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Teaching Phonemic Awareness and Predicting Future Reading Success

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TEACHING PHONEMIC AWARENESS AND PREDICTING FUTURE READING SUCCESS

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Abstract

This literature review examines teaching phonemic awareness skills and their importance in identifying students at risk. Phonemic awareness measures used at the beginning of kindergarten can help predict students' reading abilities at the end of the first and second grades. Tests of PA such as phoneme blending, phoneme segmenting, phoneme elision, RAN, and letter knowledge have all been shown to be significant predictors of future reading achievement when used with kindergarten children while rhyming did not. Teachers can use these tests to identify students at risk for reading difficulties so they can be placed in interventions early. A variety of teaching strategies and skills were addressed in the research. Some promising ones were phoneme blending, segmenting, and manipulating but the big consensus was that PA training needs to be explicitly taught for students to transfer the skills to reading. Results suggest that tests of PA can help educators predict which students are at risk and explicit training in PA can help prevent or lessen those students' difficulties when remediated early on in their education.

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CHAPTER I: INTRODUCTION

Historical Context

Teaching students how to read in the early grades so they can read to learn as their education progresses is a primary goal for PreK through third-grade teachers. The challenge comes when balancing this very important goal with teaching all of the other required skills and standards. Early educators need to constantly be weighing the time it takes to assess and teach a specific skill or strategy with the predicted effectiveness and outcome for all students. This challenge brings about the big question, how do educators get the most return on their investment of time, and what skills need to be mastered by the end of kindergarten for teachers to know most students will be successful in first grade and beyond?

Finding the best way to teach reading in a way that reaches most students is not a new concept. It has been researched and debated for years. In 2000, the National Reading Panel concluded its meta-analysis of available reading research to date. The fourteen-member team was composed of a variety of people including: leaders of educational research, college of education representatives, reading teachers, and administrators. These people were chosen very carefully by the secretary of education and the director of the National Institute of Child Health and Human Development from a pool of over 300 nominees. They could not have any financial affiliation with publishers that might affect their review of the research. They found that over 100,000 studies on reading research had been published so this would be a very big job and require a lot of time. They broke the team into subgroups based on several factors of learning to read and came up with a process to screen studies to include in the final analysis and report. The subgroups were alphabetic, fluency, comprehension, methodology, teacher

education, and technology. It took them about two years to analyze all the studies and release their official report. In the report, they announced the “big five” or the five essential components of reading instruction. The big five, also called the five pillars, are phonemic awareness, phonics, fluency, vocabulary, and comprehension. These are considered to be the foundational skills and the National Reading Panel’s (NRP) analysis was clear that best practice reading instruction should incorporate explicit phonemic awareness instruction, systematic phonics instruction, as well as ways to improve fluency and comprehension.

The meta-analysis by Ehri et al. (2001) looked more closely at phonemic awareness instruction from the National Reading Panel’s (NRP) 2000 larger analysis. They found 52 studies that met their criteria of experimental studies from a refereed journal that focused on phonemic awareness (PA) instruction and reading outcomes that had a treatment and a control group and report effect sizes. This expanded the database of studies that tested the effects of PA instruction on reading achievement. They evaluated study designs to look for variations in results from well-designed and poorly-designed studies. They concluded that the best measure to predict reading achievement at the end of kindergarten and first grades were phonemic awareness and letter knowledge. “Phonemic awareness correlated r=0.66 with reading achievement in kindergarten and r=0.62 in first grade.” (Ehri et al. 2001, p. 254). Phonemic awareness is largely thought of and described as an auditory-only skill but this analysis found that PA instruction that included letters had larger effects on PA and reading skills than instruction without them. Small group instruction for PA also showed to be beneficial over whole class instruction. Even with the NRP and this major analysis of PA there still seem to be many questions surrounding how teachers use this knowledge to improve reading outcomes

with students. Chapter two will review more research on PA done from 2000 to now to see if anything has become more clear since these analyses were done.

Definition of Terms

Phonemic awareness is one piece of the larger heading of *phonological awareness,* which is not just one thing but rather has many subtopics or skills under it. Phonological awareness includes rhyme, onset-rime, alliteration, syllables, and phonemes. Phonemes are the smallest unit of spoken language in English, with approximately 44 of them in the English language. *Phonemic awareness* is more at the sound level instead of at the word level like the other phonological skills. Phonemic awareness can be broken down into the more specific skills of: phoneme isolation, phoneme blending and segmenting, and phoneme manipulation. *Phoneme isolation* is identifying the beginning, middle, and/or ending sounds in words. *Phoneme blending* refers to listening to individual sounds and combining them into a word. *Phoneme segmenting* is the opposite of blending: take a word and break it apart into its individual sounds. *Phoneme manipulation* is changing one phoneme in a word to form a new word. *Phoneme elision or deletion* is taking one phoneme away from a word.

Guiding Questions

The areas researched in this thesis can be used by teachers of kindergarten students to help more students be successful in first grade and beyond. I knew that making sure my students master the foundational reading skills is key to their ongoing success so I first looked into the hot topics for early literacy and kindergarten. Phonological and more specifically phonemic awareness came up a lot so I decided to focus my search studies there. I settled on three questions under this topic. What phonemic awareness skill or skills best predict future

reading success? How can I measure those skills? And what can we do as classroom teachers to support our students who are found to be at risk of reading failure due to lacking specific phonological skills?

CHAPTER II: LITERATURE REVIEW

Literature Search Procedures

To find the literature and information for this thesis, searches were conducted for studies published between 2000 and 2022 on EBSCOMegaFILE, ERIC, Academic Search Premier, ProQuest Education, Google Scholar, Semantic Scholar, and Academic Search Premier. The keywords that were used in these searches were “phonemic awareness”, “phonological awareness”, “early literacy”, “early reading predictors” and “kindergarten literacy”. This chapter will review the literature found on phonemic awareness and early literacy skills with a focus on the best predictors of future reading ability.

Predicting Future Reading Success

Blaiklock (2004) focused on the relationship between phonological awareness and reading while looking at the many variables that could affect children's success in reading. Many researchers have studied the relationship between different pieces of phonological awareness and learning to read but according to Blaiklock, they failed to fully account for extraneous variables such as ability, phonological memory, pre-existing reading skill, and letter knowledge. Since any of these variables could affect the correlation between phonological awareness and reading, Blaiklock took a larger research project and used it to design a study that takes all four variables into account.

Participants for this study came from the first-year classes of two schools in New Zealand. There were a total of 36 children chosen and all spoke English as their first language. Of the 36, permission was granted for 35. Twenty-nine took all the assessments in the first year, while 27 took all the assessments in the second year. Testing sessions were separated by five to

eight weeks in the first year and 14 to 15 weeks during the second year. The average age of the students was five years and one month. During the time of this study, the school in New Zealand generally followed a whole language approach to teaching reading where the emphasis was on reading meaningful text and using context clues for word identification. The following eight tests were administered individually by the researcher: Clay Ready to Read Test, Peabody Picture Vocabulary Test (PPVT), letter name knowledge, letter-sound knowledge, phonological memory Digit Span subtest of the WISC-R, rhyme awareness, phoneme deletion items from the Test of Auditory Analysis Skills (TAAS), and the Burt Word Reading Test (Blaiklock, 2004).

Two analyses were conducted with the collected data. The first used all the variables at once, except the Burt Reading test, to predict the Burt Reading test score at the next testing period. The second analysis took prior reading into account by using the Burt Reading test as a predictive variable. The analysis showed that when prior reading knowledge was taken into account, letter knowledge was the largest predictor of reading at the next testing time. Letter names were the most in the first year while letter sounds were the largest predictor in the second year. When prior reading skill was considered as a variable, it explained most of the variances in reading at the next test time. Letter sounds continued to predict reading at certain testing intervals (Blaiklock, 2004).

