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Use of High-Probability Instructional Sequences During Pre-Academic Activities for Young Children with Autism Spectrum Disorder

Danielle Russo
University of South Florida

Use of High-Probability Instructional Sequences During Pre-Academic Activities for Young Children with Autism Spectrum Disorder

by

Danielle Russo

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Department of Child and Family Studies
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Major Professor: Kwang-Sun Cho Blair, Ph.D., BCBA-D
Catia Cividini-Motta, Ph.D., BCBA-D
Kimberly Crosland, Ph.D., BCBA-D

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DEDICATION

I dedicate this manuscript to my parents, Frank and Judy. Thank you for the boundless love and encouragement throughout this journey.

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ABSTRACT

The antecedent-based strategy, known as the high-probability (high-p) instructional sequence has been one effective way to facilitate teachers to prevent noncompliant behavior and increase acquisition of functional and adaptive behaviors for children with autism spectrum disorders (ASD). However, the outcomes of using the high-p instructional sequence as an intervention in school settings remain inconsistent. In this study, we examined the use of the high-p instructional sequence intervention during pre-academic and academic activities for three young children with ASD. Specifically, the study focused on examining the overall effects of the high-p instructional sequence on initiation and compliance to low-probability (low-p) instructions, the impact of using a differential reinforcement of alternative behavior (DRA) component in addition to the high-p instructional sequence, and maintenance of the improved behavior during a fading phase. A multiple-based across participants design was used to evaluate the intervention outcomes. The results indicated that for one of three participants, higher rates of compliance with low-p activity instructions were displayed during the high-p intervention alone phase and maintained above criterion level during high-p fading. For two children, adding DRA to high-p was necessary to increase initiation and compliance to criterion levels. Results suggest that the high-p intervention may be an effective antecedent-based intervention for children with ASD who already often initiate the low-p instruction, but who have difficulty completing tasks; however, for children with ASD who do not often initiate the low-p instruction, an additional intervention component such as DRA may be essential to increase compliance.

INTRODUCTION

The U.S Department of Education (2017) estimates that 14% of all students enrolled in public schools, ages 3-21, are currently receiving special education services. Representing a total of 6.7 million students receiving services within the school, 9% of these students have Autism Spectrum Disorder (ASD). Children who are diagnosed with ASD display deficits that impede on the development of essential life tools such as social, communication, and self-control skills (Ducharme & Shecter, 2011). As the number of children with ASD in school continues to prevail, the excessive need for these children to receive appropriate intervention within their classroom increases as well (Ducharme & Shecter, 2011). However, many factors within the applied setting of a school hinder the development and adaptation of establishing appropriate interventions that can be applied within the classroom (Ducharme & Shecter, 2011).

Although there has been a growth of knowledge for treatments that can be applied to children with ASD in the classroom, a lack of guidance in identifying evidence-based practices (EBPs) that are appropriate still stands (Cowan et al., 2017; Iovannone et al., 2003). Identifying and implementing EBPs are the imperative tasks that schools face to ensure students with ASD are receiving effective individualized interventions (Odom et al., 2010; Wong et al., 2013). However, it is challenging for school personnel working in school settings to identify applicable EBPs for reasons such that interventions or practices may misleadingly claim to be evidence-based and that they may be unfeasible for school personnel to implement (Odom et al., 2010; Stormont et al., 2005). In an effort to assist professionals and practitioners with identifying EBPs that can be utilized for children with ASD, the National Professional Development Center on

Autism Spectrum Disorder (NPDC) completed two in-depth research reviews (Odom et al., 2010; Wong et al., 2015), recognizing that EBPs derived from the science of applied behavior analysis (ABA), such as antecedent- and consequence- based interventions, are found to be the most effective practices for children with ASD in school settings (Cowan et al., 2017). Furthermore, among EBPs grounded in ABA, the National Autism Center (NAC; 2015) and Wong et al. (2015) specifically considered overall, antecedent-based intervention strategies to be effective and feasible ABA practices for children with ASD in school due to both, the level of research rigor for antecedent-based interventions and the advantages these intervention strategies hold over consequence-based interventions.

Antecedent-based interventions, such as prompt delivery (Dogan & Tekin-Iftar, 2002; Payne et al., 2012), visual supports (Bryan & Gast, 2000; Schneider & Goldstein, 2010), incorporating student choice and preference (Carlson et al., 2008; Cole & Levinson, 2002; Romaniuk et al., 2002), and noncontingent reinforcement (Hagopian et al., 1994; Jones et al., 2000) are proactive procedures that are used to either evoke a desired behavior or reduce the occurrence of an undesired behavior through modifying aspects of environmental events or routines that set the occasion for the behavior (Crosland & Dunlap, 2012; Kern & Clemens, 2007). Unlike consequence-based interventions, antecedent procedures promote a child's opportunity to engage in desired behavior without having to contact possible aversive consequences such as punishment, reprimands, or physical guidance (Cowan et al., 2017; Kern & Clemens, 2007; Lee, 2005). Reducing the need of such reactive approaches in school settings are important for creating a safe learning environment for children with ASD in general education classrooms. Antecedent-based interventions have been found to be advantageous in creating such environments (Crosland & Dunlap, 2012; Hagopian et al., 1994; Jones et al.,

2000), decreasing children's motivation of engaging in problem behavior within the classroom (Kern & Clemens, 2007).

A specific antecedent intervention that has been effective at increasing compliance for children with ASD in the school environment is known as high-probability request sequences (Banda & Kubina, 2006; Jung et al., 2008). The high-probability (high-p) request sequence involves presenting an individual with a sequence of high-p tasks, which the individual is highly likely to perform, prior to presenting a low-probability (low-p) request that is more difficult and that is less likely to be performed by the individual (Mace et al., 1988). High-p request sequences were developed based on a theory known as behavioral momentum. The theory suggests that when an increased rate of reinforcement is established in the presence of a specific discriminative stimuli, response strength will enhance due to a greater resistance to change (Lipschultz & Wilder, 2017; Nevin & Grace, 2000). Therefore, when reinforcement is delivered contingent on compliance to high-p requests which directly precede a low-p request, compliance to the low-p request may increase as well (Lipschultz & Wilder, 2017). The need for antecedent-based strategies, such as high-p request sequences, that are non-aversive and promote compliant behavior for children with ASD in applied settings is crucial to facilitate the acquisition of both adaptive and functional life skills (Killu et al., 1998).

Procedural Components of High-P Instructional Sequences

Recent research has examined multiple procedural variations of high-p request sequences in an attempt to identify specific components that may or may not increase its effectiveness as an antecedent-based intervention. Key features of high-p sequences that have been found to impact the effectiveness of the intervention include: (a) the necessity and quality of reinforcement delivered for correct responding to high-p requests (Wilder et al., 2015; Zuluaga & Normand,

2008, (b) the duration of inter-prompt time (IPT) between the last high-p request in a sequence and the low-p request (Pitts & Dymond, 2012; Wilder et al., 2015), and (c) the ratio of high-p to low-p requests delivered in a given sequence (Ardoin et al., 1999; Axelrod & Zank, 2012; Ertel et al., 2018). For example, Zuluaga and Normand (2008) examined the effects of high-p instruction sequences with and without programmed reinforcement for complying with high-p instructions in the home setting for two children with developmental disabilities, using a reversal design. Results indicated that compliance with low-p instructions increased when programmed reinforcement (e.g., edibles and praise) were delivered upon compliance with high-p instruction, compared to no programmed reinforcement.

Several researchers have also suggested that although delivering consequences for compliance to high-p requests is an important component of high-p request sequences, the intervention may still fail to be effective if the delivered consequence does not function as a reinforcer or is not high-quality (Pitts & Dymond, 2012; Zulugaga & Normand, 2008). For instance, research has found increased compliance to low-p requests when an edible or high-quality reinforcer is delivered contingent on compliance to high-p requests, rather than praise or a low-quality reinforcer (Wilder et al., 2015). Having identified the potential necessity of reinforcement and its quality as components of high-p request sequences, research has suggested that based on the rate of requests, making reinforcement more readily available may increase effectiveness of high-p sequences as well. Pitts and Dymond (2012) evaluated a shorter inter-instruction interval, such as the duration between presenting each request in a sequence, and the effect it has on increasing compliance to low-p requests. Whereas several studies examining the overall effectiveness of high-p request sequences often use a 10-s inter-instruction interval (e.g., Bullock & Normand, 2006; Zuluaga & Normand, 2008), Pitts and Dymond (2012) found a 5-s

inter-instruction interval to be most effective in increasing both compliance to low-p requests and decreasing the latency to comply. Wilder et al. (2015) extended the research and found that a 1- to 2- s inter-instruction interval was just as effective. Decreasing the duration of inter-instruction intervals can allow for an increased rate of responding, thus making reinforcement more readably available (Pitts & Dymond, 2012; Wilder et al., 2015).

