focus on targeted requests that the student can do but refuses to do. It is important to not include requests that (a) the student may not have the physical ability of doing, (b) involve requests that the student may not comprehend what is being asked of them, or (c) involve skills that the student has not yet acquired.

Two low-*p* requests were consistently given during all four phases of the intervention as well as during the generalization measures (i.e., throw your trash away; wash your hands) with some changes made to the specificity of the requests. One low-*p* request was removed for reasons discussed below.

The first two low-*p* requests were topographically similar because they both were motor requests (i.e., required the participant to stand up, and physically walk a similar distance across the classroom to complete the request). The researcher did not directly observe the participant engage in these behaviors during presession assessments and observations; however, he was confident in including these behaviors as targeted low-*p*

requests due to observing the participant engaging in similar behaviors that were topographically similar. For example, the participant was asked to throw her trash away five times during a presession assessment and verbally refused each time. The interventionist then asked her to help him by placing his notebook in a different location in the classroom. Without hesitation, the participant stood up, picked up the notebook, walked to the designated area, and placed the notebook on the table. All of these observed skills (i.e., picking up an object, scooting chair back, standing up, walking while carrying an object, and releasing the object) were similar skills needed to complete the request of throwing her trash away. In addition to being topographical in nature, both skills are considered to be in the practical domain of adaptive functioning skills (American Psychiatric Association, 2013). One of the major components of identifying a school aged student as having ID is demonstrating that along with an intellectual deficit, there are deficits in adaptive functioning. These also are considered skills that would have to be completed by someone else if not done by the individual themselves. By implementing the HPRS procedure and increasing compliance with these two adaptive behavior related requests, the student also is experiencing higher levels of independence within her school day.

A third identified low-*p* request was added based on observations during presession assessments and was later removed. It was noticed early on, that the participant would not state her name when asked. The interventionist asked familiar adults if she has said her name in the past and everyone reported that she was able to state her name; however, they could not remember a specific incidence of her actually doing so. It was determined that the participant had the articulation skills needed to state her

name. This was determined by informally consulting with the school's speech therapist and conducting a series of informal tests to see if she would (a) repeat similar sounding names, (b) repeat the individual syllables of her name, and (c) repeat other words that incorporated the initial, medial, and final sounds of each syllable of her first name. The participant was able to produce all phonemes and words required to state her name. She would repeat randomly given words rapidly given to her and then stop when asked to repeat her own name. Her physical demeanor would change when her name was stated for her to repeat. It was determined that based on the sudden change in her behavior when asked to state her name over several trials, that asking her name should not be part of the HPRS intervention.

Latency to Respond Outcomes

Applied research assessing the effectiveness of the HPRS intervention not only has measured the percentage of compliance with low-*p* requests, but also has focused on the effect the intervention has on response latency to initiate given low-*p* requests (Lee et al., 2006; Mace et al., 1988; Pitts & Dymond, 2012). Results of the current study were similar to previous investigations (Pitts & Dymond, 2012) in that the introduction of the intervention led to a decrease in response latency. A visual analysis of the data indicates that there is a clear functional relation between the HPRS procedure and reduced latency measured in mean of seconds per session.

This reduction in response latency has an impact beyond simply getting the participant to complete self-help tasks that naturally occur in the classroom throughout any given school day (i.e., throwing away trash, handwashing). By reducing the latency to respond to these requests, the participant spends less time in transition between

activities. This reduced time initiating a request also equates to more time spent engaging in other activities, such as engaging with teachers and peers and participating in additional classroom activities (Belfiore et al., 2008). Banda and Kubina (2006) conducted a study measuring the effects of a HPRS on the transition behaviors of a student with ASD. In this study, the authors measured duration of task completion. The results indicated that the student had reduced the time it took to complete the targeted daily low-*p* requests by 1 to 1.5 min. The authors concluded that a reduction in the duration of these daily tasks by even 1 min could add up to 3 hrs of additional instructional time across a 180-day school year (Banda & Kubina, 2006). This same logic could be extended to the current study. If the participant is initiating compliance at a reduced duration, then she has more time to engage in other classroom activities.

