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A Comparison of Three Reading Interventions for Three Children with Autism Spectrum Disorder

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The University of Southern Mississippi

A Comparison of Three Reading Interventions for Three Children with Autism Spectrum Disorder

by

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Bachelor of Science in the Department of Psychology

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Approved by

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Abstract

Brief experimental analyses (BEA) have been used in the present literature to identify the most effective reading strategy in increasing oral reading fluency (ORF) for typically-developing students. The current researcher extends the research by implementing three reading intervention to three children with autism spectrum disorder (ASD) to study whether a BEA is effective in identifying the most effective reading intervention for children with developmental disabilities. There were three interventions implemented throughout the duration of the study: Repeated Reading, Phrase Drill, and Contingent Reinforcement. Additionally, the present study implements an extended intervention (EA) to test the accuracy of the BEA results. Each intervention was included in the EA phase of the study. The results of the study indicated that the BEA was successful in indicating the most effective intervention in increasing the ORF for a child with ASD for two out of three students.

Keywords: *brief experimental analyses, oral reading fluency, extended intervention, autism spectrum disorder*

Dedication

To my students, whom I have had a pleasure educating.

Acknowledgments

I would like to extend thanks to everyone who offered me encouragement during the duration of this project. A special thank you to my advisor, Dr. Mong, who was always available to provide insight and support. Additionally, I would like to thank Cierra Baker, who was always there when I needed an extra little push.

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List of Abbreviations

ASD	Autism Spectrum Disorder
BEA	brief experimental analysis
CDC	centers for disease control and prevention
CR	contingent reinforcement
EA	extended analysis
ORF	oral reading fluency
PAND	presence of non-overlapping data points
PD	phrase drill
RR	repeated reading
WCPM	words correct per minute

I. Introduction and Literature Review

For children with development disorders or delays, academia may not be something that comes as easily as it does to their typically developing peers. Throughout the years, researchers and scientists have discovered that one developmental disorder in particular has been significantly increasing in school-aged children: autism spectrum disorder (ASD). The Centers for Disease Control and Prevention (CDC; 2015) has established ASD as the fastest growing developmental disorder in the United States at 10-17% annually (Reisener, Lancaster, McMullin, & Ho, 2014). According to the CDC's most recent Autism and Developmental Disabilities Monitoring Network report, 1 in every 68 children is affected by this disability. In fact, 1 in every 6 children in the United States is affected by a developmental disability of some sort. ASD knows no discrimination; it is found across all racial, ethnic, and socioeconomic groups (CDC, 2015).

ASD is characterized by deficits in social interactions and communication. Individuals with this disorder may also display restrictive and repetitive behaviors, fixations, and interests (National Institute for Mental Health, n.d., Reisener et al., 2014). Also, students with ASD also may experience difficulty in regulating emotions and behavior, which can disrupt the learning process (Mule, Volpe, Fefer, Leslie, & Luiselli, 2015). These typical symptoms in ASD are commonly cited as factors in these children's struggle in academia (Reutebuch, El Zein, Kim, Weinberg, & Vaughn, 2015). The deficit in social and communication skills may directly interfere with the traditional approaches of classroom instruction, affecting the student's ability to understand and comprehend essential materials (Mule et al., 2015). The social, communicative, and behavioral

symptoms of ASD cause great concern for an adverse educational experience for these children (Reisener et al., 2014). Unfortunately, one particular facet of academia is affected greatly by the characteristics of ASD: reading.

Furthermore, the social and communicative deficits that children with ASD may face could have an impact on the child's language skills. Without proper language skills, these children may not be able to effectively develop adequate literacy skills (O'Connor & Hermilin, 1994; O'Connor & Klein, 2004; Reutebuch et al., 2015). Without necessary literacy skills, students will not be equipped to master the skill of reading. In current research, reading comprehension has been named the most ubiquitous weakness of academic achievement for children with ASD (Jones et al., 2009; Reutebuch et al., 2015). Consequently, reading skills are necessary in order to excel in any and all other subjects in school (Reutebuch et al., 2015). More importantly, sufficient reading skills are vital to becoming a productive and functional member of society (Mule et al., 2015). Becoming a functional member of society is the ultimate goal for today's youth.