Although there has been a wealth of research studies identifying components such as reinforcement and inter-instruction intervals to increase effectiveness of high-p request sequences, there have been inconsistent findings for other components such as the topography of high-p and low-p requests. Research has suggested that compliance to a low-p request may increase when the high-p request is topographically similar (Lipschultz et al., 2018). For instance, when comparing high-p instructions that require either similar or dissimilar response topographies to the low-p instruction (e.g., vocal or motor response), levels of compliance do not differ for the low-p instruction (Lipschultz et al., 2018). However, researchers have also examined topographically similar high-p request sequences in consideration to increasing compliance with food acceptance and found that similar high-p sequences increased food acceptance (Meier et al., 2012; Patel et al., 2007). It is possible that topographic similarity increases effectiveness of high-p sequences; however, more research examining dissimilar high-p sequences is necessary to identify if topography is a beneficial component.

Furthermore, there has been varying results of research that identifies the feasibility to fade the number of high-p requests in a sequence, as well as the maintenance and generalization of compliance for low-p requests (Arodin et al.,1999; Axelrod & Zank, 2012; Belfiore et al., 2008; Borgen et al., 2017; Ertel et al., 2018; Jung, Sainato, & Davis, 2008; Lipschultz & Wilder, 2017). For instance, in an attempt to transfer the stimulus control of the high-p request sequence

to the low-p request, Axelrod and Zank (2012) and Arodin et al. (1999) delivered a 3:1 and 1:1 high-p to low-p ratio using a fading procedure and found that fading resulted in maintaining compliance at the 1:1 high-p to low-p ratio during follow up for four out of five students. However, other research suggests that when fading a 5:1 high-p to low-p ratio to a 3:1 and 1:1 ratio, effectiveness of the intervention decreases as well (Ertel et al., 2018). Research must further evaluate fading procedures for high-p sequences Likewise, more research must program for generalization of compliance for low-p request across settings and people, such as classrooms, teachers, and parents.

Targeted Population for Research in High-p Request Sequences

In an effort to examine the effects of the antecedent strategy grounded in behavioral momentum, research has also looked at a variety of populations for which high-p request sequences may or may not be effective. For instance, two meta-analyses, conducted by Lee (2005) and Cowan et al. (2017), synthesized findings from 44 studies that used behavioral momentum techniques across various populations and found that for both meta-analyses, primary school-aged children with disabilities were the most prevalent population targeted in research that benefited from high-p request sequences. Furthermore, both meta analyses found that the majority of high-p request sequences research included participants who were preschool or kindergarten age, followed by elementary, middle or high school and lastly adult age. Whereas Lee (2005) reported that of all participants included, only 16.7% were of adult age, Cowan et al. (2017) reported that no participants included were older than middle school age.

In addition to age, it is important to note that all studies examined in both meta-analyses mainly included children with a diagnosis of ASD or another related disability. Numerous research has identified the high-p request sequence as an intervention that can be effective in

increasing compliant behavior for young children with disabilities (e.g., Ertel et al., 2018; Hansen et al., 2018; Patel et al., 2006; Riviere et al., 2011). Few studies have found high-p sequences to be as effective for adults with disabilities, possibly due to a longer history of reinforcement that has been established overtime (Lee, 2005). It is possible that consequence-based interventions may be more effective for adults with disabilities who have a long history of reinforcement of problem behavior. However, adding an antecedent-based component, such as high-p request sequence, can potentially increase the effectiveness of the consequence-based intervention, for that high-p requests can be implemented prior to the onset of the problem behavior, decreasing the likelihood of its occurrence and excessive need for reactive procedures.

High-p Request Sequence Combined with Other Interventions

Although there has been a substantial amount of research indicating the effectiveness of the high-p request sequence intervention, investigators have recognized occasions in which this antecedent-based intervention is ineffective as a stand-alone treatment and only effective when another intervention component is added (Bullock & Normand, 2006; Dawson et al., 2003; Rortvedt & Miltenberger, 1994). For instance, Dawson et al. (2003) evaluated the effects of high-p instructions both with and without escape extinction to increase food acceptance as a treatment of total food refusal for a child. Findings suggested that acceptance of food increased and refusal behaviors decreased only when escape extinction was implemented contingent on refusal behaviors whether or not high-p instructions preceded (Dawson et al., 2003).

Contrarily, other findings have indicated that when the high-p sequence is combined with another intervention, such as demand fading or differential reinforcement, effectiveness often increases (McComas et al., 2000; Patel et al., 2006; Penrod et al., 2012). That is, when evaluating a progressive high-p instructional sequence with the added component of low-p demand fading

to treat food selectivity and food refusal behaviors for two children, Penrod et al. (2012) found that the multicomponent intervention was effective and that possible aversive consequence-based strategies such as escape extinction or physical guidance were not necessary. In addition, McComas et al. (2000) examined the high-p request procedure with and without differential reinforcement of alternative behavior (DRA) on requesting a child to mand for a work break. Results indicated that frequency of responding to low-p requests were greater when high-p requests preceded DRA procedures, opposed to DRA alone (McComas et al., 2000).

Lastly, findings have also suggested the high-p request sequence to be equally as effective both as a stand-alone intervention and when another intervention component is added (Belfiore et al., 2002). In a study comparing the effects of the traditional high-p request sequence to high-p request sequence in conjunction with escape from demands on academic noncompliance to complete math problems, Belifore et al. (2002) found that both interventions resulted in a reduction of latency to complete math problems, indicating no differentiation between conditions. Overall, research findings on the effectiveness of high-p request sequence combined with other interventions have been inconsistent, for that high-p request sequence have been found to be effective and ineffective both with and without a combine intervention component. Further research should evaluate specific types of interventions, such as non-aversive consequence-based interventions, that may enhance the effectiveness of high-p request sequences as an EBP.

Use of High-p Request Sequence in School Settings

Additional research has begun to recognize high-p request sequence as an approach that can be applicable for students within the context of the school setting (Belifore et al., 2002). In an applied setting such as a school, high-p request sequence has been used to increase

compliance for academic instructions, social instructions, skill mastery of communication, and social and functional skills (Belifore et al., 2002; Borgen et al., 2017; Jung et al., 2008; Lipschultz et al., 2018). For instance, Jung et al. (2008) evaluated high-p request sequence with embedded peer modeling to facilitate social interactions for six preschool-aged children with ASD in a preschool-kindergarten classroom. Social interaction initiations to peers increased for all children following intervention and were both maintained and generalized with novel settings and peers.

Other research has examined the effect that a high-p instructional sequence of mathematic problems has on academic noncompliance for two students with disabilities in the classroom (Belfiore et al., 2002). Students were instructed to complete a stack of math problem cards, in which three high-p problem cards preceded every low-p problem card. Results indicated that high-p instructional sequences were effective at both decreasing latency of task initiation and duration of task completion (Belfiore et al., 2002). Similarly, Banda et al. (2006) examined high-p request sequences when implemented by a teacher to enhance three transition behaviors for a middle school student with ASD and found that high-p requests, such as general conversation questions, were effective at decreasing both the total duration of low-p task completion, as well as the number of verbal prompts required by the teacher when providing low-p requests. The implementation of high-p request sequences in school settings have been advantageous due to the nature of its preventative techniques, not requiring a student to engage in problem behavior prior to implementation of the intervention (Lee, 2005).

Although literature has indicated the potential effectiveness of high-p request sequence as an intervention for use within a classroom, more research is needed to investigate specific populations and types of academic noncompliance which the intervention will be most beneficial

for in schools. Specifically, it is necessary to extend research to examine how the high-p instructional sequences can operate more effectively in the school setting, particularly examining the high-p components for preschool-aged children with ASD. Although the majority of the literature has evaluated the high-p instructional sequences with preschoolers and kindergartners, the added reinforcement component has been examined only with high school students with ASD or adults with ASD (Zarcone et al.,1993) or children with ASD in the home or clinic setting (e.g., Dawson et al., 2003; Patel et al., 2006). Currently, only one study (i.e., Lipschultz et al., 2018) has evaluated the effectiveness of the high-p instructional sequences with an added DRA component for preschool-age children with ASD in the school setting.