A reduction in response latency also decreases the likelihood of a staff member completing the activity for the student due to time restraints. At the beginning of the intervention, the interventionist observed on several occasions that staff members (i.e., primarily paraeducators) would frequently walk over to the participant's desk and throw her trash away for her. This was also evident by the participant's behavior. On several occasions, when the participant was asked to throw her trash away, she picked it up and held it out towards the interventionist or other nearby adults in the classroom.

Generalization Outcomes

Results from the current study also indicated that the positive effects the intervention had on compliance (i.e., increasing percentage of compliance while decreasing latency to respond to low-*p* requests) could be generalized when implemented by another adult familiar with the student. The interventionist had the classroom special

education teacher implement an additional session within each phase. During baseline and intervention conditions, the special education teacher implemented the procedure during a whole group lesson. This not only provided the opportunity to demonstrate generalization across instructors but also between the one-on-one setting (i.e., when working with the interventionist) and during group instruction where the special teacher was providing instruction to multiple students at a time.

One of the fundamental concerns of behavior analysis is that behavior change should be generalized over time, persons, and settings (Cooper et al., 2007; Stokes & Baer, 1977). When teaching new skills (e.g., compliance with low-*p* requests), it is important to embed strategies within instruction that promote the generality of behavior change and not strictly rely on what Stokes and Baer referred to as the train and hope method. One strategy involves training sufficient exemplars. An example of this method includes programmed generalization across experimenters (i.e., having the special education implement the HPRS procedure with the participant in addition to the investigator). This provides the participant the opportunity to respond correctly and to develop a history of reinforcement for compliance with low-*p* requests across more than one teacher. It would not be sufficient to demonstrate that an interventionist from a university could implement an intervention and produce positive results. It is important to demonstrate that the intervention can easily be implemented by other adults familiar with the participant (Horner et al., 2005). By having the classroom teacher implement the intervention one time per phase, the interventionist was able to demonstrate that the intervention could be implemented by others who consistently work with the participant, increasing the likelihood of the intervention continuing after the study has ended. In

addition, the results from the generalization measure also demonstrated that the intervention can be implemented with success during small group activities and does not require the interventionist to work one-on-one with the targeted student. Other studies have focused on more explicitly examined the effect of the HPRS sequence when implemented within classroom routines and group settings (Austin & Agar, 2005). Austin and Agar demonstrated that the HPRS could be implemented within group activities that occurred in a kindergarten classroom.

Social Validity Outcomes

The current study also collected data through a survey that included both Likert-scales and open-ended questions. These questions provide insight on the teacher's perception of the feasibility of the intervention, the magnitude of effects, and on the overall perception of the HPRS intervention as an appropriate intervention for addressing noncompliant behavior.

The teacher strongly agreed that the intervention was an acceptable intervention and that the change in behavior (i.e., increased compliance, reduced latency to respond) was of significant magnitude. This was expected as it was clear that the student would get up and throw her trash away and go to the sink to wash her hands consistently when asked. What was not as expected was the teacher's comments on the open-ended questions. The teacher indicated that the participant's noncompliant behaviors had decreased significantly since the beginning of the intervention and it was suggested that there was a possible connection to compliance at home. According to the teacher, the participant had become more compliant getting on the bus in the mornings and as a result, her attendance had increased during the intervention. In addition, both the teacher and

paraeducator reported that the student was more engaged during group activities and it was even suggested that she was more accurate in her responses.

There is a plausible explanation of these perceptions. It would be easy to interpret that if an intervention was introduced and a change in behavior occurred that corresponded with the introduction of the intervention, that there could be a possible functional relation between the intervention and change in behavior. In the case of the participant's attendance and increases correct responses in other classroom settings, there are too many extraneous variables that cannot be ruled out to imply causality (Alberto & Troutman, 2013). Instead, there could be a correlation between the antecedent intervention and staff attitudes towards the student, and in turn, this change in attitude leading to increase opportunities given to the participant to respond to requests and other prompts across the school day. This type of effect has been noted, but not directly measured, in other investigations of the HPRS sequence. In a study conducted by Banda and Kubina (2006), it was anecdotally noted that the student was more cooperative after the intervention had been implemented and that the teacher was not "nagging" the student as much during the school day. These changes in both the student and the teacher's behaviors were reported to have an overall positive effective on the teacher-student relationship (Banda & Kubina, 2006). Compliance has been considered a "keystone behavior," in that improvements in the response class (i.e., compliance) also has been associated with collateral decreases in other problem behaviors as well as increase in untargeted academic and social skills (Ducharme & Shecter, 2011). Both the results of Banda and Kubina's 2006 study and the results from the current student provide some evidence of this collateral effect.