Kilpatrick (2012) looked at the tests teachers can use to identify students at risk for reading difficulties due to phonological awareness deficits. There has been extensive research on the importance of phonological awareness for successful reading; however, few have looked at the tests teachers have available to them to see what tests can actually help predict which students' slow reading progress is due to poor phonological awareness skills or something else.

Unfortunately, many of the popular tests teachers have available to them such as DIBELS, AITMSweb, and PALS focus only on phoneme segmentation, which has not been proven to be the best practice through research. This study examines three different phonological awareness tests; phoneme blending, segmenting, and manipulation to determine which tests or combination of tests best predict future reading success or struggles. Kilpatrick notes that one study is not enough to establish best practices and hopes this study will open the door for more studies aimed at researching the topic of what phonological tests will help teachers identify students who may need more intensive interventions in phonological skills to be successful.

Kilpatrick's (2012) study was conducted with 67 first-graders and 49 second-graders from a lower-middle-class elementary school in upstate New York. All students were native English speakers, and 94% of the students were white. The selection criteria included the absence of any visual, hearing, or cognitive disabilities. The participants were given the reading subtests for word identification and attack from the Woodcock Reading Mastery Test-Revised. To test participants' phonological awareness, three tests were administered from the CTOPP, focusing on segmenting words, blending words, and elision. The phonological tests were administered first in standard CTOPP (Comprehensive Test of Phonological Awareness) order with elision first, then blending, and finally segmenting. A certified school psychologist pulled students from their classrooms to the hallway in 15-minute sessions to gather the data from December through May.

The results from Kilpatrick (2012) showed that all of the phonological awareness tests significantly correlated with word identification and attack results for both grade levels. Segmenting had the lowest correlation with word identification and phonological decoding

tasks. The researcher looked at the data through several different analyses to explore the relationships among these different tests. They looked at the first and second-grade samples separately in different ways, such as with each word identification and attack as the dependent variables. Segmenting words showed no significant variance beyond blending words. There was some variance in first graders when looking at blending words and elision, but it was not significant. In the analysis that included all three tests, 55 percent of the variance was accounted for by blending words and elision, while segmenting words did not contribute. There was only a slight variation when looking at word identification versus word attack. The study suggested that no single test captures all the variance, so multiple tests should be used. Since segmenting added no significant variance beyond that of blending, it seems blending words and elision tests would be the most appropriate for teachers. The elision and blending words tests each accounted for a unique variance and together and that variance was impressive. Therefore the data suggested that the more common segmenting tests may not be the best way to determine students with phonological awareness difficulties. The CTOPP Elision and Blending words tests used together appear to be much better at identifying those students.

To see what tests in kindergarten could predict the risk of future reading difficulties, Catts et al. (2001) examined students in kindergarten and again in second grade. The researchers also looked at the unique perspective of how speech and language pathologists could help identify these at-risk children as early as possible.

The study included 604 children who initially took part in a more extensive epidemiologic study of language impairments in children. From the original study, 642 children with language impairments were recruited and permission was given for 328 of them to

participate in this future study. Of the 328 children, 123 had language impairments, 103 had nonverbal cognitive impairments, and 102 had language and nonverbal cognitive impairments. A random sample of children without impairments was also recruited and they received permission from 276 of those typically developing children to participate. All children were English speakers with no history of sensory or neurological disorders and no children had been diagnosed with autism or mental retardation at the beginning of the study. The children were given a battery of tests in kindergarten including five subtests from the Test of Language Development-2: Primary, a narrative abilities test developed by Culatta et al. (1983), phonological awareness tests of syllable and phoneme deletion adapted from Rosner's Auditory Analysis Test, rapid automatic naming ability test (RAN), the letter identification subtest of the Woodcock Reading Mastery Tests-Revised, nonverbal cognitive abilities subtests from the Wechsler Preschool and Primary Scale of Intelligence-Revised, and three tests of reading comprehension. The tests were administered in kindergarten from November to May with 80% being tested from January to April. The tests were given again approximately two years later, at which time 94% of children were in second grade. Testing was done in two-hour sessions by fourteen examiners in kindergarten and three in second grade. It was necessary to standardize the score using age norms since the tests were given to different children during different times of the year. It was also necessary to divide the children into those who did and those who did not show reading difficulties in second grade since the purpose of the study was to provide a mechanism to identify kindergarteners who are at risk for reading difficulties in second grade. That division resulted in 183 children from the study being identified as having reading

difficulties and 421 who did not by using the criteria of one standard deviation below the mean to define reading difficulties (Catts et al., 2001).

When analyzing the data from the kindergarten tests and then reading outcome tests in second grade, the researchers found five significant variables that each uniquely predicted the chance of reading difficulties in second grade. The variables that best predicted reading difficulties were letter identification, sentence imitation, the child's mother's level of education, phonological awareness (deletion), and RAN. These variables were used as part of a logistic regression formula to calculate and compare the probability of reading difficulties in second grade from the children's scores in kindergarten. As predicted those children with reading difficulties in kindergarten were far more likely to have difficulties in second grade as well. Early identification of at-risk students is key so that early interventions can be started to help these students succeed. They suggest that more research is needed and finding ways to predict reading difficulties even earlier than kindergarten should continue to be studied (Catts et al., 2001).

Extended from the previous study Hogan et al. (2005) followed some of the same students to fourth grade. They tested them again to analyze if those same scores from kindergarten and second grade continued to predict literacy development through fourth grade too.

The last study was conducted with 604 students, since that time 34 students had left the study leaving 507 children with complete data from kindergarten through fourth grade. The children were assessed on phonological awareness skills using a deletion task in all three grades: kindergarten, second, and fourth. In the second and fourth grades, the letter

identification task done in kindergarten was dropped, and phonetic decoding and word reading tasks were added. As in previous grades, the tests in fourth grade were also given in two separate two-hour sessions by trained examiners with degrees in speech and language sciences/pathology or education (Hogan et al., 2005).

The researchers used a path analysis again to see if the tests that predicted reading development from kindergarten to second grade continue to predict further development in fourth grade. Results of the analysis showed that although scores in kindergarten on phonological awareness predicted second-grade word reading skills, second-grade scores did not provide any further prediction of word reading in fourth grade. When looking closer at this data, the researchers found that from second to fourth grades the relationship between phonological awareness and word reading was reversed meaning second-grade word reading predicted fourth-grade phonological scores instead. This suggests that after kindergarten, or at least by second-grade measures of phonological awareness will not give teachers information about future word reading skills but rather measures of word reading or phonetic decoding skills may be the most useful (Hogan et al., 2005).

A study of the predictive relationship between phonological skills and early reading development by Clayton et al. (2020) examined if letter-sound integration could offer insight into future reading development. They wanted to see if a failure to gain automatic associations of letters and sounds would be a risk factor for future reading difficulties. They studied this along with other skills known to be predictors of reading development such as phoneme awareness, alphanumeric RAN, and letter-sound knowledge. Clayton et al. (2020) stated “It’s

critically important to determine the cognitive skills that predict variations in reading development, to allow us to identify and treat children at risk of reading difficulties" (p. 91).

This study had 191 children participate from seven primary schools in Greater London. There were 107 boys and 84 girls ranging in age from four to five years old. The children were tested four times during 14 months, three times during their first school year, and once during their second year from September to November. At each testing window, the children were tested individually in two sessions that lasted about 30 minutes each. The tests given were meant to measure their automatic letter-sound integration and a variety of early reading language skills. The test given to each child consisted of the following: a letter-sound priming task, the letter-sound knowledge subtest from the York Assessment of Reading for Comprehension (YARC) (Hulme et al., 2009), the Early Word Recognition (EWR) subtest from the YARC, phoneme awareness sound deletion subtest from the YARC, and two rapid automatized naming (RAN) subtests from the Comprehensive Test of Phonological Processing. The letter-sound priming task required children to decide whether the stimuli/sound given was a speech sound or a "robot sound." They were shown a visual letter prime and an auditory letter-sound target. Half of the letters shown and sounds given real speech letters/sounds, and the other half were scrambled speech sounds or "robot sounds" and one of five letter-like forms. A baseline was given with a novel letter and real speech sound each time, then the visual was presented first, followed by the sound, then the cue "real sound?" Their response time was recorded from the start of the auditory sound. Six different conditions were presented in this task, and the task was given in two sessions on consecutive days. Faster response times were associated with better letter-sound knowledge, phonemic awareness, and RAN skills.