Yet another reason ASD students may be suffering in the realm of academia is the quality of their instruction. Students with this disability typically receive instruction in special education or inclusion classrooms; this offers them limited access to specific social activities that may facilitate the acquisition of language and literacy skills (Reisener et al., 2014). Also, as previously mentioned, ASD students may be perceived as less capable, so they may suffer from lack of instructional attention. It is vital to student success to receive appropriate instruction; however, it can be challenging to pinpoint the appropriate instructional technique for specific student groups, such as students with ASD (Mule et al., 2015).

Despite the fact that it is widely acknowledged that children with ASD have difficulties in several different areas of academic functioning, the vast majority of current research is geared toward behavioral interventions. While behavior is important to a child's overall functioning, the vast majority of the child's time is spent in an academic setting. Evidence-based interventions have been used to target academic difficulties for the normal population, and even some of the abnormal population, yet it has rarely been extended to the ASD population. There is a large deficit in the current research on how to ease academic difficulties for children with this increasingly prevalent disability. This is perhaps because children with ASD are commonly perceived as less capable of learning academic skills than their typically developing peers (Reisener et al., 2014).

While reading comprehension is the ultimate goal, it is important to first establish the skills necessary to reach that milestone. Oral Reading Fluency (ORF) is essential to developing the obligatory reading skills needed to develop comprehension skills (Daane, Campbell, Grigg, Goodman, & Oranje, 2005). ORF is characterized by a student's ability to read with speed and accuracy and is usually calculated by words correct per minute (WCPM). ORF is necessary for more complex reading skills, however, it is a critical skill that has been neglected thus far in current research. ORF is an important component to overall reading ability and is crucial in order to increase overall academic performance (Reisener et al., 2014).

Recent federal initiatives, such as No Child Left Behind and Individuals with Disabilities Education Act, have made it the law to provide all children with instruction that is consistent with current research. However, it is hard to maintain this law when academic research for the ASD population is so limited. This restricted scope of research

is detrimental; it is imperative for school officials and parents to be aware of effective evidence-based academic interventions for children in order to ensure the most cultivating environment for the future generations (Reisener et al, 2014). Autism is an increasingly prevalent development disorder that can affect children from all backgrounds; therefore, it is important to offer the most effective tools and resources in order for this student population to grow into functioning members of society.

II. Methodology

Participants, Selection, and Setting

Three school-aged children were chosen to participate in three reading interventions. The students were recommended for the study by their teacher, who indicated that the students were struggling with reading in the classroom. The researcher administered a reading probe to the nominated students, and if the student's WCPM scored below grade level, then the student was chosen for inclusion in the study. All three of the participants met the criteria for diagnosis of ASD as deemed in the Diagnostics and Statistics Manual -5th edition (DSM-V; American Psychiatric Association, 2013). The students were chosen from an autism demonstration classroom located in the southern United States. The interventions were conducted on school premises during regularly scheduled hours.

Materials

Instructional grade level passages (ILP) were administered during all phases of the study: curriculum based assessment, baseline, brief experimental analysis, extended intervention, and generalization. All passages were appropriate according to the student's current instructional level. Instructional level was determined at the beginning

of the study to account for any possible discrepancies between grade-level and current reading level. All passages that were used for the study were acquired from AIMSweb (2002).

Procedure

Curriculum Based Assessment (CBA). Prior to the beginning of the study, a CBA was administered in order to determine the instructional level of each participant. Passages were chosen based on the participant's instructional level instead of the participant's developmental level.

Baseline. The child's ORF was calculated before any intervention was implemented. During this phase, no instruction was given. Passages were administered during the baseline phase in order to establish accurate level, trend, and variability (Hayes, Barlow, & Nelson-Gray, 1999; Mong, Mong, Henington, & Doggett, 2012). The number of passages implemented were contingent upon establishing at least three stable data points.

Brief experimental analysis (BEA). A BEA was conducted in order to assess the effects of the interventions on the child's ORF. The purpose of this is to establish which intervention was most successful based on visual analysis (Mong & Mong, 2012). During the BEA, each intervention was introduced one time. The intervention that produced the highest WCPM was considered to be the most successful intervention for the participant.