Generalization and Maintenance Effects

Numerous replications have identified the effectiveness of teacher delivered high-p instructional sequences (Arodin et al., 1999; Axelrod & Zank, 2012; Belfiore et al., 2008); however, literature has lacked in identifying if the effects of the high-p instructional sequences can generalize across teachers. Current literature examining the effects of the high-p instructional sequences in the classroom has mainly focused on implementing the strategy in one classroom and being delivered by one teacher or researcher. Because problem behavior may be likely to occur across multiple settings within a school, the effects of high-p instructional sequences when implemented across novel settings and teachers should be examined as well. In addition, there is a need to extend research examining maintenance effects of the high-p instructional sequences intervention in the applied setting for students with ASD. Ardoin et al. (1999) found that high levels of compliance persisted when fading out the high-p instructional sequence during classroom transitions for typically developing students; however, for students with ASD in the school, levels of compliance varied when fading the high-p sequence (Axelrod & Zank, 2012;

Belfiore et al., 2008). Intervention efficiency can be essential when implementation is occurring in the applied setting, more importantly, when the intervention is implemented in the classroom by the teacher themselves. Therefore, research examining the use of fading procedures is needed to ensure efficiency of the high-p instructional sequence intervention.

As discussed above there are clear gaps in the literature on high-p instructional sequence intervention. Therefore, the purpose of this proposed study was to evaluate the use of the high-p instructional sequence intervention combined with a DRA during pre-academic or academic activity instructions for young children with ASD in the school setting. This study examined the following research questions: (a) Will the high-p instructional sequence implemented by teachers increase compliance to low-p instructions in young children (preschoolers and kindergartners) with ASD; (b) will adding a DRA component to the high-p instructional sequence be necessary to increase compliance to low-p instructions; (c) to what extent will improved levels of compliance to low-p requests maintain when a fading procedure is implemented?

METHOD

Setting

This study was conducted in one elementary school classroom and two pre-kindergarten classrooms at two public elementary schools in central Florida. Both schools were located in urban neighborhoods, with one school serving approximately 650 students and one school serving approximately 400 students. Of the three classrooms, one classroom was a non-categorical special education classroom, serving six children with disabilities, ages between 5 and 8 years, who had a wide range of disability categories and learning needs. The children were receiving special education services under the category of ASD, intellectual disability (Down Syndrome), developmental delay, or other health impairment. The other two classrooms were inclusive pre-k classrooms, supporting both children receiving general early childhood education or early childhood special education services. All classrooms were staffed with one teacher and one to two supporting instructional aides. The classrooms were identified by the school psychologist and guidance counselor of each school as classrooms that may benefit from additional behavioral strategies and supports. All sessions took place in the natural environment of the classroom during the targeted classroom activity time period in which low-p activity instructions were regularly presented. Specific pre-academic and academic activities were identified by the teacher and researcher based on the individual needs of each student.

Participants

Three children, ages 3 to 7, diagnosed with ASD, and their corresponding three teachers participated in this study. Inclusion criteria for child participants included: (a) medical diagnosis

of ASD, (b) difficulty responding to pre-academic or academic classroom instructions, (c) ability to follow one-step instructions, (d) consent from parents to participate in the study, and (e) willingness of teachers to receive training to implement the high-p instructional sequence intervention.

Once consent was obtained from teachers interested in participating in the study, parent flyers and parental permission informed consent forms were sent home with students in each teacher's classroom. Parents interested in having their child participate in the study either contacted the reasercher for more information about the study or returned the parent permission informed consent. Children who returned a signed parent permission informed consent were considered to participate in this study. The researcher conducted a brief teacher interview using a10-item questionnaire developed by the researcher to ensure the children were meeting the inclusion criteria.

Child participants. After the researcher conducted a brief teacher interview, three children were deemed elegible and were included as participants. All children had received a medical diagnosis of ASD before they were enrolled in their program and were receiving special education or early childhoold special education services in a segregated special education classroom or in an inclusive pre-k classroom.

Lucas. Lucas was a 7-year-old Hispanic boy enrolled in a special education classroom serving students ranging from ages 5 to 8-years old. In addition to ASD, Lucas had received a diagnoses of Expressive Language Disorder when he was 3 years old. Lucas had received speech-language therapy since he had entered the public school setting in pre-kindergarten. Lucas was able to follow multi-step instructions and demonstrated delayed development in social and communication skills. However, Lucas exhibited difficulties during academic activities.

Specifically, Lucas exhibited task refusal behavior in the form of crying, whining, and leaving the work table during non-preferred academic activities such as independent work and writing. Lucas's teacher reported that Lucas often called out to preferred adults in the room for reassurance that he was completing the task correctly. When Lucas engaged in the problem behavior, continuous verbal and physical prompting were often used to redirected Lucas to the task at hand.

Marco. Marco was a 4-year-old Hispanic boy enrolled in an inclusive pre-kindergarten classroom. Marco was receiving early childhood special education services under eligibilities for developmentally delayed and language impaired. Marco was receiving speech-language therapy once a week in the school setting and ABA services three times per week outside of school. Marco was an English language learner, speaking both Spanish and English in the classroom. Marco could speak 3-to 4-word sentences, imitate gross motor movements, follow one-step directions related to daily classroom routines and activites, and appropriately responded to greetings and fairwells from peers and adults. Marco exhibited difficulties staying in his area and attending during whole group activities, such as circle and center times. Marco often engaged in problem behavior such as turning around and facing the back of the classroom and looking out of the classroom window, the computer screens, and other areas of the classroom during whole group activities on the carpet. His teacher reported that using frequent verbal, gestural, and physical prompts, as well as picture cue cards were necessary to redirect Marco to attend to the group activity.

Tim. Tim was a 4-year-old Hispanic boy enrolled in an inclusive pre-kindergarten classroom. Tim was receiving early childhood special education services under elegibilites for developmentally delayed and language impaired. Tim was receiving ABA services twice a week

in the school setting and daily outside of school. Tim could follow simple one-step instructions related to specific classroom routines when using verbal and gestural prompting, match identicial objects and pictures, and imitate hand sign approximations. However, Tim had not yet demonstrated imitation or the spontaneous production of words or sounds. Tim exhibited difficulties complying with teacher instruction to transistion from a highly preferred activity, such as looking at books, to a less preferred activity. When asked to give up, put away, or put down a preferred activity, Tim often engaged in whining, grunting, and squeezing behaviors. Tim's teacher often used gestural and physical prompting to transition Tim to the next activity.

Teacher participants. All three teacher participants were between 25 and 55 years old. Two teachers were White, non-Hispanic women and one teacher was a White, Hispanic woman. Lucas's and Marco's teachers obtained a bachelor's degree in special education and Tim's teacher obtained a bachelor's degree in education. Lucas's teacher had taugh in both general education and special education classrooms for a variarty of grade levels over 15 years. Marco's teacher had taught pre-kindergarten children with disabilities receiving early childhood special education and children receiving general education for 5 years.

Response Definitions and Measurement

The dependent variables for this study were the percentage of initiation to low-p activitiy instructions and percentage of compliance to low-p activity instruction. Initiation was defined as initiating the low-p activity within 10 s of teacher instruction. Compliance was defined as initiating the low-p activity within 10 s of teacher instruction and completing the low-p activity within an acceptable time that was determined by the teacher. Compliance to the low-p activity was only scored if the low-p activity was both initatied and completed, as per the definition.

For Lucas, the targeted low-p academic activity was writing sentences during independent academic work and the low-p instruction was “write the sentence”. Initiating writing a sentence was defined as Lucas picking up the pencil and touching the pencil to the paper within 10 s of Lucas’s teacher stating the instruction. Compliance to writing a sentence was defined as initiating writing the sentence within 10 s of teacher instruction and continually writing the sentence until completion in the absence of getting up from seat, speaking to peers or teachers, or putting the pencil down to engage in another activity. If Lucas needed teacher assistance to spell a word during writing a sentence, Lucas’s teacher assisted Lucas with the word and walked away. The same sentence worksheet was used throughout all sessions and consisted of five blank lined spaces to write five sentences on the front and back of the paper.