Clayton et al. (2020) found that the measures of reading letter knowledge, phoneme deletion, and RAN had a significant correlation at each testing time. The children greatly improved on all of the phonological tests over the time of the study but especially from test one to test two. The researchers used a latent growth curve model to examine the relationships between the measures used and reading development. This method eliminates measurement error and allows for reciprocal effects to be studied as well. Phoneme awareness and alphanumeric RAN show a reciprocal relationship with reading development. This means that as one goes up the other does too. The more children learn to read, the better they do at phonemic awareness tasks and RAN and vice versa. This study supports others in demonstrating the close relationship between phonological skills, phonemic awareness, letter-sound knowledge, and RAN to reading development. Finally, the response time in the letter-sound integration task did predict reading growth but did not provide a significant contribution above what the letter-sound knowledge, phonemic awareness, and RAN had already predicted (Clayton et al., 2020).

The study by Burns et al. (2018) examined the relationship between different components of phonemic awareness and letter-sound knowledge for kindergarten students in high-poverty schools. They wanted to see if measures for the four components of phonemic awareness would contribute to a significant variance in early literacy skills.

The study was part of a three-year research project called Path to Reading Excellence in School Sites by the PRESS Research Group. PRESS is a comprehensive model with tiered support to help get all students reading at grade level by the end of their third-grade year. The model includes universal screening, interventions, and progress monitoring for students. It also

supports high-quality core instruction for all and professional development for school staff. The study participants were one hundred ninety-two children from kindergarten classrooms in three upper midwest elementary schools. The schools served a number of students ranging from 199-485 and were in urban areas. The sample was 99.8% African American students with 53.6% being male and 46.6% being female. The number of students that fell under the federal definition of high poverty was 88.3% and 26.6% were also ELL students. To screen for reading difficulties all kindergarteners were given benchmark assessments during the fall, winter, and spring. As part of this assessment, students were tested on their letter sound fluency (LSF) where students were given a one-minute probe in which they were asked to give the letter sound only. Their final score was the total number of correct sounds in one minute. The kindergarteners participating in this study were also given the Quick Phonemic Awareness Assessment (QPA), which was produced by the PRESS Research Group following their winter benchmark assessment. The QPA assessment was given one on one by a researcher and took five to seven minutes per student to complete. It has four tasks with five items each that include rhyming, initial sounds, isolation, blending, and segmenting. All tasks had practice items and used standardized directions. Students were scored for each task on the number of correct responses out of five (Burns et al., 2018).

To test the primary research question, to what extent do measures of the four components of phonemic awareness contribute unique variance to a measure of early literacy with students from an urban high-poverty elementary school, a regression model to analyze the data was used. The researchers found that segmenting, blending, and initial sound isolation all significantly predicted LSF scores accounting for about 32% of the variance. Rhyming, on the

other hand, did not predict LSF and only accounted for about 1% of the variance. The results suggested that using the QPA test, possibly without the rhyming, would be a good predictor of LSF and early literacy skills, therefore it helps identify at-risk students. Since the rhyming test did not contribute a significant variance it may not be worth the time to give it. Identifying at-risk students as early as possible means teachers can start interventions early and hopefully stop or greatly reduce later reading difficulties (Burns et al., 2018).

The study by Hulme et al. (2002) wanted to provide more conclusive evidence for the importance of different levels of phonological awareness when being used to predict reading abilities. They use non-words throughout the study and use the exact same procedure for each task except for the different phonological units that the children need to detect.

The participants were 72 students in reception (kindergarten) and year one at one of two schools in the city of York or two schools in Cambridgeshire. There were 39 boys and 33 girls with a mean age of 5.6 years at the time of their first assessment. No children had reported hearing, speech, or visual impairments and all spoke English as their first language. This study was a short-term longitudinal study where students were tested twice during a seven to fourteen-month time span. Children were tested using the British Ability Scale II and the British Picture Vocabulary Scale second edition. They were tested on onsets, rimes, and initial and final consonants using three different tasks. The tasks were sound detection, sound oddity, and sound deletion. This made for a total of 12 subtests in all. Each subtest consisted of two practice trials and 10 experimental trials. Practice trials were done with real words, and experimental trials were done with non-words. The stimuli(non-words) were digitized on a computer and recorded by a native British English speaker.

The researchers Hulme et al. (2002) analyzed the data in several different ways. All tasks were checked for reliability using Cronbach's Alpha and were found to be acceptable. When looking at predicting reading ability from phonological tasks, there were significant correlations between each measure and reading, though initial and final phoneme awareness seem to be better predictors of reading than onset and rime awareness do. Two different sets of hierarchical regression analyses were done with reading as the dependent variable, but since they were found to show identical patterns of results, they only reported the raw scores and not the log-transformed ones. The four measures, onset, rime, initial phoneme, and final phoneme along with figuring in age and vocabulary scores, the combined measures accounted for 54% of the variance in reading scores. They looked at the extent that each phonological awareness task uniquely predicts reading skills when controlling for the other phonological measures. In this case, only initial phoneme awareness had a significant variance of 10%, suggesting that identifying the first phoneme is a better predictor of reading ability than onsets, rimes, and final phonemes. The researchers also looked at how the measures predicted later reading skills by putting kids in the category of poor readers and better readers and again used the hierarchical regression analysis using reading skill as the dependent variable. This analysis showed that for the less skilled readers, only the initial phoneme was a unique predictor of reading skill. The more skilled readers, both initial and final phoneme awareness showed to be unique predictors of reading skills. Neither group showed that rime awareness was a predictor of reading skills. Since the skill levels of participants varied greatly due to some having more school experience by being in first grade, they focused more analysis on the 62 children that scored lower reading one to 20 words during the BAS test, so they were getting the best look at predicting from early

basic learners. This analysis closely matched the other in that measures of phoneme awareness and not onset and rime correlate with reading abilities (Hulme et al., 2002).

The purpose of Landerl et al.'s (2019) study was to test the unidirectional prediction of phonemic awareness (PA) and rapid automatic naming (RAN) on reading ability and another model that allows for cross-lagged predictions for PA and reading ability. They wanted to see if the predictive pattern of PA and RAN were universal or language-specific, so they included groups of children speaking English, French, German, Dutch, and Greek for the study.

The study participants were 1,120 children in grade one and followed until grade two. The breakdown of each language group was 172 native English speakers from six public elementary schools in Alberta, Canada, 262 native French speakers from eight public schools in Ottawa, Canada, 343 native German speakers from nine public schools in Graz, Austria, 114 native Dutch speakers from five public schools in the Amsterdam vicinity, and 229 native Greek speakers from six public school in Crete, Greece. All participants were recruited on a volunteer basis. Children were assessed in October or November and again in April or May of both their first and second year of school, except the German group, which was not assessed at the beginning of their second year. By the end of the study, the sample of children had 148 English speakers, 240 French speakers, 330 German speakers, and 219 Greek speakers left. The researchers put special attention to selecting tasks and developing test administration procedures to make the measures comparable in all five languages. The measures used tested phonemic awareness, rapid automatized naming (RAN), and reading fluency. When testing phonemic awareness a phoneme elision test with both real and nonwords was used. For rapid automatized naming the assessed color and digit naming. They used four colors and four digits

in a semi-random order for the assessment. Reading fluency was assessed using the word reading efficiency and the phonemic decoding deficiency subtests from the Test of Word Reading Efficiency and similar forms are available in other languages. The tasks were completed in a quiet room at the children's schools by a trained research assistant in two sessions taking about 20 minutes each (Landerl et al., 2019).