Identification of High-*p* Requests

An important component of the HPRS intervention, is that the interventionist is able to increase the participant's rate of responding by providing multiple (e.g., 3-4) quick and simple requests that the participant has a history of complying. This history of compliance increases the likelihood that the participant will engage in the desired response class (i.e., compliance) and as a result, receive reinforcement. This relation between increasing response rate and history of reinforcement has an effect on the behavior's (i.e., compliance) resistance to change when faced with a challenging environmental stimuli, such as the low-*p* stimuli (Mace et al., 1988; Nevin et al., 1983). Said another way, the participant is more likely to continue to engage in compliant behavior even when faced with more aversive low-*p* requests. One of the most crucial steps in establishing this momentum of compliance is selecting appropriate high-*p* requests. In two early studies where the HPRS intervention was not successful in establishing a momentum of compliance with particular participants (Ardoin et al., 1999; Rortvedt & Miltenberger, 1994), it was noted that participants were not consistently compliant with the high-*p* requests.

Some researchers of the HPRS intervention have suggested the use of high-*p* requests that are topographically similar to the low-*p* targeted request (Lipshultz & Wilder, 2017a). In the current study, all high-*p* requests were topographically similar in that they required a motor response when the low-*p* request involved a motor response (e.g., throw your trash away) or were vocal responses (e.g., what is my name?) when the low-*p* request was vocal in nature (i.e., what is your name?). In Mace et al. (1988)

seminal study on the use of HPRS to increase compliance, the authors included the high-*p* requests of (a) give me five, (b) come here and give me a hug, and (c) show me your wallet. All of these requests required a motor response from the participant; however, were not specifically related to the steps involved in the low-*p* request of asking the participant of putting his lunch box up in the appropriate location. Much of the research that has been conducted on the HPRS intervention has followed a similar pattern of including high-*p* requests that are not directly related to the low-*p* requests (e.g., Belfiore et al., 2008; Ducharme & Worling, 1994; Zarcone et al., 1994) with some researchers including a mix of motor and vocal related high-*p* requests (e.g., Singer et al., 1987) within the same high-*p* sequence.

In addition to including high-*p* requests that were topographically similar to the low-*p* request, the current study also included some high-*p* requests that were the initial discrete steps of the more complex chained low-*p* requests. For example, a task analysis of throwing trash away could involve the following steps (a) pick up trash, (b) scoot the chair back, (c) stand up, (d) walk to the trash can, (e) release the trash into the trash can, and (e) return to designated area. When the participant is asked to "throw trash away," she may or may not choose to be compliant based on the effort evolved in completing any or all of the involved steps. It was directly observed early on in the current study that standing up was somewhat challenging for the participant. She would often pause before pushing herself up or would attempt to hand the trash to someone else prior to standing. In at least one instance, the participant responded to the request to throw her trash away, picked up her trash, scooted her chair back, and then paused as she began to push herself up off of the chair. This pause resulted in a break in the momentum of compliance and

the participant did not follow throw with the request. Interestingly, it was determined that standing up in isolation was a high-*p* request when it did not involve being followed by additional steps. In addition, the interventionist tested the request "scoot your chair back" and determined it also met the criteria for being a high-*p* request. Once these requests were formally tested, the interventionist added both "scoot your chair back" and "stand up" to the list of high-*p* requests. An example of this new high-*p* sequence included (a) pick up your trash, (b) scoot your chair back, and (c) stand up. In this example, all three requests are discrete behaviors that are part of the natural chained procedure of "throwing trash away."

With the "throwing trash away" low-*p* request, a task analysis was used to determine which initial steps could be used as high-*p* requests. The logic of using a task analysis to break down a step into smaller units of discrete behavior was also applied to the identification of the low-*p* request for "washing hands." Using a forward chaining procedure (Cooper et al., 2007), the interventionist targeted the first step in hand washing for the low-*p* request. Instead of providing the prompt, "wash your hands" after the high-*p* request was implemented, the interventionist prompted the participant to, "go to the sink so she could wash her hands." Once the participant demonstrated compliance and walked to the sink, the interventionist provided social praise and the HPRS trial ended. At this point, modeling and various levels of prompting (e.g., verbal, gestural, physical) was embedded in the instruction to help teach the remaining steps of handwashing. Although not formally assessed, the participant was more actively involved in all the steps of handwashing by the end of the intervention.