Extended intervention analysis (EA). Following the BEA phase of the study, additional passages were administered in order to compare the most successful intervention found in the BEA to the interventions considered less successful. Each

intervention was counterbalanced within and between the participants; each intervention was given in a random order so that each participant had a different order of interventions and no intervention was repeated back to back for each participant in a series. Researchers collected EA data over a two-week time span. The researchers only collected one data point a day in order to prevent possible carryover effects from one intervention to the next. Data was collected until researchers found an appropriate divergence between interventions (Mong et al., 2012).

Generalization. In order to assess the interventions' ability to generalize to the participants' overall reading fluency, a novel passage was introduced to each participant after a complete intervention series in the EA phase. The child would read a passage that they had never seen before for one minute and WCPM would be calculated.

Interventions

Three different interventions were implemented during the study. The interventions that were included in the BEA and EA were: Repeated Reading, Phrase Drill, and Contingent Reinforcement. The interventions were counterbalanced against each other in order to account for possible order effects.

Repeated Reading (RR). RR is an evidence-based intervention that has been previously shown to increase ORF, however, limited research has extended this technique to the ASD population (Reisener et al., 2014). In this condition, the student read the ILP a total of four times. During the first three readings, the student read the entire passage; if a student missed a word, immediate corrective feedback was given. On the fourth reading, the child would read the passage for one minute and WCPM was calculated.

Phrase Drill (PD). In the PD condition, the student read an ILP and the researcher marked all of the missed words. The researcher presented the missed words to the student, prompting the student to say the word aloud. Then, the researcher had the student read the phrase that contained the missed word three times. Once each phrase containing the missing words was drilled three times, the student read the passage again for one minute, and WCPM was calculated (Mong et al., 2012).

Contingent Reinforcement (CR). Research suggests that CR is used in situations in which the student has the capability of performing the task, however a lack of desire to do so. Prior to the implementation of this intervention, the student listed a specified number of items that they were willing to work for (i.e., stickers, candy, toys). The student was instructed that they may choose a reinforcer if their reading improved from baseline during the condition (Mong et al., 2012). The student read an ILP one time for one minute and WCPM was calculated. If the student's WCPM was higher than baseline, the students received a preferred reinforcer.

Experimental Design

An alternating treatments design (ATD) was used during the BEA and EA procedure. In using an ATD, each intervention was presented one at a time, on separate occasions, which makes it possible to compare each intervention's effectiveness (Mong et al., 2012). Additionally, the interventions were counterbalanced within and between subjects in order to account for possible order effects. Researchers also looked for the occurrence of nonoverlapping data points (PAND). PAND was calculated by dividing the number of nonoverlapping data points with the highest baseline score by the number of total intervention data points. PAND has been cited as an effective way to measure the

magnitude of the study's effect size (Campbell, 2004; Olive & Smith, 2005; Mong & Mong, 2012; Mong et al., 2012). A PAND score of above 90% is indicative of an extremely effective intervention; 70-90% suggests that the effects of the intervention was effective; 50-70% indicates that the intervention was possibly effective; and a PAND of below 50% suggests that the intervention did not work (Scruggs & Mastropieri, 1998; Mong et al., 2012).

Treatment Integrity

Interscorer Agreement (ISA). The researcher established a list of instructions in which to be followed during each of the reading interventions prior to the beginning of the study. ISA was calculated by dividing the number of agreements and disagreements per reading intervention and multiplying by 100 in order to obtain an ISA percentage (Mong et al., 2012). ISA was collected during 80% of the study, and the overall ISA percentage for the passages was 99%.

Interobserver Agreement (IOA). IOA was calculated by dividing the agreement of steps completed for each session of the intervention by the total number of steps to be completed. This ratio will be multiplied by 100 in order to obtain an IOA percentage (Mong et al., 2012). Overall, IOA was collected during 61% of the study. RR had an agreement of 100%; PD had an agreement of 97%; CR had an agreement of 100%; and Generalization had an agreement of 98%.