When analyzing the data, only the three assessment times that all languages were assessed were included. Since the German students did not participate in the assessment at the beginning of grade 2 that assessment time was not included in the analysis. Significant correlations were found between PA, RAN, and reading in all five languages. The best predictor of each skill was that skill at the previous testing point. So, PA predicted PA, RAN predicted RAN, and reading predicted reading in all five languages consistently. English, German, and Dutch showed that in grade one there was a parallel development of reading and PA. While in grade two all five languages reading predicted PA and in English PA predicted reading. RAN was a consistent predictor of reading in all five orthographies. This study showed the importance of early phonology as the complexity of the orthography increases. The relationship between reading and phonemic awareness is complex and interactive and is affected by many things (Landerl et al., 2019).

The study by Gellert and Elbro from 2017 was conducted to look at the predictive power of a dynamic test of phonological awareness to reading in kindergarten and first grade when controlling for letter knowledge and standard phonological awareness measure with no floor effect. The researcher also set out to see if the predictive value of those dynamic tests would change during first grade and if the tests could help in the early identification of at-risk children.

The study was done with Danish children who were tested four different testing times during November of kindergarten and May of first grade. They wanted to find an equal number of poor and average readers, about 80 of each. Six Danish schools with four hundred thirty children in nineteen different kindergarten classes participated in the screening for this study and were tested on letter knowledge and phonological awareness. After the screenings were completed, 200 children were selected for individual testing after gaining parental consent. Of these two hundred children, half (100) were selected for scoring poorly on the tests and therefore being at risk for reading failure. The other one hundred children were randomly chosen from the same classrooms as the other group of children. By the end of the studies' testing periods, 25 children had either moved or were removed from the study for needing to repeat kindergarten or starting other special education services so the analysis was done on the remaining 160 children. There were 83 girls and 73 boys with complete data. From this group, 76 were from the original group of at-risk children, and 84 were from the random selection that was not seen as at risk (Gellert & Elbro, 2017).

In Denmark, formal reading instruction does not begin until grade one. Kindergarten includes informal activities to promote letter knowledge and phonological awareness. The Danish language has a deep orthography with a complex syllable structure like English and many studies there have shown similar results to those of English-speaking children. The tests given to children in the study were given at four different testing points, two during kindergarten and two during first grade. The students were given tests of phonological awareness, letter knowledge, decoding, ability to learn to read, as well as independent, word, and nonword reading. For phonological awareness, both static and dynamic tests were given. In the static

test, the examiner pronounced a single phoneme and asked the child to point to the picture that started with that sound. There were six choices and they named all the pictures for students prior to presenting the phoneme sound. Two practice questions were given, and then 15 test questions. The dynamic test of phonological awareness followed the static test, and the examiner gave all the items the child missed in the static test again with up to three specific prompts. The first prompt was for the examiner to ask the student to name the pictures. If they could not name them the examiner would name them, followed by the examiner saying the phoneme again and asking the student to point to the picture that started with that sound. If the student still did not choose the correct answer they prompted the child to imitate the phoneme sound and then asked them again to point to the picture. If the student still did not choose the correct picture the third prompt was given. In the last prompt, the examiner gave the target sound before giving each of the six picture words and then asked the student one more time to point to the picture that started with that sound. If they still did not choose the correct picture the correct answer was given and they moved to the next question. In the test of letter knowledge, the children were asked to identify the letter names for both uppercase and lowercase letters separately and in random order. The scores for these two tests were averaged into one composite score for letter knowledge. To test decoding and children's reading ability, a dynamic test was given where students were taught three novel letter shapes with associated sounds. Ten trials were given which was usually enough for them to correctly recall the sounds. The children were shown how to blend the sounds together to form nonwords. Up to five trials with corrective feedback were done with a set of four two-letter nonwords. If the child could not remember the sound, they would be given it but they needed to say the nonword on their

own to get credit. They got one point for each word they correctly read for a maximum score of 20. If they could not correctly name all four nonwords in two consecutive trials the test was discontinued. If they successfully met the criteria of reading all four nonwords in two consecutive trials then students were given the next part of the test where they are given 12 new words to read independently. This test was followed by a test of real word reading and then nonword reading. Each of these tests included 30 words presented in three lists that are prefaced with five practice words. If the child failed to read all words in the list the test was discontinued (Gellert & Elbro, 2017).

When looking to answer the first two research questions asking if a dynamic test of phonological awareness would help predict reading development in Kindergarten and first grade when a full range of static phonological awareness and letter knowledge were accounted for, several linear regression analyses were done. In June of Kindergarten, the analyses showed that the dynamic test of phonological awareness significantly added 7% to predicting the children's reading abilities at the end of their kindergarten year even after controlling for letter knowledge. In November of first grade, the dynamic tests were found to account for 3% of the variance in reading abilities even after controlling for the static phonological tests and letter knowledge. In May of first grade, the dynamic tests dropped to an insignificant 2% in variance when controlling for the static tests and letter knowledge. In conclusion, through both the logistic and linear regression analysis, the dynamic tests of phonological awareness contributed uniquely to predicting reading difficulties through the beginning of first grade but became insignificant by the end of first grade (Gellert & Elbro, 2017).

To further investigate dynamic tests, Bridges and Catts (2011) examined the validity and usefulness of using dynamic tests of phonological awareness to predict future reading success or at-risk for having reading disabilities. They especially wanted to find out if the dynamic screening tests added significantly to predicting which students will be successful readers and which may have reading disabilities and if so how much more did it add over the static versions of the tests and the other common screeners of phonological awareness.

This study had two sample groups of kindergarten students from Iowa and Kansas. Group one had ninety students from Iowa and group two had ninety-six students from Kansas. About half of the children in group two were selected as at risk since the children in group two are also participating in another study about early identification of reading disabilities. Children labeled as “nonverbal” on an IEP, who had a limited English proficiency score of one or two, or who had significant health or cognitive impairments were excluded from the study. Students in both groups were tested using the word attack and word identification subtests from the Woodcock Reading Mastery Test-Revised/NU. Group one participants were also given the Static Deletion Task and the Dynamic Screening of Phonological Awareness from Bridges & Catts (2008). The students in group two were given the Dynamic Screening of Phonological Awareness and the Initial Sound Fluency subtests from DIBELS. The tests were given by trained examiners in mid to late September and again in April or May of the student's kindergarten year (Bridges & Catts, 2011).

A number of analyses were carried out to compare the predictability of the different tests used separately and in combination with each other. When comparing the dynamic test of phonological awareness to a similar static test, the dynamic test was shown to significantly

predict end-of-the-year achievement while the predictability of the static test was not significant. For the comparison of the dynamic test and the initial sound fluency test the dynamic test did not show a floor effect as the initial sound fluency test did. The dynamic test showed a significant variance for the word attack, but not the word identification subtest. They also looked at using the dynamic test as a supplemental screening tool to try to reduce false positives that occur with many of the early screening tools. The analyses were done using a variety of cut-off scores to see if they could reduce the number of false positives and negatives. The results indicated that over 40% of the students that later became poor readers were not identified using these procedures, but they also found that false positives could be reduced by about 25% with only small changes in sensitivity (Bridges & Catts, 2011). Though the study did find that dynamic screening tests can help add to the predictive power of screening students it was not clear if they should be used as the primary or supplemental test. Because children come to kindergarten with varying literacy knowledge and experience, the dynamic tests offer a unique perspective where the examiner can get additional data by observing how the children respond to the feedback and instruction during the test so as to judge how difficult it may be for the child to learn to read. Bridges and Catts stated that even though this study gives some evidence of the benefit of dynamic tests of phonological awareness, more research is needed to look at them as part of a multivariate screening approach (Bridges & Catts, 2011).