High-Quality Reinforcement

A second component of the HPRS intervention important in establishing a momentum of compliance strong enough to continue even when faced with a low-*p* request, is the embedding of high-quality reinforcement within the HPRS procedure (Lipschultz & Wilder, 2017a; Nevin & Grace, 2000). Pitts and Dymond (2012) investigated the effects of implementing HPRS with and without programmed reinforcement for high-*p* requests on the compliance of low-*p* request for three elementary aged students with ASD. The authors found that the HPRS procedure was more effective when high-quality reinforcers (i.e., edibles) were used in comparison to relying on social praise. Much of the recent research on the utility of the HPRS procedure has included conducting preference assessments as a method for identifying stimuli that is more likely to serve as reinforcement for compliance with both high-*p* and low-*p* requests (Esch & Fryling, 2013; Pitts & Dymond, 2012; Wilder et al., 2015). Like Pitts and Dymond, the current study conducted stimulus preference assessments to identify preferred stimuli to use as reinforcers contingent on compliance of high-*p* and low-*p* requests. It was determined that social attention served as a primary reinforcer for the student. The interventionist provided the participant with social attention after each episode of compliance. Interestingly, the classroom teacher did leave out social praise during one session of the HPRS and the participant still complied with the low-*p* requests. It is possible that the intervention itself, may become the reinforcing stimuli. The participant in the current study clearly preferred social attention as her preferred stimuli. She would engage in attention seeking behaviors with her teacher, paraeducators,

peer helpers, and most of the students in the classroom. She often laughed during the intervention. In addition, she would call out to the teacher as the procedure was beginning, as almost if saying, “hey, watch what is about to happen.” The instructor attempted to embed the HPRS within the natural routine of the classroom. Due to the nature of the identified low-*p* requests (i.e., throwing trash away; washing hands), meal time and art activities were the best time for a session to occur. The participant did begin to notice stimuli in the instructional environment that was present during the intervention and would on occasion respond to this stimuli with, “say it.” The “say it” response was interpreted as the participant wanting the instructor to begin the HPRS procedure.

Competing with Noncompliance

Two important components discussed so far in the implementation of the HPRS intervention has been related to selecting appropriate high-*p* requests and appropriate reinforcement as both of these are necessary in building a momentum of compliance. A third concern is addressed competing behaviors (i.e., noncompliance).

The interventionist attempted to put noncompliance on extinction by not providing any type of social attention after noncompliance occurs and withholding the reinforcing stimuli until the participant was compliant or until the trial ended. There are two issues with this. First, the negative reinforcement of not engaging in the preferred task may be stronger than the contingency of getting positive reinforcement from the instructor from engaging in the undesired task. Second, the reinforcing value of withholding the desired stimuli may be weakened due to the stimuli being readily available in the instructional setting. This may not be of great concern in the therapy setting, where the instructor is working one-on-one with the participant and can have

more control over the stimuli readily available in the instructional environment. This is not a practical or viable option if the intervention is implemented in the natural setting where noncompliance is likely to occur (i.e., the classroom). This was demonstrated on several trials throughout the study. The participant would often respond to low-*p* requests with a verbal "no." When this occurred, the interventionist would not make eye contact or react in any manner to the participant's attempt at initiating social interaction with him. On several occasions, the participant would call out to other students and adults in the classroom and gain positive reinforcement from others in her environment even though the interventionist was withholding all social attention he could give from her.

Limitations of the Current Study

In chapter one, several delimitations were discussed including focusing on participants with ASD and ID and only addressing compliant behaviors within the classroom setting. In addition to these delimitations, there are also several limitations to this study. This limitations are discussed below.

First, the study only included one participant with a diagnosis of moderate ID. The investigator originally sought to have at least three participants with a diagnosis of ASD and/or ID with the hope for participants with both diagnosis. Several potential participants were initially identified but had to be ruled out as potential participants due to factors outside of the interventionist's control. In the end, this led to having one participant with a diagnosis of moderate ID.