III. Results

Figures 1-3 displays the results for each participant. During baseline, Bruce showed no trend and no increase or decrease in level. Troy showed a slight increase in trend and no increase or decrease in level; meanwhile, Kenneth showed a decrease in

trend and level during the baseline phase. The median baseline score for each participant is as follows: Bruce – 8 WCPM; Troy – 37 WCPM; Kenneth – 10 WCPM.

In the BEA phase of the study, Bruce's highest score was 29 WCPM and occurred during the PD condition. Additionally, Bruce read 22 WCPM in the RR condition and 12 WCPM in the CR condition. The highest score for Troy was 59 WCPM in the RR condition. He also read 53 WCPM in the PD condition and 40 WCPM in the CR condition. Similarly, RR was the highest scoring condition for Kenneth as well with 35 WCPM. The respective scores during the PD and CR conditions for Kenneth was 35 WCPM and 9 WCPM.

During the EA phase, Bruce's highest mean score (38 WCPM) and highest median score (37 WCPM) occurred during the RR condition. However, the PAND was 100% for each intervention which provides evidence that each intervention was successful in increasing Bruce's ORF. Troy's highest mean score (64 WCPM) and highest median score (63.5 WCPM) was also obtained during the RR condition. The PAND was 100% for each intervention, indicating that each intervention was successful for increasing Troy's ORF. Additionally, Kenneth's highest mean score (47.5 WCPM) and highest median score (45 WCPM) also occurred during the RR condition. The PAND was 100% for both the RR and PD condition, which signifies that both RR and PD was successful in increasing Kenneth's ORF. However, the PAND for the CR condition was 75%; this indicates that CR was not as effective as the other interventions for increasing Kenneth's ORF. These results indicate that the BEA was successful in identifying the most successful intervention for two out of three participants (i.e., Kenneth and Troy). However, it is important to note that the PAND supports the

effectiveness of all the interventions for Bruce and Troy as well as two out of three interventions for Kenneth.

Furthermore, the median score for Bruce's generalization passages was 20.5 WCPM. Based on visual analysis, Bruce's generalization data was slightly variable. However, his data showed an upward trend and an increase in level. It is significant to note that each generalized data point maintained above his highest baseline WCPM (8). The median score for Troy's generalization passages was 53 WCPM. His scores showed a stable level, slight variability, and a slight downward trend; however, his scores still stayed above the highest baseline WCPM (38). The median score for Kenneth's generalization passages was 16.5 WCPM. His data points showed a slight increase in level and trend; however his PAND during generalization was only 50%. This suggests that Kenneth's ORF did not significantly increase and the effects of the interventions did not generalize to novel passages.