Rather than looking at phonological awareness the study by Cummings et al. (2007) examined the first sound fluency (FSF) test that measures phonemic awareness (PA) skills. The researchers looked to identify the descriptive rates of growth on the FSF through Prek and K, assess the reliability of the data, and the criterion-related validity of it over one school year.

They hypothesize that FSF will be more reliable because it is easier to administer than previous PA measures such as ISF (initial sound fluency) tests.

The participants of this study were Kindergarten (K) and PreKindergarten (PreK) children from three school districts in three states in the Midwest, Rocky Mountain West, and Pacific Northwest regions of the USA. They also came from 17 different classrooms throughout those districts. The measures used to test children were: initial sound fluency (ISF), letter name fluency (LNF), phoneme segmentation fluency(PSF), nonsense word fluency (NWF), picture naming (PN), rhyming (RH), alliteration (AL), comprehensive test of phonological processing (CTOPP), and of course FSF. All tests were given by trained members of the schools' data collection team that had been collecting DIBELS data for at least several years. The teams were also trained to collect FSF data by the principal researcher. Tests were given in the fall, winter, and spring with about 30 weeks from beginning to end. In addition, FSF probes were given monthly throughout the fall for K and spring for PreK to a select group of students.

The results from Cummings et al. (2007) showed that despite floor effects at the beginning of K and beginning to middle of PreK, FSF still proved to be sensitive to changes in PA skills. First sound fluency showed average gains of 1.38 sounds per week while ISF only showed 0.86 from September to December. Overall, FSF showed a weekly gain of 0.47 and ISF only showed 0.01. Evidence that FSF is valid in kindergarten was proven with this study but the validity with PreK was mixed and will require further research. Cummings et al. (2007) stated “the findings from this study provide preliminary evidence that the FSF measure could be used in the context of a school-wide beginning reading improvement model to assess students’ PA skills” (p. 104).

The study by Evans et al. (2006) examined the relationship between students' letter names and letter-sound knowledge and their predictive value in combination with phonological awareness on first-grade word identification and phonological awareness skills. They also examined which letter names and sounds are more readily known or learned more easily by kindergarten students.

The study participants were 149 kindergarten children, with 79 being male and 70 being female. Initial tests were given in April of their kindergarten year when the children's average age was five years and nine months. Tests were given individually in two separate sessions. The tests given at this testing point were: letter names and sounds, The Test of Phonological Awareness by Torgesen & Bryant, 1994, the Test of Early Reading Ability-2, RAN with colors, The Peabody Picture Vocabulary Test-Revised, the memory for Sentences subtest from the Sanford Binet Scale of Intelligence, and the Block Design subtest of the Wechsler Preschool and Primary Scale of Intelligence-Revised. Children were tested again ten months later when they were in first grade. This time the testing was done in one session but was still completed one-on-one. They tested phonological awareness using the same test as in kindergarten and reading skills with the word identification subtest of the Woodcock Reading Mastery Test-Revised. When it came time for testing in first grade, 139 students were still in the study.

The results from Evans et al. (2006) showed that the letters where the upper and lower case looked visually similar were the most known lowercase letters except for u. Letters that look similar when reversed or flipped such as b, d, p, q, and g were the least known lowercase letters. They did not find any correlation between how well letters were known and the order they are in the alphabet or for the frequency they are found in the initial position in words.

There was a significant correlation between children knowing the name of the letter and the sound of that letter. When examining the sounds most known by students, they found that the letter that the name starts with the sound and vowel was the most well-known. They accepted the short or long vowel sound on this test. The least known sounds were those letters that did not contain their sound in their name with letters that have their sound at the end of their name or in the middle. When looking at the relationship between letter names/sounds along with phonological awareness and cognitive variables, the researchers found gender, age, and all four cognitive variables were modestly correlated with phonological awareness and alphabet knowledge in kindergarten as well as phonological awareness and word identification in first grade. Family income had a modest negative correlation. Letter name knowledge and phonological awareness both help facilitate letter sound knowledge. They also found that kindergarten phonological awareness scores independently predicted phonological awareness scores in first grade (Evans et al., 2006).

Another study examining kindergarten measures to predict reading ability in first and second grade was Schatschneider et al. (2004). This study aimed to identify important predictors of reading development and achievement at the end of first and second grade through multiple measures given to a sample of kindergarteners.

The study participants were drawn from a larger study with 945 children. Schatschneider et al. used a random sample of students in kindergarten through second grade. The participants were from three different elementary schools and all in regular education classrooms. Out of the original 945 children, 540 who had data from kindergarten and either first or second grade were selected for this study. From those 540, 384 were used to examine predictors of early

reading since they had data from kindergarten and first grade. They also used 189 participants' data to assess the predictors for achievement in second grade. The children were tested four times from October through April of Kindergarten. The measures used to test children included tests of phonological awareness such as blending onset and rime, blending and segmenting words, first sound comparison, phoneme elision, and sound categorization. To measure alphabetic knowledge, they used tests of RAN, vocabulary, visual-motor integration, and recognition/discrimination. At the beginning of kindergarten only, two tests of expressive and receptive language were also given. At the end of first and second grade, a number of standardized tests were administered including subtests from the Woodcock-Johnson Psychoeducational Test Battery- Revised (WJ-R) and the Test of Word Reading Efficiency (TOWRE) (Schatschneider et al., 2004).

An analysis of the data collected was done using the ten predictors PA, letter name, sound knowledge, RAN colors, RAN objects, vocabulary, visual motor integration, perceptual matching, expressive language, and receptive language. Several different analyses were done to test whether each predictor or combination of predictors would show a unique contribution to predicting future reading achievement. Most of the predictors follow a similar pattern of having a higher variance in first grade than in second grade. For example, under fluency letter naming, speed drops in second grade to 30% from 43% in first grade, and phonological awareness drops to 12% in second grade from 25% in first grade. Even with the drops, the researchers stated, “it is apparent that phonological awareness, RAN letters, and knowledge of letter sounds are the most predictive” (Schatschneider et al., 2004, p. 270).

The study by Smith et al. (2008) examined the relationship between pre reading skills in kindergarten and future reading development in students identified as reading disabled and those that are not. They wanted to answer two questions. Will differences exist in letter knowledge, phonological awareness, and RAN between the two groups? And how would these first tests add to group differences as a function of age?

The study participants were 44 children who had been part of a larger study of dyslexia done in the Boston area. They were divided into two groups, 16 identified as RD and 28 for the control group. Children were determined to be (reading disabled) RD if they scored at or below one standard deviation on three or more of the six reading subtests given. Children were tested once prior to kindergarten and again prior to first grade. The tests used included two rhyme production tasks, one with nonsense words and the other with real words, a delete initial consonant (DIC) task, letter identification, and two RAN tasks one with colors and one with objects. As part of the larger study, both groups were given cognitive tests, too (Smith et al., 2008).

Results showed that the means for the control group were greatest except for RAN, which took more time for the RD students to complete. There was a floor effect present on the DIC task at the testing session prior to kindergarten but by the time they were tested prior to first grade, the control group no longer had trouble with this task. The scores from prior to kindergarten were analyzed and students were categorized as good, average, or poor performers. The students who fell into the poor performers category were 12 of the 13 RD students and 16 out of 29 were from the control group. When looking at the students who fell into the good performers group, 12 were from the control group and zero from the RD group

fell into this category. Performance on the RAN tests prior to kindergarten also showed differences between the control group and the group later determined to be RD but those differences disappeared by the test time prior to first grade. The only test that continued to show gaps at the first-grade testing time was the phonological awareness tasks of consonant deletion and rhyme production. Results indicated that prior to kindergarten, the tests of letter knowledge, phonological awareness, and RAN can help identify students at risk for being RD but accuracy increased when students were tested before first grade and phonological awareness still showed deficits. The variables accurately predicted reading outcomes in 80.5% of children at the testing time prior to kindergarten but increased to 91.7% at the test prior to first grade (Smith et al., 2008).