One area that the HPRS procedure has received a lot of attention is with addressing compliance with students diagnosed with ASD. Several researchers have conducted evidence-based practice reviews to determine whether the HPRS procedure

and/or behavioral momentum interventions could be considered an EBP for individuals with ASD. The current study adds to the literature of the effectiveness of the HPRS procedure when implemented with students with moderate to severe disabilities (Davis et al., 1994; Mace et al., 1988; Romano & Roll, 2000), but does not lend itself to add to the literature base on the effectiveness of the intervention with other populations including students without disabilities (e.g., Austin & Agar, 2005), students with mild disabilities (e.g., Ducharme & Worling, 1994), or students diagnosed with ASD (e.g., Houlihan et al., 1994, Pitts & Dymond, 2012).

A second limitation of the current study is that generalization measures were only conducted by a special education teacher. As a result, this study demonstrated that two educators with master degrees in special education could implement the intervention with promising results. Belfiore, Basile, and Lee (2008) also demonstrated that the HPRS could be implemented by a life-skills program teacher of students with mild to moderate developmental disabilities. With more students with disabilities being included in the general education setting, and noncompliance being a factor that can hinder the success of the student in the general education classroom, it is important for studies of potential evidence-based practices to provide documentation of being easily implemented within inclusive settings. This study does not demonstrate that a general education teacher or a paraeducator was successful at implementing the HPRS procedure, which are the staff typically present in the general education setting.

A third limitation of the current study is that it did not include a formal measure of the duration of task completion. If reducing latency is important due to increasing the time the participant can engage in other activities within the school setting, then reducing

the total duration of the time it takes the student to complete the task would arguably be even more important in the overall importance of this intervention. Banda and Kubina (2006) suggested that measures such as frequency and latency do not provide an accurate picture of compliance with low-*p* requests. This is due to the possibility that the student may quickly initiate a response to comply with a request but then take a significant amount of time to complete the request. It should be noted that in the current study, duration of task completion was not a noticeable problem with the targeted participant. Once the participant would initiate a response, she would perform the task within a relatively quick time frame. She was highly motivated by the social attention she received for completing the tasks. It should also be noted that due to the ceiling placed on latency to respond (i.e., 30-s), there were four instances of compliance that occurred across both baseline and intervention conditions that were not calculated in percentage of compliance.

A fourth limitation is that the request were not necessarily given in random order as originally planned by the interventionist. Due to the nature of the targeted requests (e.g., hand washing; throwing trash away), the interventionist decided to embedded these request within the naturally occurring time that these requests would be performed. This limited each session to being conducted either during breakfast, lunch, or an art activity where both hand washing and throwing trash away would be expected behaviors. Five trials were provided within each session. It would not be typical to wash your hands three to five times during a 30-min art activity or during mealtime. Instead, the interventionist set up the environment and provided a rationale for handwashing at least twice during each session. For example, if handwashing already occurred during a session, he would

point out the table was sticky and that the participant's hands were getting dirty. He also would generate reasons for having additional trash on the table. During one session, when the participant was asked to throw her trash away after meal time, she picked up both trash items and took them to the trash can. The interventionist then created more trash my making a mistake on the paper they were using and crumpling up the paper on the desk. This manipulation of the environment was necessary in providing naturalistic opportunities to engage in the targeted requests but did not lend themselves to being randomly implemented during a session.

A fifth limitation of the current study was that not all extraneous variables could be ruled out due to implementing the procedure within the natural routine of the classroom setting. It was determined early on, that the participant enjoyed attention from all others in her environment and that social attention would serve as a reinforcer for compliance with both high-*p* and low-*p* requests. Because of this, the interventionist would withhold any social attention from the participant for the duration between giving a prompt to engage in a request and the completion of the request. If the participant did not engage in the request, the interventionist would ignore all attempts made on the part of the participant to gain social attention until the ceiling of 30-s was reached. At this point, he would continue with the activity. If the participant completed the task requested, he then provided high levels of social praise and attention. The interventionist implemented this part of the intervention with fidelity; however he could not always control others in the environment. In reviewing the videos for procedural fidelity, it was noted that a student could be heard in the background telling the targeted participant to throw her trash away. The same student also responded with, "yes you can" in response

to the participant given a verbal “no” when asked by the interventionist to throw trash away. On another occasion, a paraeducator was heard telling the participant that she hopes that she was following all of the interventionist’s directions. The interventionist did discuss the importance of providing the participant with no attention during these requests but it was difficult to control their natural urges to respond.