For Marco, the targeted low-p pre-academic activity was attending to his teacher reading a book during morning whole group carpet time and the low-p instruction was “Look at Ms. M”. Initiating attending to teacher while reading a book was defined as Marco turning around and facing the teacher within 10 s of teacher instruction. Compliance to attending to teacher during reading a book was defined as turning around and facing the teacher within 10 s of teacher instruction and attending to the book for a minimum of 10 s.

For Tim, the low-p pre-academic activity was attending to a non-preferred center activity during small group center time and the low-p instruction was “Tim, Look at (non-preferred activity)”. Non-preferred center activities consisted of coloring and functional play with toy cars on mat, Play-Doh, and sensory bins with rice. Initiating attending to teacher during center was defined as Tim moving his body or turning his head in the direction of the teacher within 10 s of teacher instruction. Compliance to attending to teacher during center time was defined as moving

his body or turning his head up in the direction of the teacher within 10 s of teacher instruction and attending to the non-preferred activity for a minimum of 3 s.

Percentage of initiation to the low-p activity instruction was calculated by dividing the total number of times initation of the activity occurred by the total number of times the activity instruction was presented during the session and multiplied by 100. The percentatage of compliance to the low-p activity instruction was calculated by dividing the total number of times compliance to the activity occurred by the total number of times the activity instruction was presented during the session and multiplied by 100.

Teacher Implementation Fidelity. Two implementation fidelity checklists were utilized to ensure fidelity of teacher implementation in baseline and intervention phases. The baseline fidelity checklist included the following 4 items (see Appendix E): (a) high-p activity instruction not delivered for at least 1 min prior to delivery of low-p activity instruction, (b) gains student attention prior to the delivery of low-p activity instruction, (c) brief praise provided for compliance to low-p activity, and (d) no programmed consequence delivered for noncompliance.

The intervention fidelity checklist included the following 10 items (see Appendix F): (a) gains student attention prior to delivery of first high-p request, (b) delivers previously identified high-p requests, (c) delivers the correct number of high-p requests per current phase, (d) provides praise contingent on compliance to all high-p requests, (e) delivers one low-p request immediately following the last high-p request on the sequence, (f) waits 10 s to determine initiation of low-p request, (g) waits appropriate amount of time to determine completion of low-p activity, (h) provides praise according to correct reinforcement schedule contingent on completion of low-p activity, (i) ignores child disengagement to low-p activity, and (j) waits a minimum of 1 min following low-p activity instruction given to deliver another high-p

instructional sequence. Teacher implementation of each procedure listed on the checklist was scored as "Y" if implemented correctly, "N" if not implemented correctly, or "N/A" if the procedure did not pertain to the current phase and measured as percentage of procedures implemented correctly.

Teacher implementation fidelity was assessed for all sessions across all teachers and phases. For all teachers, the average implementation fidelity for baseline procedures was 100%. During the high-p instructional sequence intervention, Lucas and Tim's teachers implemented intervention procedures with 100% fidelity in all sessions and Marco's teacher implemented intervention procedures with an average of 96% fidelity (range = 88%-100%). During the high-p plus DRA phase Tim's teacher implemented intervention with 100% fidelity, and Marco teacher implemented intervention with an average of 92% fidelity (range = 75%-100%). During fading, Lucas's teacher implemented fading procedures with 100% fidelity across all sessions.

Social validity. Teachers were asked to complete a social validity form adopted from the Intervention Rating Profile-15 (IRP-15; Martens, Witt, Elliott, & Darveaux, 1985) immediately following the last fading session. The adopted IPR-15 (see Appendix G) consisted of 10-items rated on a 6-point Likert scale with 1 = *strongly disagree* and 6 = *strongly agree* and addressed the acceptability of the intervention goals and procedures and satisfaction with the outcomes of the intervention. Instructional staff who implemented intervention during probes for generalization were also asked to complete the adopted IPR-15 social validity form immediately following the last generalization probe during the fading phase.

Interobserver Agreement. Interobserver agreement (IOA) was assessed by the researcher and three research assistantss during an average of 42% (range = 33.3% -100%) of sessions across all phases including baseline, intervention, and fading. Research assistants were

graduate students in applied behavior analysis and school psychology who had experience collecting data were trained by the researcher. The researcher and research assistants collected data on student compliance to the high-p instructional sequence, initation and compliance to low-p activity instruction, and teacher adherence to intervention procedures. For initiation to low-p activity instructions and compliance to low-p activity, IOA was calculated by dividing the number of trials the resarcher and research assistant agreed on the occurrence of initation and/or compliance by the sum of agreements and disagreements, and multipled by 100. IOA on teacher implementation fidelity was calculated by dividing the number of instances the researcher and research assistant agreed on correct implementation of a procedure by the sum of agreements and disagreements and multiplied by 100.

Table 1

Mean interobserver agreement of student behavior and teacher implementation fidelity

	Lucas				Marco				Tim			
Condition	%	LP-I	LP-C	IF	%	LP-I	LP-C	IF	%	LP-I	LP-C	IF
Baseline	33	100	100	100	43	100	95	100	40	100	97	100
High-P	33	100	100	88	33	86	100	88	33	100	100	100
High-P DRA	-	-	-	-	33	100	100	100	100	100	100	100
Fading High-P	33	100	100	100								
Fading DRA	-	-	-	-								
Mean	33	100	100	96	38	93	98	94	40	100	97	100

Note. %= Percentage of sessions assessed; LP-I= Low-P Initiation; LP-C= Low-P Compliance; IF= Implementation fidelity

For child initiation to low-p activity instruction, mean IOA was 100% for Lucas, 93% (range = 86% to 100%) for Marco, and 100% for Tim. For child compliance to low-p activity instruction, mean IOA was 100% for Lucas, 95% for Marco (range = 87.5% to 100%), and 99% for Tim (range = 97% to 100%). For teacher implementation fidelity, mean IOA was 96% (range

= 88% to 100%) for Lucas's teacher, 96% (range = 88% to 100%) for Marco's teacher, and 100% for Tim's teacher. Table 1 displays mean IOA scores for each participant and phase.

Experimental Design

A multiple-baseline across participants design was used to evaluate the effectiveness of the high-p instructional sequene during academic and pre-academic activity instructions for students with ASD. An ABC sequence was used to evaluate three phases including (a) baseline, (b) high-p instructional sequence, and (c) differential reinforcement of alternative behavior (DRA). Following intervention phases, two fading conditions were included in which the high-p instructional sequence and DRA procedures were faded, respectively. Generalization probes were embedded across all phases if time allowed.

Procedures

Pre-assessment. Prior to baseline, each teacher and the researcher created a cohesive list to identify potential high-p and low-p activity instructions for each. The teacher was asked to create a list of daily pre-academic activity instructions that were commonly presented during classroom activities with which the student often showed a low probability of compliance and activities with a high probability of compliance when the instruction was issued. For the purpose of the study, the teacher was asked to identify activities that involved providing instructions which required the child to initiate an activity (e.g., "start writing the alphabet" or "begin cutting with scissors"), rather than to stop an activity (e.g., "stop writing the alphabet" or "stop cutting"). For low-p activities, the teacher was asked to only identify low-p activities in which the child was previously observed independently completing to ensure that low levels of compliance were not due to skill deficits.

Once a list of high-p and low-p activity insructions were identified, the teacher was asked to issue each activity instruction a minimum of five times, over two 5- to 10-min periods that were determined by the teacher and the researcher. Percentage of compliance for each instruction was calculated by dividing the number of times the participant complied with the instruction by the total number of times the instruction was presented. Criteria previously set in high-p sequence research (e.g., Axelrod & Zank, 2012; Belifore et al., 2008; Mace et al., 1988) were the criteria set for the current study. That is, high-p activity instructions were deemed as instructions that were complied with 80% of the time or more and low-p activity instructions were determined as instructions that were complied with 40% of the time or less.

During the preassessment, instructions that were complied with between 41%-79% of the time were excluded from the study. In addition, a single session assessment (see Appendix B), derived from previous high-p instructional sequence research (Lipschultz et al., 2018), was utilized if the low-p activity instruction was complied with 0% of the time during pre-assessment. In order to ensure that noncompliance to low-p instruction was not due to skill deficits, a single 3-trial session was conducted in which either highly preferred edibles or tangibles (see preference assessment below) were immediately delivered to the child contingent on compliance to the low-p activity instruction. If the participant did not comply during the single session assessment, a new low-p activity instruction was identified. High-p and low-p instructions chosen for each student are displayed in Tables 2-4.