The study by Wilde et al. (2003) examined two different screening tools that are used to measure phonemic awareness skills. The first test was the Test of Auditory Skills (TAAS) and the second was the Yopp-Singer Test of Phoneme Segmentation (Yopp-Singer). The study was designed to evaluate the effectiveness of these tests in predicting successful readers at the end of first grade. They also wanted to see if the two tests evaluated the same skills and if one is more effective than the others.

The participants of the study were 25 kindergarteners from an elementary school in a small midwestern city. This school district was considered low-income with 70% of students qualifying for free and reduced lunch. All students were given the TAAS and Yopp-Singer tests during May of their kindergarten year. The computer-based Standardized Test for the Assessment of Reading (STAR) was used as the dependent measure and was given in February of their first-grade year. The TAAS is used to evaluate students' auditory perception skills. The

TAAS gives two practice items and then 13 test items. It starts with the most simple task of repeating a compound word and then asks them to omit one of the syllables, then omit the first sound in a word to the middle sound, and finally omit part of a blend. The Yopp-Singer is a test of phoneme segmentation where students are asked to separate the sounds in a word that was pronounced by the examiner. For example, for the word dog, the student would say the sounds /d/o/g/. The STAR reading test is a computerized test that is norm-referenced and gives teachers almost immediate feedback on factors such as a student's reading levels, percentile rank, and grade equivalent. The test is adaptive so depending on the student's answers, it moves to easier or harder questions to determine this feedback. The STAR is a well-established valid measure of reading achievement (Wilde et al., 2003).

The results showed that there was a correlation between the Yopp-Singer and TAAS test that was statistically significant. Wilde et al. were a little surprised that the correlation was not stronger though. They speculated that this may be because the Yopp-Singer only has children doing one task and many of them were not able to segment phonemes or simply did not understand the task. Many children broke the word into onset and rime instead of each individual sound. The TAAS on the other hand starts easier and gets increasingly more difficult so children were more likely to get at least some questions correct. Though phoneme segmenting is a predictor of reading achievement, there is also a lot of evidence that the ability to separate onset and rime comes before full segmentation so if the Yopp-Singer results were examined for both, it may have been a stronger predator or reading success. When comparing the Yopp-Singer, TAAS, and STAR scores, the TAAS had a stronger correlation with the STAR than

the Yopp-Singer did. The researchers also attribute this to the difficulty of the Yopp-Singer test (Wilde et al., 2003).

The study by Cunningham and Carroll (2013) investigated the effect of early phonological processing (PP) and language skills on children's later development of PA and morphological awareness (MA) They also examined the link between PA and MA skills on later reading skills like reading comprehension. They sought to discover if morphological and phonological strategies or reading and spelling of nonwords will transfer to and account for the link between MA, PA, and reading skills.

The study was conducted in the United Kingdom (UK) with participants from a previous study in kindergarten and first grade and from many different schools in the Midlands area. Four subgroups were formed from the 198 students tested. Students with a first-degree relative with dyslexia or who were in speech and language therapy were considered at risk for reading difficulties. This included 82 students. The first group was originally formed with 27 children found to have a double deficit due to low PP and low language scores but was dropped to 20 when seven were considered too impaired to understand the instructions for the dynamic tests. The second group had 17 students with low PP but average language skills. The third group also had a single deficit but this group had average PP and low language. The fourth group was formed with 131 children who were considered average in both PP and language skills. Children were tested again with dynamic tests of MA and PA three years later when they were in third or fourth grade. Children were tested at the university, in their school, or at their homes in two 30-minute sessions. The measures used dynamic phoneme deletion, dynamic morpheme production, a test of phonological and morphological strategies for reading pseudowords, a test

of phonological and morphological strategies for spelling, and The York Assessment of Reading for Comprehension (Cunningham & Carroll, 2013).

The results from Cunningham and Carroll (2013) provided evidence that students with poor PP skills when starting kindergarten were significantly more likely to demonstrate poorer PA and MA three years later. Regression analysis showed that PA, MA, and morphological and phonological strategies for reading and spelling of nonwords were significantly predicted by PP scores. When looking at PA, it also predicted all the nonword measure scores. Morphological awareness only added predictive significance when looking at reading comprehension. The researchers found some surprising results, too. They expected the language group to show significance in the subgroup analysis but it did not. They were also surprised that PA and not MA were predictive of both phonological and morphological strategies for reading and spelling of nonwords. This study provided support for the explicit teaching of PA and MA skills to support future reading accuracy and reading comprehension (Cunningham & Carroll, 2013).

The study by Paige et al. (2018) was a large-scale study examining the extent that letter identification and phonological awareness can predict spelling abilities in kindergarteners and how those abilities are acquired throughout kindergarten. They also evaluated these things in the context of a large urban school where many students would be considered at risk for reading difficulties.

The study participants were 2,100 kindergarteners from a large urban school district in the Midwestern USA. The students were from 63 schools with 91 teachers. Teachers volunteered to be part of the study and received 90 hours of training in reading instruction throughout the year. The children were tested for letter name knowledge, spelling knowledge,

and phonological awareness skills. Tests were administered at three different times throughout the year by the students' teachers who were trained on how to administer all tests. To test letter naming knowledge students were asked to name all the uppercase letters in a random order followed by the lowercase letters. It was noted scores were out of 54 because they showed the letters g and a with two different fonts. The Kindergarten Inventory of Development Spelling (KIDS) was used to test spelling knowledge. Phonological awareness was tested using the Phonological Awareness Test (PAT). The PAT includes three subtests, one for initial consonant sounds (IC), the second is the Phoneme Segmentation Test (PST), and the last is the Blending Sounds Test (BST) (Paige et al., 2018).

The results for question one about how LNK, PA, and SK are acquired in the second half of kindergarten showed that significant growth was found from December to May for LNK, PA, and SK. Only 33% of children knew all the letter names in December compared to 72% in May. Just 15.5% of children scored 50 out of 55 on the test of PA skills in December compared to 48% in May. The test of SK also showed significant growth from February to May. The second question aimed to find to what extent LNK and PA could predict SK at the end of kindergarten. They found that LNK accounted for 31% and accounted for 21.8% of the variance and therefore were significant predictors of SK in May (Paige et al., 2018).

Teaching Early Literacy Foundational Skills

A study by Boyer and Ehri in 2011 looked at the effects of phoneme segmentation instruction with and without articulation pictures. This study was conducted with preschool-age children in the pre-alphabetic phase to see if the phonemic awareness instruction in phoneme segmenting would help move them into the partial alphabetic phase, allowing them to read and

spell some words and if either way of teaching segmenting would prove to be more effective than the other.

They had very specific criteria for selecting students to be a part of the study. The children had to be able to name the 15 target letters, but not yet be able to segment more than three words, spell more than one nonword, read none of the target words from the posttests, and score no more than one standard deviation below the mean on the Peabody Picture Vocabulary Test for their age. Once selected, children were grouped in triplets with other children with similar scores. There were three groups in the study: the letters-only (LO) group, the letters and pictures of articulatory gestures (LPA) group, and the control or no treatment group. The LO group used 15 letter tiles to segment words, while the LPA group used those same letter tiles and eight tiles that showed mouth pictures and they were given hand mirrors to see their own mouth movements while learning about articulation. During the training of the LO group, no attention was drawn to articulation and the mouth pictures were not shown.