Recommendations for Future Research

The results of the current study are promising in that the use of HPRS can be an effective strategy for increasing compliance to low-*p* requests. On the other hand, when combined with the literature on the use of HPRS, there still needs to be additional research on the specific variables that are necessary components of this intervention. First, the currently study required the use of three high-*p* request before giving a low-*p* request. Second, the intervention demonstrated that when the intervention was removed, noncompliance increased to initial baseline levels. Fading procedures have been implemented in studies addressing the effects of the HPRS intervention with students with moderate to severe disabilities (Belfiore et al., 2008; Ducharme & Worling, 1994), students with mild disabilities (Axelrod & Zank, 2012), students without disabilities (Ardoin et al., 1999), and students diagnosed with ASD (Meier et al., 2012; Penrod et al., 2012). In these studies additional sessions occurred where the participant was provided with a reduced number of high-*p* requests. Future researchers should continue to examine whether fading the number of high-*p* requests can increase the likelihood of the effects of the intervention being maintained, even after the intervention has been removed.

According to Kalb and Loeber (2003), when students are noncompliant, it may impair the daily interactions he or she has with peers and adults, reducing the quality of

those relationships. Similar to the findings of other HPRS studies (e.g., Banda & Kubina, 2006), it is possible that the current student demonstrated evidence to this claim. According to teacher and paraeducator input for the current study, the targeted student had increased her compliance and willingness to respond during various classroom activities without the use of the HPRS procedure. It cannot be asserted that there is a causal relation between the intervention in this current study and the participant's increase in compliance and in her willingness to respond. I propose the following explanation which warrants future investigation. The participant was identified as a student who frequently does not comply with directions and as a result staff did not ask as much of her and completed various self-help related activities for her. As a result of the intervention and focus on compliance, the staff in the classroom observed an increase in the participant's compliant behavior, and as a result increased social praise and other reinforcement given to the participant. This increase in positive interactions with the participant may have carried over to other classroom activities. The teacher and paraeducators may be more likely to increase interactions and increase asking the participant to engage in behaviors which provided the participant with an increased opportunity to respond. In addition, the HPRS procedure increased a history of reinforcement for the behavior of compliance. This history of compliance combined with the increased opportunities to respond and attention given to reinforce compliant behavior across staff members, may result in an increase in overall compliance. Future research should be implemented to systematically measure this effect.

The current study demonstrated that the HPRS procedure is a simple procedure (although it is often described in technical applied behavior analytic terms) that can be

quickly implemented during instructional activities to increase compliance. The current study, like many studies in applied behavior analysis, demonstrated that an interventionist working on his Ph.D. and a special education teacher with a master's degree and several years of experience can implement the procedure with fidelity and achieve the desired results of increased compliance. With an increase of students with ID and other disabilities being included in the general education setting and with research stating that noncompliance is often a major concern in more inclusive settings (Cowen et al., 2017; Lee, 2005; Lipschultz & Wilder, 2017b), future research should be conducted on the feasibility of other staff members implementing the procedure, who are more likely to be present in the general education classroom. These staff members would include the general education teacher and paraeducators who generally have not had extensive training in working with students receiving special education services.

The intervention in this study included high-*p* requests that were topographically similar to the low-*p* requests. Few studies have investigated the effects of topographically similar versus non-topographically similar requests (Lipschultz & Wilder, 2017a). In the current study, high-*p* requests that required motor movement (e.g., hand me, scoot your chair back, stand up) proceeded a low-*p* request that also required large gross motor skills (i.e., walking to trash can, walking to sink). The order of the high-*p* requests were also naturally ordered from small motor to large motor movements. For example, in the sequence (a) hand me the marker, (b) scoot your chair back, (c) stand up, and (d) go to the sink so we can wash your hands, each request requires more effort than the proceeding request. This characteristic was not deliberately manipulated during the current study but warrants future research. Future researchers may want to determine the

effect of effort order of completing high-*p* requests on building behavioral momentum of compliance. In addition, future research should also examine the possibility of low-*p* requests (e.g., go to the sink to wash your hands) becoming a future high-*p* requests within a chained task.