Table 2

Lucas's Percentage of Compliance with Teacher Instruction during Pre-assessment

Instruction Category	Instruction	Percentage compliance during pre-assessment (%)
High-P	**1.** Put letter in puzzle	100
	2. Put number in puzzle	100
	3. Cut the paper	90
	4. What shape is this?	100
	5. What letter is this?	100
	6. What number is this?	100
	7. Pick a Mr. Potato Head Piece	100
Low-P	**1.** Write the sentence	20
	2. Color the picture	30

Table 3

Tim's Percentage of Compliance with Teacher Instruction during Pre-assessment

Instruction Category	Instruction	Percentage compliance during pre-assessment (%)
High-P	**1.** Sit down	83
	2. Take the book	100
	3. Play with house	83
	4. Take puzzle piece	100
	5. Take the number	100
	6. Take the car	80
Low-P	**1.** Look at [nonpreferred item]	13
	2. Give me the book	40

Table 4

Marco's Percentage of Compliance with Teacher Instruction during Pre-assessment

Instruction Category	Instruction	Percentage compliance during pre-assessment (%)
High-P	**1.** Make the letter sound	80
	2. Clap your hands	90
	3. Sit crisscross	90
	4. What letter is this?	80
	5. Put bubble in mouth	100
	6. Put hands by side	100
Low-P	**1.** Eyes on Ms. M	17
	2. Look at the letters	25

Stimulus preference assessment. A 4-item paired-stimulus preference assessment (see Appendix D; Fisher et al., 1992) was conducted to identify reinforcers that were delivered contingent on compliance to low-p activity instruction in the DRA phase if the high-p intervention was not effective alone. Reinforcers that were used in the assessment were four preferred edibles or tangibles and were determined by the child's teacher prior to the first session of high-p plus DRA. During the preference assessment, the researcher presented two items at a time and told the child to choose. The child was allowed access to the item for 30 s and another session began. The sum was calculated for the total number of times each item was selected and the items were ranked by highly preferred, moderately preferred, and least preferred.

Baseline. Baseline data collection was conducted during the target classroom activity time period in which activity instructions presented resulted in the lowest probability of compliance to the instructions issued. Baseline observation sessions across children were conducted an average of 16.5 min in duration and consisted of a minimum of five trials and maximum of 10 trials. Sessions occurred during regular classroom activities. Dependent on the nature of the low-p activity instruction chosen for each child, the sessions either occurred during one-on-on (Lucas) or group activity (Tim and Marco) instruction time. In each trial, the teacher withheld from presenting the child with instructions for at least 1 min, then presented the low-p activity instruction as usual. Dependent on consequences normally provided during the target routine, brief praise (e.g., "Good job using the scissors and cutting a circle") was provided to the child contingent on compliance to the low-p activity instruction. Appropriate initiation to the low-p activity instruction within 10 s or noncompliance to the low-p activity instruction resulted in no programmed consequences.

Teacher training. The researcher utilized behavioral skills training (BST; Miltenberger, 2012) to train individual teachers on implementing intervention procedures to increase compliance to low-p activity instructions. The trainings took approximately 15 min to complete and occurred outside of classroom instruction time at the convenience of each teacher. The trainings included the four main components of BST including instructions, modeling, rehearsal, and feedback, to effectively teach the procedures of the high-p instructional sequence. The researcher first provided the teachers with specific instructions on how to deliver the high-p instructional sequence procedures such as those identified on the teacher implementation fidelity checklist (see Appendix E). Next, the researcher modeled for the teachers how to implement the high-p instructional sequence prior to delivering instructions to a low-p activity that were targeted for their student. The researcher also modeled how to appropriately respond to the student when the student complied or did not comply to the low-p activity instruction. The researcher responded to any questions had by the teachers and finally, asked the teachers to role play and engage in the high-p instructional sequence procedures to identify the teacher's ability to implement the high-p instructional sequence with fidelity. Praise and corrective feedback were provided to the teachers on their performance of procedural implementation. The teachers were required to implement all procedures of high-p instructional sequence with 100% accuracy. Training was complete once the teachers demonstrated 100% accuracy of the high-p instructional sequence procedures for three role-play situations. All teachers demonstrated 100% accuracy of the high-p instructional sequence procedures after three role-play situations.

High-p instructional sequence. Intervention began once the teacher reached mastery criterion of implementation of high-p instructional sequence procedures and completed training. During the high-p instructional sequence phase, sessions were similar to that in baseline;

however, during each trial, the teacher immediately preceded the low-p activity instruction that was presented in baseline with three high-p activity instructions. The teacher delivered each high-p instruction followed by the low-p activity instruction with approximately a 5-s inter-prompt time (IPT) between instructions. That is, the time between compliance with the high-p instruction and the delivery of the next instruction in the sequence was approximately 5-s. The teacher immediately provided praise to the student for compliance to the high-p instructions and low-p instruction and waited at least 1 min before presenting another high-p instructional sequence. If the student did not comply with a high-p instruction, the sequence was immediately terminated and no programmed consequences were provided. The teacher was instructed to wait 1 min and represent the high-p instructional sequence. The researcher provided the teacher with verbal performance feedback at the end of each session. If teacher implementation fidelity fell below a 100%, a booster BST session occurred to ensure all procedures in the intervention were being implemented. During the high-p instructional sequence phase, criterion for the participant to move to the next phase was three consecutive sessions with at least 80% compliance to the low-p instruction across trials. If participants did not meet the criterion, data were collected for a minimum of three sessions.

DRA. A DRA was utilized if the high-p instructional sequence alone did not increase compliance to the set criterion. The DRA phase was identical to the high-p instructional sequence condition except that compliance to the low-p instruction resulted in the immediate delivery of either a small piece of a highly preferred edible or access to a highly preferred activity that was previously identified in a stimulus preference assessment. Criterion to move to the next phase was the same as that of the previous phase.

Fading high-p instructional sequence. High-p fading began once the child demonstrated compliance to the low-p activity instruction at or above the set criterion level for three consecutive sessions. During the first fading condition, only one high-p instruction was delivered immediately prior to the low-p instruction. Procedures in the high-p fading condition were similar to procedures in the high-p instructional sequence condition except only one high-p instruction immediately preceded the low-p activity instruction. Compliance to the low-p activity instruction resulted in the delivery of either praise alone or praise and a highly preferred edible or activity. Criterion to move to the next phase was the same as that of the previous phase.

Fading DRA. In the second fading condition, DRA was faded out. Following high-p fading, DRA fading began once participants demonstrated compliance to the low-p activity instruction at or above the set criterion level for three consecutive sessions when preceded by only one high-p instruction. Procedures in the DRA fading condition were similar to that of the high-p fading condition; however, the preferred edible or tangible was delivered contingent on compliance intermittently. A fixed ratio schedule of three (FR3) was utilized in which, the preferred edible or tangible was only be delivered contingent on compliance after the participant complied to three low-p activity instructions consecutively.

RESULTS

Initiation and Compliance to Low-P Instruction

Figure 1 displays the percentage of initation and compliance with low-p pre-academic and academic activity instructions for each child. Table 4 provides means and ranges of percentage of compliance to high-p instructions and percentage of initiation and compliance to low-p instructions during baseline, intervention, and fading phases across children.

For Lucas, average initation and compliance of the low-p instruction "write the sentence" during baseline was 63% (range = 40%-80%) and 10% across trials, respectively. Percentage of initation of the low-p instruction across trials consistently remained at a higher level than percentage of compliance to the low-p instruction during all baseline sessions. During the high-p intervention alone phase, both Lucas's initation and compliance to the low-p instruction immediately increased from baseline, to above criterion levels and remained high and stable throughout the phase. Lucas's initation and compliance to the low-p activity instruction ranged from 80% to 100% (M = 97) and 80% to 90% (M = 82) across trials, respectively. When fading the high-p sequence from three high-p instructions to one high-p instruction, Lucas's initiation and compliance to the low-p activity instruction remained at high, stable levels above the criterion, both ranging from 80% to 100% (M = 93) across trials.