The study found that both the LO and LPA groups performed significantly better than the no-treatment control group in all posttests. The difference between the LO and LPA groups was more subtle with the LPA group scoring higher than the LO initially and then, over time, that gap decreased to a non-significant level. When assessing the effects of the segmenting, instruction students were given they also looked to see if those skills transferred to another segmenting skill. The posttest contained four words with consonant-consonant (CC) clusters that were not taught in the training phase. Results showed little success suggesting that more explicit instruction is needed to attain this skill (Boyer & Ehri, 2011).

Keesey et al. (2015) assessed letter-sound correspondence while studying the effect of a word box intervention on the reading and spelling skills of kindergarten students. This particular study is very small, with only three students, but it still showed that given this soundbox intervention, the three students that had been labeled at-risk showed enough growth to no longer fall into that category. The study selected students to participate in the intervention that had scored below the twenty-fifth percentile on the AIMSweb kindergarten tests of phonemic segmentation fluency, nonsense word fluency, and also were unable to isolate initial sounds in words or segment vowel-consonant or consonant-vowel-consonant words on the study's initial baseline measure phoneme segmenting with counters. The intervention used nonsense word lists of increasing difficulty to teach and measured three skills; phoneme segmentation, letter-sound correspondence, and spelling using the “my turn - together - your turn” format. Students were provided interventions individually for 20 minutes two to three times a week.

The results of the posttests show that for these students the soundbox intervention, which explicitly taught phoneme segmentation, letter-sound correspondence, and spelling was successful in increasing scores of all three skills for all three students. The findings from this study also support previous research that learning the alphabetic principle is done through explicit instruction in letter-sound correspondence and not just with exposure to text. Although the student in this study showed impressive gains, the study was quite small, and more research is needed in this area (Keesey et al., 2015).

De Groot et al. (2017) also talked about letter-sound correspondence when studying rapid automatic naming and phonemic awareness. Rapid automatic naming (RAN) is a way of assessing students’ accuracy in quickly recalling something such as letter names, sounds,

numbers, and colors. For this study, they looked at both alphanumeric (letters and numbers) and non-alphanumeric (colors and pictures) to assess the phonological processing skills of students with and without ADHD and/or reading disabilities. This study had a large sample size of 1,262 children ages eight to thirteen from Dutch regular elementary schools mostly from the northern Netherlands. There were four groups of children divided by a diagnosed reading disability (RD) only, diagnosed attention deficit hyperactivity disorder (ADHD) only, or both RD and ADHD, and a control group. To be placed in the RD group students had to score at least 1.5 standard deviations below the mean on word reading. Students were excluded from the study if they had an IQ of more than 1.5 standard deviations below average on the Dutch version of the Wechsler Intelligence Scale, had visual or hearing impairments that were not corrected, had diagnosed neurological disorders, and/or had specific language impairments. Word reading fluency was measured with three standardized Dutch word reading tests, two use real words while the third uses pseudowords. To test RAN ability the subtests Letters and Digits from the Dutch standard test of continuous naming. Phonemic awareness was measured by the Dutch PHAT-R test (De Groot et al., 2017).

The analysis of data showed the standardized means for the control group was close to zero, meaning this group was a good representation of the typically developing kids in this age group. For the experimental groups, there were notable differences when compared to the control group. There were also notable differences between the experimental groups themselves. They looked at rapid automatic naming (RAN), phonemic awareness (PA), and then RAn and PA together (RANPA). There was a clear difference between the ADHD-only group and both RD groups with both RD groups performing significantly worse than the ADHD-only group

on all measures. All of the standardized effect sizes were considered large ranging from 0.82 to 1.91 except the ADHD-only group's RAN, which came in with a moderate effect size of 0.63. When looking at phonemic awareness, the data suggested that all three experimental groups are prone to difficulties but especially the comorbid RD/ADHD groups (De Groot et al., 2017).

Rather than looking at only one or a few elements of early literacy, Hatcher, Hulme, and Snowling (2004) evaluated the effectiveness of four reading programs meant for teaching reading to four-year-old children. They wanted to look at three things. First, does supplementing a structured reading approach including phonics with phonological awareness training, lead to increased reading skills? Second, what is the best phonological unit to focus on, and what strategy for teaching children to connect their phonological skills to print? Third, are year-one children at risk for reading failure more likely to benefit from the additional phonological awareness training than the other children not deemed at risk?

This longitudinal study conducted in the United Kingdom used 20 schools in the city of Carlisle. One class, of four and five-year-old students, at each school, was randomly assigned to one of four different groups. There were 410 children with complete data at the end of the study due to some moving out of the area. The four groups were: reading curriculum alone(control), reading with rhyme, reading with phoneme, and reading with both rhyme and phoneme. The standard reading curriculum used by all classes contained concepts of print, letter identification, word reading, phonics, writing, spelling, and sound linkage for spelling and embedded phonics. The reading with rhyme group got additional teaching in word identification, syllable identification, rhyme supply, and onset-rime linkage. The reading with phoneme group received the basic reading along with word identification, syllable

identification, phoneme blending and linkage, phoneme discrimination, phoneme segmenting and linkage, linkage, phoneme deletion and linkage, phoneme substitution and linkage, and phoneme transposition and linkage. The reading with rhyme and phoneme group got all the listed components from each of the other groups. The assessments given included 12 different measures for each student. The measures tested were: a general cognitive ability, which was estimated from receptive vocabulary from the English Picture Vocabulary Test, and matrices to test nonverbal ability such as the Naglieri Nonverbal Ability Test (NNAT), literacy skills measured with four different tests: letter identification by either name or sound, reading measured The Early Word Recognition Test, British Ability Scales (BAS) Word Reading Test A, and the Graded Nonword Reading Test, which measures phonics decoding skills. Arithmetic was tested with The BAS Basic Number Skills Test and phonological skills were tested with two measures of rhyme awareness and two for phoneme awareness. The rhyme awareness tests were rhyme detection and rhyme production from the Phonological Abilities Test (Hatcher et al., 2004).

The results of Hatcher et al. (2004) showed that phoneme level skills are a stronger predictor of both word and nonword final level of reading skills. To answer the questions, the researchers presented at the beginning of the study, it shows that for the first question of whether or not supplementing teaching of reading with explicit phonological awareness training would have benefits for normally developing children, the answer was surprisingly, no. There was no significant improvement in the score of those children. Question two asked whether the size of the unit focused on in training would have an important effect, the answer to this was also no. Though there were significant improvements in phonological skills after the training, the improvements did not transfer to improvements in literacy skills. The third question in this

study asked whether incorporating phonological training would be particularly important for the children deemed at risk. They wanted to see if the training typically presented to individuals would have benefits when presented to a whole class and if it could help prevent reading problems from developing in these young children. The children who were at risk did make more progress in reading if they were in the classes that received the extra phoneme level training. The most significant gains come for children in the groups that explicitly linked phonemes to print (Hatcher et al., 2004).

Gonzolez-Frey and Ehri, 2020 conducted a study to compare two different methods of decoding instruction that relate to phonemic awareness skills. They wanted to see if connected phonation or segmented phonation help children learn to decode better than the other. They looked to answer three research questions. First, will the children learn to decode consonant vowel consonant (CVC) nonwords with continuous consonants more easily when they are taught using the connected phonation technique versus the segmented phonation technique? Second, will the decoding skills learned transfer more easily to new CVC nonwords with stop consonants when they are taught using connected phonation versus segmented phonation? Third, will children that have not been taught segmented phonation in their regular classroom have the same results as those that were?