Recommendations for Practice

The findings of this study demonstrate that the use of a HPRS can be effective for not only increasing the compliance to low-*p* requests for participants diagnosed with ID, but also decreasing the time it takes for participants to initiate such requests. This decrease in latency allows for more time to engage in socially appropriate interactions as well as to engage in academic instruction throughout the day.

In order for an intervention to be considered as a possible and feasible strategy by classroom teachers, it needs to produce desirable results and has to be easily implemented within the typical context of the classroom (Lee, 2005). The intervention requires no additional materials, can be easily embedded within various activities throughout the school day, and implemented by a variety of individuals who work with the targeted student. No additional materials have to be purchased or made to implement the HPRS procedure.

The HPRS intervention can also be individualized to meet the diverse needs of the participant. In the current study, it was determined that the high-*p* requests could be modified to include approximations of the desired behavior to avoid having physically demanding parts of the tasks interfere with the behavioral momentum created by the intervention.

In addition, the HPRS procedure can be used in conjunction with a task analysis to initiate the first step in a behavior chain the participant has the skills to complete but typically refuses to do. For example, in the current study, the HPRS procedure was used to increase the participant's compliance with going to the sink area to wash her hands. Once the HPRS procedure was successful in getting the participant to the sink, additional evidence-based practices (e.g., modeling, prompting) were incorporated to teach the remainder of the steps required in washing hands.

Summary

Compliance, and its counterpart, noncompliance, has been the subject of much research in behavior analysis. In a recent review of the literature addressing the assessment and treatment of noncompliance, Lipschultz and Wilder (2017a) initially identified close to 30,000 articles published in peer-review journals between 1970 and 2016 when using the search term "noncompliance." After applying a more stringent criteria, the authors identified over 1,000 empirical articles that reported on a procedure to either (a) assess noncompliant behavior or (b) to increase compliance/decrease noncompliance (Lipshultz & Wilder, 2017a). One of the most frequently discussed antecedent interventions found in the literature to address noncompliant behavior is the HPRS procedure (Cowan et al., 2017; Lee, 2005; Lipschultz & Wilder, 2017a).

This study adds to the literature on the use of HPRS as a non-aversive, antecedent intervention to both (a) increase compliance with low-*p* classroom related requests and (b) decrease the response latency in responding to such requests for a high school student diagnosed with a moderate ID. The current study also examined whether the effects of the intervention were similar when implemented by another adult familiar with the

student. In addition, the current study also sought to determine the teacher's perceptions of both the magnitude of behavior change related to the implementation of the intervention and the feasibility of the implementation of the intervention within the classroom setting.

In the present study, the participant demonstrated an increase in compliance and a decrease in response latency with the intervention was implement by either the interventionist or by the classroom special education teacher. This increase in compliance, led to the participant being more independent in two self-help related adaptive behavior skills which is a common deficit for individuals diagnosed with an ID.

In addition, there were noticeable improvements in other areas including (a) increased attendance rate, (b) increased participation during group activities, (c) increased correct responses to comprehension related questions, and (d) a noticeable difference in perceived attitude towards the participant. The HPRS procedure cannot be directly linked to causality of these noticeable improvements. What is plausible is that implementing a proactive antecedent intervention which focused on reinforcing discrete compliant behaviors instead of punishing instances of noncompliance may have an overall impact on the student's history of compliance and staff member's willingness to provide opportunities to respond.

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Appendix A: High-*p* and Low-*p* Identification Form

Initial High-*p* and Low-*p* Request Identification Form

Student: _____ Teacher: _____

Target Low-Probability Requests: Please provide 1-3 requests that the student can perform but will not perform when requested. These requests should be to perform tasks that has a negative impact on the student or other students if not performed.

Request	Setting

Target High-Probability Requests: Please provide 3-5 high-probability requests for every low-probability request provided. These requests should be to perform tasks that the student has mastered and has consistently demonstrated a willingness to perform.