For Marco, initation of the low-p instruction "look at Ms. M" remained at high levels, ranging from 67% to 100% (M = 80) initation across trials during baseline sessions, while compliance remained low, ranging from 13% to 40% (M = 26) compliance across trials during baseline sessions. During the high-p intervention alone phase, Marco's initation and compliance

immediately increased to above criterion levels. However, during sessions 2 and 3, compliance decreased to low levels and increased again, showing variability in compliance levels. In the high-p intervention alone phase, Marco initatied and complied to the low-p activity instruction average of 100% and 68% (range = 43%-100%), respectively across trials. During the high-p plus DRA phase, initiation and compliance remained stable at 100% and 60% across trials in session one and increased too 100% and 83% across trials in session two, respectively.

For Tim, both initiation and compliance to the low-p instruction remained at low levels during baseline. Tim initatied and complied to the low-p instruction during baseline for an average of 39% (range = 0%-33%) and 20% (range = 0%-20%), respectively.

Social Validity

Social validity survey data obtained from Lucas's teacher indicated that the high-p instructional sequence intervention was highly satisfactory and acceptable in the classroom setting. Table 5 provides raw and mean scores for Lucas's teacher, using a 6-point Likert scale that ranged from 1 (*strongly disagree*) to 6 (*strongly agree*) The average rating for the acceptability and satisfactory with the high-p instructional sequence intervention for Lucas's teacher was a 6.

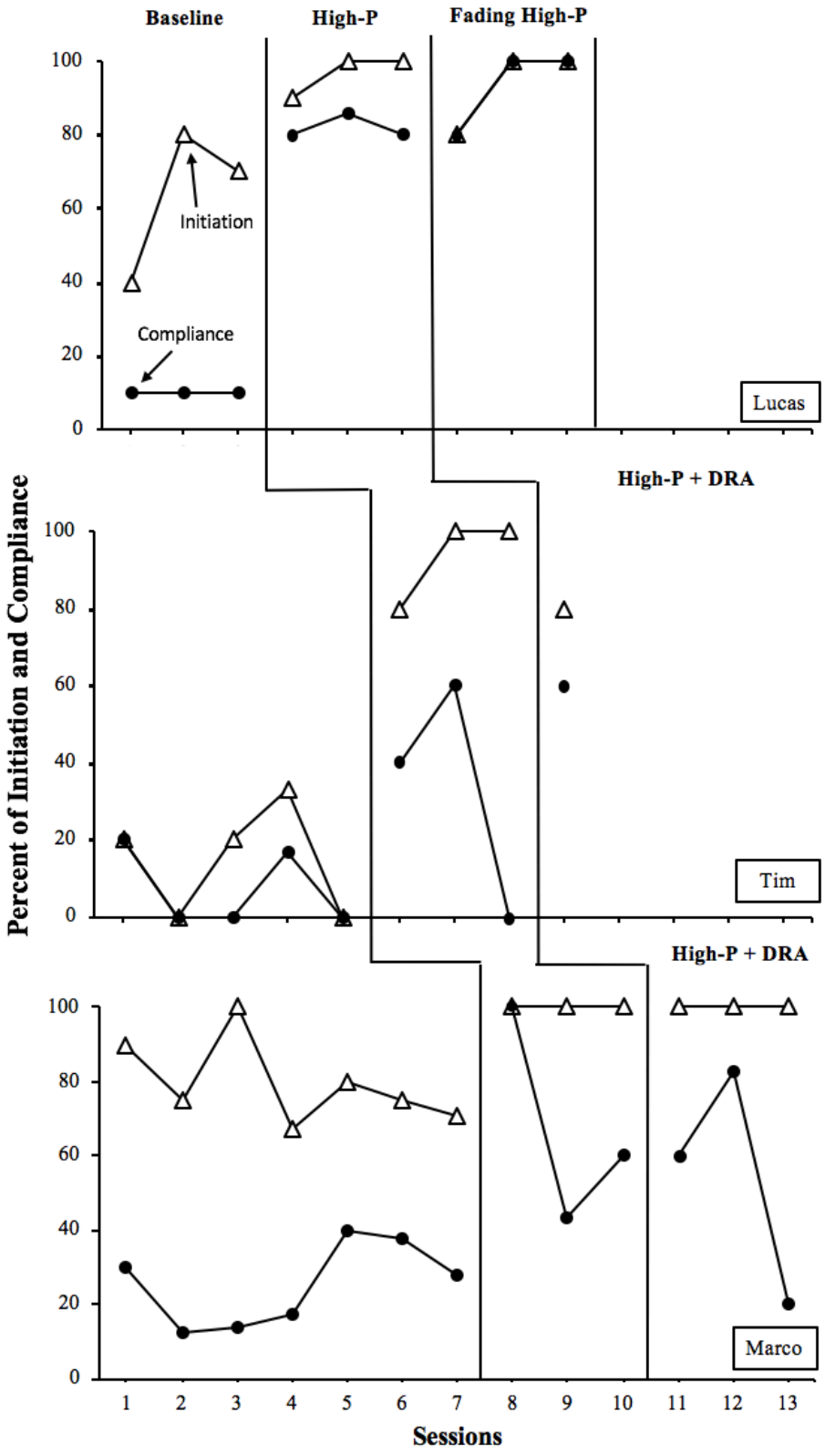

Figure 1. Percentage of initiation to low-p pre-academic instruction and trials with compliance.

Table 5

Means and range of percentage of initiation and compliance to high-p and low-p instruction

Condition	Lucas *M* (Range)	Marco *M* (Range)	Tim *M* (Range)
Baseline			
Low-*p*			
Initiation	63% (40% - 80%)	80% (67% - 100%)	15% (0% to 33%)
Compliance	10% (10% - 10%)	26% (13% - 40%)	7% (0% to 20%)
High-*p*			
High-*p*			
Compliance	100%	100%	100%
Low-*p*			
Initiation	97% (90% - 100%)	100%	93% (80% to 100%)
Compliance	82% (80% - 100%)	68% (43% to 100%)	33% (0% to 60%)
High-*p* plus DRA			
High-*p*			
Compliance	—	100%	100%
Low-*p*			
Initiation	—	100%	80%
Compliance	—	54% (20% to 83%)	60%
Fading High-*p*			
High-*p*			
Compliance	100%	—	—
Low-*p*			
Initiation	93% (80% - 100%)	—	—
Compliance	93% (80% - 100%)	—	—
Fading DRA			
High-*p*			
Compliance	—	—	—
Low-*p*			
Initiation	—	—	—
Compliance	—	—	—

Table 6

High-probability instructional sequence social validity rating results

	Lucas's Teacher
1. Overall, I had a positive experience participating in this study.	6
2. This intervention was effective for increasing compliance to pre-academic activities.	6
3. I plan to continuing using these procedures in my classroom to increase compliance.	6
4. I believe this intervention would benefit other teachers as well.	6
5. I believe this intervention would be effective for a range of students.	6
6. The procedures in this intervention were not challenging to implement.	6
7. This intervention is practical to implement during classroom routines and pre-academic activities.	6
8. Increasing compliance will lead to academic improvements for the student.	6
9. I liked the procedures in this intervention.	6
10. I believe the goals of this intervention met my goals to increase the student's appropriate behavior.	6
Mean	6

DISCUSSION

The purpose of this study was to examine the use of the high-p instructional sequence intervention during pre-academic and academic instructional activities to increase compliance for young children with ASD in the school setting. Specifically, the study evaluated the extent to which the high-p instructional sequence intervention alone would be effective in increasing compliance when implemented by the teacher, whether a DRA component in addition to the high-p sequence would be necessary to increase compliance to criterion levels, and whether compliance would maintain when fading out the intervention. The results indicate that for one of three children, when the high-p instructional sequence intervention was implemented alone, initiation and compliance to pre-academic or academic activity instructions increased and the improved initiation and compliance maintained when the high-p instructional sequence intervention was faded.

These findings support previous research that the high-p instructional sequence intervention can be effective for children with ASD in the classroom setting for several reasons (Belifore et al., 2002; Borgen et al., 2017; Jung et al., 2008; Lipschultz et al., 2018). First, these results support previous findings of compliance maintaining when the number of high-p instructions delivered prior to the low-p instruction are faded. For example, Alexrod & Zank (2012) and Belfiore et al. (2008) found that when fading from a 3:1 high-p to low-p ratio, to a 1:1 ratio, compliance maintained when no programmed reinforcement was delivered contingent on compliance to the low-p instruction. As with these previous findings, in the current study, for Lucas, compliance maintained when the high-p instruction was faded during which only one

high-p instruction was presented prior to the low-p instruction without the use of programmed reinforcement delivered for compliance to the low-p instruction.