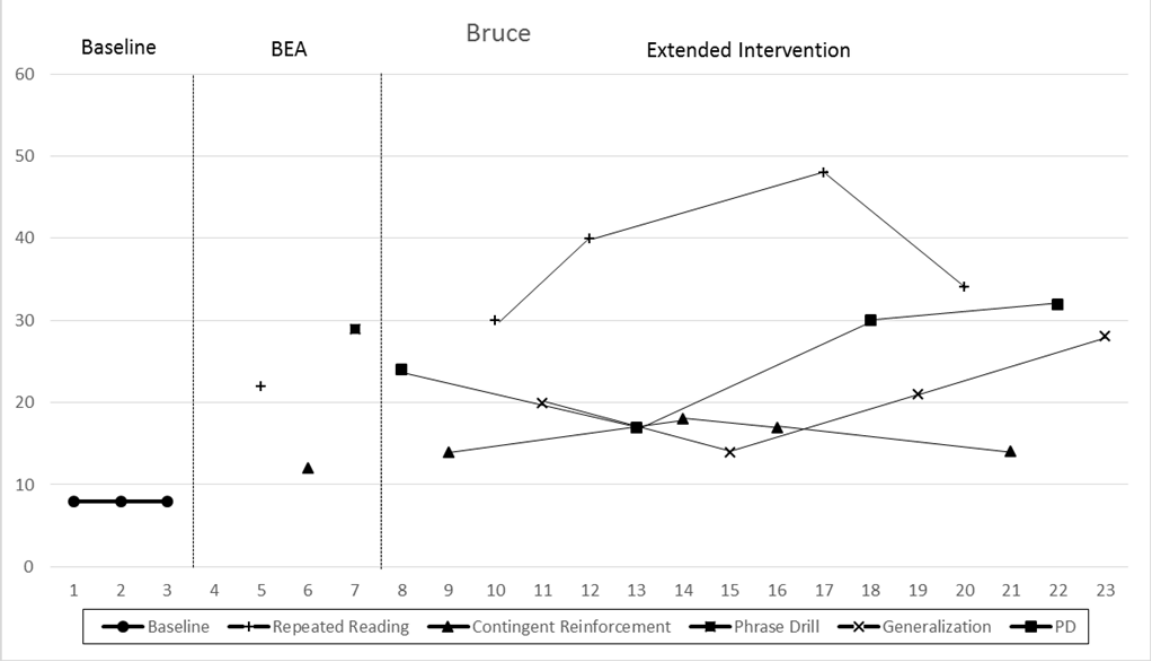

Figure 1. *Bruce's data. This figure represents the WCPM the student obtained during each session of baseline, BEA, and extended intervention.*

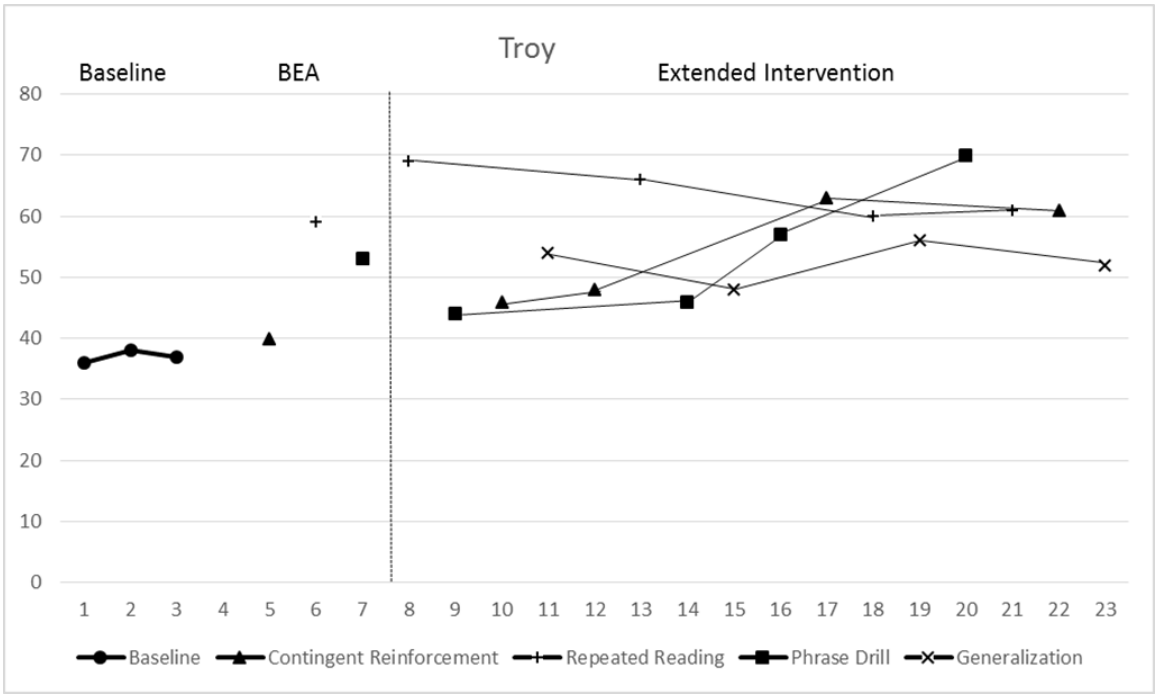

Figure 2. *Troy's data. This figure represents the WCPM the student obtained during each session of baseline, BEA, and extended intervention.*