Request	Setting

Appendix B: High-*p* and Low-*p* Presession Assessment

High-*p* and Low-*p* Request Presession Assessment

Student: _____ Date:_____

	Request	T1	T2	T3	T4	T5	Total	Percentage	HP/LP
1							**/5**		
2							**/5**		
3							**/5**		
4							**/5**		
5							**/5**		
6							**/5**		
7							**/5**		
8							**/5**		
9							**/5**		
10							**/5**		
11							**/5**		
12							**/5**		

Appendix C: HPRS Data Sheet

High-Probability Request Sequence Data Sheet

Student: _____ Date:_____

Interventionist: _____ Session: _____ Phase: A B

Observer:_____

		Request	Latency (sec)	Compliance	SR+ Delivered
Trial 1	**:05**	**HPR 1:**			
	:10	**HPR 2:**			
	:15	**HPR 3:**			
	:20	**LPR:**			

		Request	Latency (sec)	Compliance	SR+ Delivered
Trial 2	**:05**	**HPR 1:**			
	:10	**HPR 2:**			
	:15	**HPR 3:**			
	:20	**LPR:**			

		Request	Latency (sec)	Compliance	SR+ Delivered
Trial 3	**:05**	**HPR 1:**			
	:10	**HPR 2:**			
	:15	**HPR 3:**			
	:20	**LPR:**			

		Request	Latency (sec)	Compliance	SR+ Delivered
Trial 4	**:05**	**HPR 1:**			
	:10	**HPR 2:**			
	:15	**HPR 3:**			
	:20	**LPR:**			

		Request	Latency (sec)	Compliance	SR+ Delivered
Trial 5	**:05**	**HPR 1:**			
	:10	**HPR 2:**			
	:15	**HPR 3:**			
	:20	**LPR:**			

% Compliance: Total number of LPR + _____ / _____Total number of LPR =_____ X 100 = ____ %

Latency Mean: Trial 1____+ Trial 2 ____+ Trial 3____+ Trial 4 ____+ Trial 5 ____=_____/5 =_____

Appendix D: Procedural Fidelity

Procedural Fidelity: HPRS Task Analysis

Interventionist: _____ Date: _____

Observer: _____ Session: ____ Phase A B

Step in Sequence	Completed Step Correctly Trial 1	Completed Step Correctly Trial 2	Completed Step Correctly Trial 3	Completed Step Correctly Trial 4	Completed Step Correctly Trial 5
Got student's attention					
Presented First High-p Request					
Provided SR+					
Presented Second High-p Request within 5-s of first request					
Provided SR +					
Presented Third High-p Request within 5-s of second request					
Provided SR +					
Presented Low-p Request within 5-s of last HP request					
Provided SR +					
Waited at least 3 minutes before next trial					

Procedural Fidelity: # of + _____/ _____Total number of steps = ____ x 100 = __ %

Appendix E: Social Validity

Social Validity Form

Please rate the following questions based on your observations of the intervention being implemented and the observed outcomes for each participant.	Strongly Agree	Agree	Slightly Agree	Slightly Disagree	Disagree	Strongly Disagree
1. The intervention was an acceptable intervention for addressing the participant's noncompliant behavior.						
2. Most of my colleagues would find this intervention appropriate for addressing noncompliant behavior.						
3. The changes in the percentage of compliance were of significant magnitude.						
4. The changes in the latency to respond to requests was of significant magnitude.						
5. The amount of time needed to implement the intervention is appropriate for the classroom setting.						
6. The amount of time it took to see a change in the participant's behavior was appropriate.						
7. The participants' noncompliant behaviors have decreased to a point, that they are no longer a problem within the classroom setting.						
8. I am likely to continue using this intervention with the participants as a means for addressing noncompliant behavior.						
9. I am likely to use this intervention with others students as a means for addressing noncompliant behavior.						
10. I am likely to share the outcomes of this intervention with others (e.g., teachers, paraeducators, parents) and suggest this intervention as a means for addressing noncompliance with others.						

In addition to the feedback provided above, is there anything else you would like the experimenter to know in regards to the feasibility and appropriateness of this intervention?

(Please feel free to add addition comments on the back of this form)

Is there anything else you would like the experimenter to know in regards to the outcomes of this intervention?

(Please feel free to add addition comments on the back of this form)