One potential hypothesis for his compliance maintaining when fading the high-p instructional sequence may have been a result of increased skill fluency of writing sentences due to repeated exposure of writing 5 to 10 sentences per session. It may be possible that writing sentences were a low-p activity instruction for Lucas due to a high-response effort. For instance, although Lucas could write sentences, the work may have been challenging for him when completing it independently, which led to Lucas often attempting or initiating writing the sentence, but not completing it. The repeated presentation of the sentences across trials and sessions may have increased Lucas's fluency of writing sentences, decreasing the response effort and made compliance to writing sentences more likely to maintain during fading (Vostal et al., 2015).

Another important aspect of the results to note of this study is the high levels of initiation to the low-p activity during baseline for both Lucas and Marco. Their ability to initiate the task prior to implementation of intervention may have played a role in the immediate positive effects on compliance once intervention was implemented. This is an interesting finding because although previous literature has shown the high-p instructional sequence intervention to be effective with praise alone contingent on compliance (e.g., Alexrod & Zank, 2012; Ardoin et al., 1999; Belifore et al., 2008), several studies have also found the intervention to be ineffective when praise alone is delivered contingent on compliance (Ertel et al., 2018; Lipschultz et al., 2018; Pitts & Dymond, 2012; Wilder et al., 2015; Zuluaga & Normand, 2008).

Based on the findings thus far, the results of the current study suggest that the high-p sequence intervention may be effective in increasing compliance of young children with ASD

without the use of potent reinforcers when the low-p activity instructions are already being initiated often by the child. Perhaps the momentum and resistance to change that may have been created from the high-p sequence is enough to turn an instruction into one that a child is only likely to initiate and to one that the child is likely to both initiate and complete without the necessity for a more potent reinforcer. However, given that two children required DRA to further increase their levels of compliance, it can still be said that programmed reinforcement may play a key role at increasing levels of compliance for younger students. For instance, whereas the child who did not require the additional DRA component was 7 years old, the two children who required the additional DRA component were both 4 years old. It may be that younger children with ASD require more tangible reinforcers to increase compliance when using the high-p sequence intervention, whereas older children may succeed with natural reinforcers, such as praise, alone.

Limitations and Future Directions

There are several limitations that may have influenced the results of the study. The first limitation is the change in environment in Marco's classroom during baseline that might have affected the outcome of the intervention. In baseline sessions 4 and 5, the number of students in Marco's classroom decreased from 23 students to 12 students due to half of the students being placed in a new classroom. In session 5, there was an increase in both initiation and compliance to the low-p instruction from 67% and 17% to 80% and 40%, respectively. Although this change in the environment may have been the reason for compliance to increase during baseline, baseline sessions continued to occur until data stabilized and compliance to low-p instruction remained within the criterion level, or 40% or below across trials.

A second limitation is the variable number of trials per session dependent on the topography of the low-p activity instruction chosen for each child. Although there was a required minimum of five trials and a maximum of 10 trials per session, often more trials (between 7 and 10 trials) per session occurred during the baseline phase than the intervention phase. For instance, in baseline for Lucas, the teacher was able to present the low-p activity instruction of "write the sentence" more often during the targeted routine. During the intervention phase, preceding the low-p instruction with three high-p instructions and waiting 1 min after initiation of the low-p activity instruction consumed more time of the targeted routine; therefore, less trials were completed during intervention phases. Likewise, for Marco, Marco's teacher was able to present the low-p instruction "look at Ms. M" when reading a book for more trials during baseline sessions than during the intervention phase. Although teachers were aware that the low-p instruction had to be presented a minimum of five times during each session, intervention sessions often had less low-p instructions presented than baseline sessions likely due to the time it took to implement the intervention during a short target academic time period. Future research should examine evaluating the high-p instructional sequence intervention using a consistent number of trials across all sessions in all phases to account for over- or under-estimating student compliance.

A third limitation to the current study is a possible function of attention which may have maintained Lucas's noncompliance and affected his data. In a previous academic and functional behavior assessments that were conducted for Lucas's individualized education plan, for his problem behavior, it was hypothesized that when presented with a task, Lucas would engage in off-task behavior consisting of calling out to preferred adults, getting up from his seat, and crying, which often resulted in teacher attention in the form of verbal and physical prompting. If

Lucas's noncompliance was maintained by teacher attention, then teacher praise contingent on high-p and low-p compliance may have functioned as a reinforcer for Lucas. Furthermore, the teacher interaction Lucas received when his teacher presented him with the preferred high-p instructions, may have worked to reduce the establishing operation of teacher attention.

For instance, during baseline, the teacher would present Lucas with the low-p instruction and walk away to help other students. However, during intervention, the teacher interacted with Lucas to present the high-p instructions prior to the low-p instructions opposed to presenting the low-p instruction and walking away. If teacher attention functioned as a reinforcer for his noncompliance, this could have indeed influenced the resulting outcome of the high-p instructional sequence intervention. Although Rortvedt and Miltenberger (1994) found the high-p sequence intervention to be ineffective as treatment for two children with noncompliance that appeared to be maintained by attention, both children were typically developing.

Therefore, future researchers might consider conducting a functional behavior assessment to examine the differential outcomes of the high-p instructional sequence intervention for children with ASD whose noncompliance serves different functions. If a child engages in a low level of noncompliance maintained by attention, the high-p instructional sequence would increase response strength, creating a greater resistance to change. Thus, along with natural reinforcer such as praise, high-p instructional sequences may be an effective intervention without the necessity of more potent reinforcers.

Implications for Practice

The high-p instructional sequences can be an easy antecedent-based intervention that can help reduce the onset of problem behavior and increase acquisition and fluency of academic skills within the school setting (Brosh et al., 2018). Although the high-p instructional sequence

requires limited training and materials to implement, school-based practitioners, such as teachers and other school personnel, should consider the following when implementing the high-p instructional sequence in the classroom setting. First, programmed reinforcement or potent reinforcers should be delivered contingent on compliance to the low-p instruction if possible. As indicated in the literature (Ertel et al., 2018; Lipschultz et al., 2018; Pitts & Dymond, 2012; Wilder et al., 2015; Zuluaga & Normand, 2008), the results of the study suggest that the high-p instructional sequence may more likely be efficacious when potent reinforcers such as edible and tangibles are delivered for compliance.

In addition, a variety of high-p instructions should be used when implementing the high-p instructional sequence opposed to repeated presentation of the same high-p instructions with each presentation of the low-p instruction. When using the same high-p instructions repeatedly, those instructions may begin to become a discriminative stimulus associated with the low-p instruction. This may cause the high-p instruction sequences to become aversive and increase the likelihood of noncompliance because they have been repeatedly paired with the low-p instruction (Lipschultz & Wilder, 2017; Normand et al., 2010) Lastly, if using the high-p instructional sequence to increase compliance to a low-p instruction for a child who already demonstrates high levels of initation to the instruction, multiple high-p instructions in the sequence may not be necessary to increase compliance. Perhaps, only one or two high-p instructions in a given sequence presented prior to the low-p instruction is necessary to increase the levels of initiation of the instruction to initation and completion of the instruction.

Conclusion

Despite the limitations, this study contributes to the existing literature on the use of the high-p instructional sequence as a school-based intervention by supporting its effectiveness in to

increasing initiation and compliance to pre-academic and academic activity instructions for young children diagnosed with ASD. Overall, the findings of the study indicate the high-p instructional sequence alone might be an effective intervention for some children with ASD; an additional DRA intervention component would be necessary for some children with ASD. Considering that compliance maintained at or above criterion levels during fading, high-p instructional sequence intervention might be both feasible and effective for teachers to implement within a classroom setting.

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APPENDIX A: TEACHER INTERVIEW QUESTIONNAIRE

1) Does the child have a diagnosis of ASD? Does the child have other diagnoses as well?

2) Does the child display basic motor (e.g., ability to turn pages in a book, ability to hold writing utensil) and receptive language skills (e.g., ability to follow at least one-step directions, ability to respond to name)?

3) Are there specific routines (e.g., center times, reading, group activity) that the child often has a particular difficult complying to pre-academic activitiy instruction? If so, please describe these routines and specific activities.

4) What are some of the explicit instructions you give to the students prior to beginning the activity?

5) What is the pre-academic activity instruction you may say your student is least likely to comply with?

6) What does the child's behavior look like when he or she is not complying to the activity instruction?