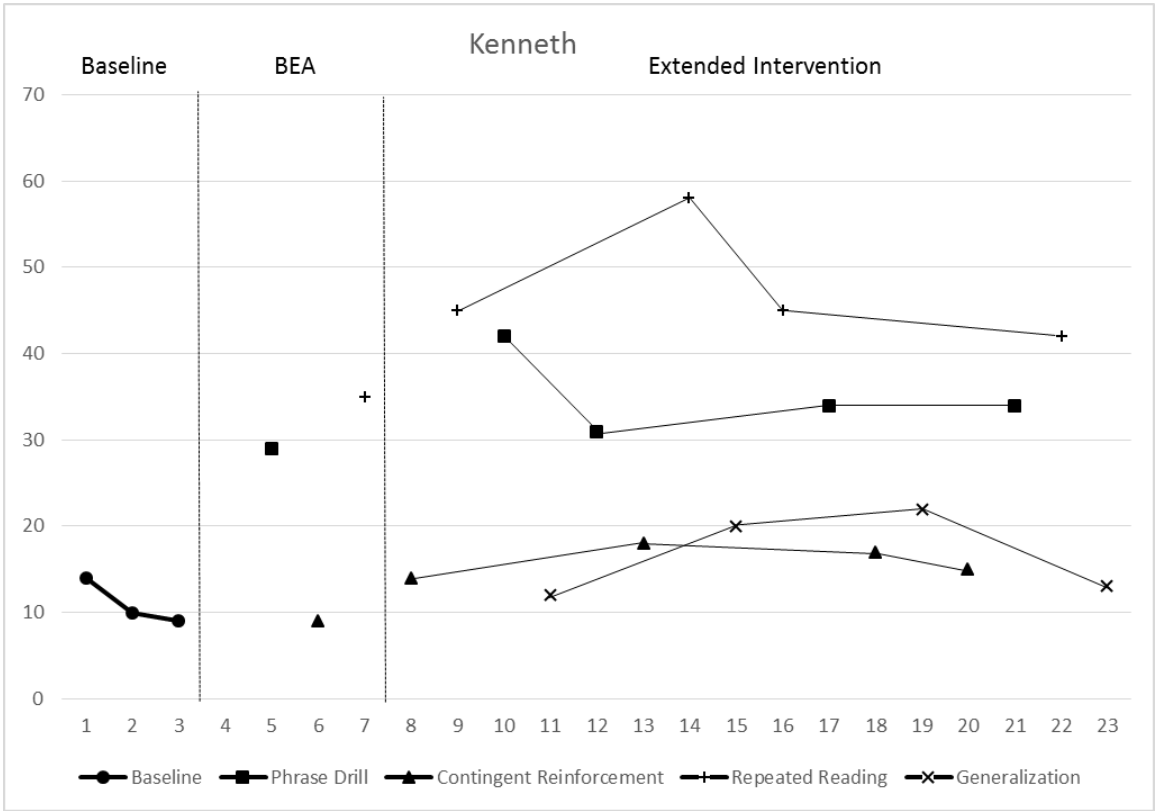

Figure 3. *Kenneth's data. This figure represents the WCPM the student obtained during each session of baseline, BEA, and extended intervention.*

IV. Discussion

The current study sought to identify the most effective technique for each child in increasing reading fluency through the use of BEA. An EA was further used to evaluate the accuracy and efficiency of the BEA's results. The results from the EA indicate that the BEA was effective in indicating the most effective reading intervention for two out of three students. Kenneth and Troy's highest BEA intervention (RR) was also the highest intervention in the EA phase of the study, thus validating the BEA results. However, despite the fact that Kenneth scored well above baseline during the RR condition (median 45 WPCM), it is important to take into account that his PAND for generalization passages was only 50%. Therefore, it should be noted that the BEA ultimately was not effective for Kenneth. Although the BEA was not supported through the EA and did not support PD as the most effective intervention for Bruce, the PAND was 100% for each intervention, including generalization passages, which indicated that each intervention was ultimately effective for Bruce.

Additionally, it is important to note the nature of each intervention. For Bruce, PD was identified as the most effective intervention during the BEA phase of the study. However, this result was ultimately not supported during EA. Interestingly, RR was identified as the most effective overall for each participant. This could be due to the fact that RR is a repeated practice of the entire passage, which includes both errors and non-errors. PD is the repeated practice of solely the errors, which does not provide the student with an opportunity to continually practice the entire passage. Similarly, CR does not provide the student with an opportunity to practice the passage at all; it is a reading of a novel passage to assess whether a reinforcer will motivate the student to work harder.

Furthermore, the total time invested in each intervention is an additional point of interest for the current researcher. Though RR was the most effective reading intervention overall, it is also the most time consuming intervention, each session lasting for a duration of 20-30 minutes. PD was the second most time consuming intervention, each session lasting for a duration of 10-15 minutes. Lastly, CR is the least time consuming intervention with each session lasting between 1-5 minutes. It is important to take the duration of the intervention into account when utilizing reading interventions within the classroom.

Moreover, even though the present study seeks to study the effectiveness of BEA and EA using evidence-based interventions, there are limitations to this study. The first limitation of the present study is the sample size. Due to the involved nature of the interventions, a small sample size (n=3) was selected for the study. Additionally, there was little variation in demographics between the participants. Consequently, this provides the study with weak external validity because it cannot be easily generalized to a larger ASD population. Future research could assess the effectiveness of a BEA with a larger sample size that contains more demographic variety to improve the generalizability of the results.

A second limitation is the chosen research design for the current study. An alternating treatments design was used in order to limit order effects from the interventions; however, carry over effects from each intervention was still possible given the short duration of the study (Mong et al., 2012). In the future, researchers could study the interventions independently for a longer duration in order to account for possible interference of treatment effects.

An additional limitation is the fact that the study took place during the regular academic school year, and the participants were continuing to attend class for the duration of the study. This provides a threat to internal validity because factors other than the interventions themselves could have had an effect on the children's ORF. For example, the participants were receiving regular instruction within the classroom, and this could have had an effect on the results of the study. Therefore, it is not with certainty that the researcher reports internal validity of the interventions' effect on ORF.

Conclusively, the results of the extended analysis did not support the notion that a brief experimental analysis is an effective strategy in identifying the most appropriate reading intervention for improving reading fluency for children with autism. Though the BEA was supported for two out of three participants, one of those participants did not show generalization to novel passages. Ultimately, it is the researcher's conclusion that the BEA is no more effective than choosing an intervention at random.

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Appendix

Appendix A – IRB Approval

THE UNIVERSITY OF SOUTHERN MISSISSIPPI

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NOTICE OF COMMITTEE ACTION

The project has been reviewed by The University of Southern Mississippi Institutional Review Board in accordance with Federal Drug Administration regulations (21 CFR 26, 111), Department of Health and Human Services (45 CFR Part 46), and university guidelines to ensure adherence to the following criteria:

- The risks to subjects are minimized.
- The risks to subjects are reasonable in relation to the anticipated benefits.
- The selection of subjects is equitable.
- Informed consent is adequate and appropriately documented.
- Where appropriate, the research plan makes adequate provisions for monitoring the data collected to ensure the safety of the subjects.
- Where appropriate, there are adequate provisions to protect the privacy of subjects and to maintain the confidentiality of all data.
- Appropriate additional safeguards have been included to protect vulnerable subjects.
- Any unanticipated, serious, or continuing problems encountered regarding risks to subjects must be reported immediately, but not later than 10 days following the event. This should be reported to the IRB Office via the "Adverse Effect Report Form".
- If approved, the maximum period of approval is limited to twelve months.
  Projects that exceed this period must submit an application for renewal or continuation.

PROTOCOL NUMBER: 16032905
PROJECT TITLE: A Comparison of Three Reading Interventions for a Child with Autism Spectrum Disorder
PROJECT TYPE: New Project
RESEARCHER(S): Alexandra Utley
COLLEGE/DIVISION: College of Education and Psychology
DEPARTMENT: Psychology
FUNDING AGENCY/SPONSOR: N/A
IRB COMMITTEE ACTION: Expedited Review Approval
PERIOD OF APPROVAL: 11/01/2016 to 10/31/2017
Lawrence A. Hosman, Ph.D.
Institutional Review Board