7) How do you handle your student's noncompliant behavior? (e.g., corrective verbal feedback, redirecting, physical guidance) Please explain in detail and provide examples.

8) Are there specific routines (e.g., center times, reading) that the child prefers or is often likely to comply to pre-academic activity instruction? If so, please describe these specific routines and activities.

9) What are some of the explicit instructions you give to the students prior to beginning the activity?

10) How do you react/reward your student when he or she complies to activity instruction following the initial instruction? (e.g., verbal praise, positive written notes to parents, token economy) Please explain in detail and provide examples.

APPENDIX B: DATA SHEETS

Compliance Recording Sheet - Pre-assessment

Date:
Observer:

Teacher:
Participant:
Classroom Routine:

Record a "+" for compliance to high-p instruction or "-" for noncompliance to high-p instruction.

	Trials										
High-P Activity Instruction	1	2	3	4	5	6	7	8	9	10	% of compliance
1.											
2.											
3.											
4.											
5.											
6.											
7.											
8.											
9.											
10.											

	Trials										
Low-P Activity Instruction	1	2	3	4	5	6	7	8	9	10	% of compliance
1.											
2.											
3.											

Record a "+" for compliance to low-p instruction or "-" for noncompliance to low-p instruction.

Single session pre-assessment using DRA

	Trial
Low-P Activity Instruction	1
1.	

Record a "+" for compliance to low-p instruction or "-" for noncompliance to low-p instruction.

APPENDIX C: INITIATION AND COMPLIANCE DATA SHEET

Initiation and Compliance Recording Sheet

Date:
Observer:
Start time:
End time:

Teacher:
Participant:
Classroom Routine:

	High-p Sequence	Low-p Instruction		Comments
Trial		Initiation	Completion	
1				
2				
3				
4				
5				
6				
7				
8				
9				
10				
Percentages of Initiation and Compliance		__%	___%	

For event recording, record a "+" for initiation and/or compliance or "-" for noncompliance

APPENDIX D: 4-ITEM STIMULUS PREFERENCE ASSESSMENT

Date: Teacher:
Observer: Participant:

Item A:_____

Item B:_____

Item C:_____

Item D:_____

Circle the item selected for each trial and record the number of times each item is selected, calculate the overall total for each item and rate the items as highly, moderately, or least preferred.

Trial #	Item selection	
1	A	B
2	C	A
3	A	D
4	B	C
5	D	B
6	C	D

Trial #	Item selection	
1	A	B
2	C	A
3	A	D
4	B	C
5	D	B
6	C	D

Overall Total for Item A: _____

Overall Total for Item B: _____

Overall Total for Item C: _____

Overall Total for Item D: _____

Highly Preferred: _____

Moderately Preferred: _____

Least Preferred: _____

APPENDIX E: TEACHER IMPLEMENTATION FIDELITY BASELINE

Teacher Implementation Fidelity – Baseline

Date: Teacher:
Observer: Participant:

Procedure	Implemented Correctly?
1. High-p activity instruction is not delivered for at least 1 min prior to delivery of low-p activity instruction	Y/N/NA
2. Gains student attention prior to the delivery of the low-p activity instruction	Y/N/NA
3. Brief praise provided for compliance to low-p activity	Y/N/NA
4. No programed consequence delivered for noncompliance to low-p activity	Y/N/NA
Teacher implementation: Total # of Y/Y+N TOTAL	

Circle: Y = yes, N = no, N/A = not applicable

APPENDIX F: TEACHER IMPLEMENTATION FIDELITY INTERVENTION

Teacher Implementation Fidelity – Intervention

Date: Teacher:
Observer: Participant:

Procedure	Implemented Correctly?
1. Gains students' attention prior to delivery of first high-p request	Y/N/NA
2. Delivers the correct number of high-p requests per current phase	Y/N/NA
3. Uses previously identified high-p requests	Y/N/NA
4. Provides praise contingent on compliance to all high-p requests	Y/N/NA
5. Delivers one low-p request immediately following the last high-p request in the sequence	Y/N/NA
6. Waits 10 seconds to determine compliance to low-p request	Y/N/NA
7. Provides praise or praise and edible contingent on initiation of low-p request during correct intervention phase	Y/N/NA
8. Waits a minimum of 1 minute following initiation of low-p request to deliver another high-p sequence	Y/N/NA
Teacher implementation: Total # of Y/Y+N TOTAL	

Circle: Y = yes, N = no, N/A = not applicable

APPENDIX G: SOCIAL VALIDITY FORM

Please circle the number that best describes your agreement or disagreement with each statement using the scale below.

1= Strongly disagree	2= Disagree	3= Slightly disagree	4= Slightly agree	5= Agree	6= Strongly agree

11. Overall, I had a positive experience participating in this study.	**1**	**2**	**3**	**4**	**5**	**6**
12. This intervention was effective for increasing compliance to pre-academic activities.	**1**	**2**	**3**	**4**	**5**	**6**
13. I plan to continue using these procedures in my classroom to increase compliance.	**1**	**2**	**3**	**4**	**5**	**6**
14. I believe this intervention would benefit other teachers as well.	**1**	**2**	**3**	**4**	**5**	**6**
15. I believe this intervention would be effective for a range of students.	**1**	**2**	**3**	**4**	**5**	**6**
16. The procedures in this intervention were not challenging to implement.	**1**	**2**	**3**	**4**	**5**	**6**
17. This intervention is practical to implement during classroom routines and pre-academic activities.	**1**	**2**	**3**	**4**	**5**	**6**
18. Increasing compliance will lead to academic improvements for the student.	**1**	**2**	**3**	**4**	**5**	**6**
19. I liked the procedures in this intervention.	**1**	**2**	**3**	**4**	**5**	**6**
20. I believe the goals of this intervention met my goals to increase the student's appropriate behavior.	**1**	**2**	**3**	**4**	**5**	**6**

APPENDIX H: IRB APPROVAL LETTERS

RESEARCH INTEGRITY & COMPLIANCE
Institutional Review Boards, FWA No. 00001669
12901 Bruce B. Downs Blvd, MDC35, Tampa, FL 33612-4799
(813) 974-5638 FAX (813) 974-7091

10/17/2019

Danielle Russo
ABA-Applied Behavior Analysis
Tampa, FL 33612

RE: **Expedited Approval for Initial Review**
IRB#: Pro00041595
Title: Use of High-Probability Instructional Sequences During Academic Activities for Elementary Students

Study Approval Period: 10/16/2019

Dear Ms. Russo:

On 10/16/2019, the Institutional Review Board (IRB) reviewed and **APPROVED** the above application and all documents contained within, including those outlined below.

Approved Item(s):
Protocol Document(s):
Study Protocol- Clean

Consent/Assent Document(s)*:
Parental Informed Consent .pdf
Teacher Informed Consent .pdf

*Please use only the official IRB stamped informed consent/assent document(s) found under the "Attachments" tab. Please note, these consent/assent documents are valid until the consent document is amended and approved.

It was the determination of the IRB that your study qualified for expedited review which includes activities that: (1) present no more than minimal risk to human subjects, and (2) involve only procedures listed in one or more of the categories outlined below. The IRB may review research through the expedited review procedure authorized by 45 CFR 46.110 and 21 CFR 56.110. The research proposed in this study is categorized under the following expedited review category:

(7) Research on individual or group characteristics or behavior (including, but not limited to, research on perception, cognition, motivation, identity, language, communication, cultural beliefs or practices, and social behavior) or research employing survey, interview, oral history, focus group, program evaluation, human factors evaluation, or quality assurance methodologies.

Research Involving Children as Subjects: 45 CFR §46.404

This research involving children as participants was approved under 45 CFR 46.404 / 21 CFR 50.51: Research not involving greater than minimal risk to children is presented.

Requirements for Assent and/or Permission by Parents or Guardians: 45 CFR 46.408

Permission of one parent is sufficient. Assent is not required.

As the principal investigator of this study, it is your responsibility to conduct this study in accordance with IRB policies and procedures and as approved by the IRB. Any changes to the approved research must be submitted to the IRB via an Amendment for review and approval. Additionally, all unanticipated problems must be reported to the USF IRB within five (5) business days.

We appreciate your dedication to the ethical conduct of human subjects research at the University of South Florida and your continued commitment to human research protections. If you have any questions regarding this matter, please call 813-974-5638.

Sincerely,

Melissa Sloan, PhD, Vice Chairperson
USF Institutional Review Board