Gonzolez-Frey and Ehri (2020) completed three studies as part of their larger study conducted with kindergarten children in the northeastern U.S.A. Study one had eighteen students from an urban elementary school. Study two had 16 students from a suburban school. Study three had 38 students from an urban charter school. The criteria for selecting participants were that the children knew the 13 letter sound targets and could not read more than one CVC

nonword. Students were matched into pairs by word reading score and randomly assigned to the two treatment groups. The treatment groups were taught using either segmented phonation or connected phonation. Students in studies one and two were exposed to segmented phonation as part of their regular curriculum but they had not yet learned to decode words. The students were trained and tested individually. During the first session, students were given pretests to verify students knew the 13 target letter sounds and could not decode more than one CVC nonword and to test oral phonemic awareness skills of blending and segmenting. In session two they were trained in either segmented phonation, pausing between each sound, or connected phonation, blending sounds without a pause. When the study criteria were met they were given transfer tests with CVC words containing stop consonants, these letter sounds are made with a short puff of air and can not be held out for several seconds as the continuous sounds can. The students were given five practice words where they copied the examiner by repeating what they said, they were then given nonwords to decode independently, but were given corrective feedback until they successfully read five words in a row. In study three, a posttest of twenty new CVC nonwords was given one day later.

The results for the first question of Gonzolez-Frey & Ehri (2020) showed that the students in studies one and two took about the same number of trials to meet the decoding criteria. The students in study three who received the connected phonation training without exposure to segmented phonation in their regular curriculum took significantly fewer tries to learn to decode than the group that received segmented phonation training. When looking at question two for which type of phonation training would best transfer to reading CVC nonwords with stop consonants, the results showed significant differences for the connected phonation

group for all three studies. It showed that 90% of the students in the connected phonation group scored higher than the average while only 32% scored higher in the segmenting group. When looking at the data from the transfer task, the number of errors or mispronunciations was recorded. Almost all students (95 to 100%) in the connected phonation groups had fewer mistakes than the mean, while 75% of the segmentation groups children had more mistakes than the mean. A correlational analysis was also done and showed that the word reading pretest, but not the phonemic awareness tests added significant variance in the student's ability to decode the nonwords in the transfer task. The results of all three studies showed that the training in decoding helps students learn to decode, but that the connected phonation training looks to be quite promising, and therefore, more research should be done on this method. (Gonzolez-Frey & Ehri, 2020)

The study by Yeh and Connell (2008) was designed to test the common idea in Head Start programs that rhyming and vocabulary instruction will also promote phonemic awareness skills. They do not provide direct instruction in segmenting and blending because they believe that rhyming and vocabulary activities are more developmentally appropriate and will lead to those other phonemic awareness skills indirectly. The researchers designed their study to see which type of instruction, rhyming, vocabulary, or blending/segmenting would the four and five-year-olds in Head Start be more likely to develop phonemic awareness skills. This will help teachers know what skills to focus on.

There were 128 participants in this study who were four and five years old. They were all enrolled in Head Start centers in Boston but spread out among 16 different classrooms. The children were from low-income families and mostly minorities, which is part of the Head Start

eligibility criteria. The 16 classrooms were randomly assigned to one of the three treatment groups: phoneme segmentation, rhyming, or vocabulary development. The treatment groups were mixed within centers so that one center would not have all the same treatment groups within it. At the start of the study, all children were non-readers with low phonemic awareness skills. Each of the treatment groups implemented instruction for 14 weeks. The teachers assigned to the phoneme segmentation group received training on how to teach systematic lessons focusing on phoneme segmentation, phoneme blending, and phoneme substitution/manipulation. The rhyming group teachers were trained and given preplanned rhyming activities from a curriculum for teaching phonological awareness. The curriculum was meant to continue to more advanced phoneme skills, but for this only used the rhyming activities. The vocabulary group instruction used strategies suggested by the National Reading Panel, 2000 meta-analysis as well as the regular Head Start curriculum that already focused on vocabulary development. The teacher read and reread books and stopped to explain new words and used questioning strategies to promote vocabulary, too. To ensure each teacher was providing their students with the instruction for their assigned group with fidelity, they were observed at least 30 minutes per week. They also were asked to keep notes, do interviews, and take surveys about their instructional practices. The measures used to test the children's skills were oral phonemic awareness tests of phoneme segmentation, blending, deletion, and substitution, letter-sound knowledge, decoding, word recognition, rhyming, and vocabulary (Yeh & Connell, 2008).

An analysis was done for each group by comparing pre and post-test scores. The pre-test scores for all groups were similar so researchers knew that any variance in post-test scores was

not due to any differences at the start of the study. The results showed that each treatment group made significant gains on the measure associated with their treatment group. This suggests that the instruction for each treatment group was implemented as intended. When looking at the effect each treatment group had on letter-sounds knowledge measures, the analysis showed that the segmentation group had significant gains over the rhyming group but that the gains over the vocabulary group were less significant. When analyzing the effect of the treatment groups on rhyming measures, they found that although the rhyming group showed larger gains than the other groups, the gains were not significant. The results for the vocabulary group were the same; no significant differences among treatment groups were found. There were no significant gains for word recognition measures by any of the groups. This result is expected since the participants were all four and five-year-old non-readers and the treatments only lasted 14 weeks. These results indicated that children may learn phoneme awareness skills naturally through reading, rhyming, and vocabulary activities but that it is more effective to deliver explicit instruction. Yeh and Connell (2008) stated:

> It appears that explicit instruction emphasizing phonemic awareness may be more likely to prevent reading difficulties, especially among disadvantaged children such as those served by Head Start, than instruction emphasizing rhyming, vocabulary development or incident exposure to phonological activities in the context of story reading. (p. 254)

Rather than using just rhyming and vocabulary, Ryder et al. (2007) evaluated if explicit instruction in phonemically-based decoding and phonemic awareness skills would be an effective intervention for struggling readers in a whole language classroom environment.

This study was conducted in New Zealand with six and seven-year-old native English speakers. They chose 24 children from four different year two and year three classrooms whose scores on the Burt Word Reading Test were the lowest. The students were paired with others with closely matched scores and then were randomly assigned to the intervention or control group. The pairs assigned to the intervention groups received four sequenced lessons per week in phonemic awareness and phonemically-based decoding strategies over 24 weeks from a trained teacher aide. The lessons were semi-scripted and lasted about 25 minutes each. All 56 lessons included five components and the materials required: a one to two-minute review, five minutes of phonemic awareness exercises, the main lesson, and an activity to practice the new learning from the lesson. Some materials used were: syllable cards, sound mats with letter tiles, grapheme bingo cards, silly sentence worksheets, handheld mirrors, and decodable text. The phonemic awareness practice focused on oral activities such as syllables, rhyming, and phoneme isolation, segmentation, blending, and substitution. The phonetically based or alphabetic decoding strategies focused on introducing letter sounds along with their associated grapheme(s) and what the students' mouths and tongues should be doing while making that sound. The lessons also included writing activities with letters and words as well as word-chaining activities with letter tiles (Ryder et al., 2007).

The results of Ryder et al. (2007) showed a clear difference between the intervention and control groups. The intervention group surpassed the control group's scores on all measures of the posttests. Effect sizes varied from .70 Neale raw score to 1.71 for the phonological awareness total score. When examining the Burt posttest scores the researcher found that according to age norms the intervention group's scores were only two months below

average while the control group was ten months below. The researchers Ryder et al. stated, “results suggest that the intervention program was successful in achieving its primary goal of significantly improving the phonological awareness skills of struggling readers” (Ryder et al., 2007, p.363). Two years later, researchers were able to gather follow-up data on ten of the twelve pairs by giving them the Burt and Neale tests again. These results showed that the intervention group continued to show significantly higher scores than the control group. On the Burt test, the intervention group was seven months behind according to age norms while the control group was 17 months behind. On the Neale accuracy subtest, the intervention group was only one month behind while the control group was 16 months behind. This suggests that interventions in phonemic awareness and phonological/alphabetic decoding strategies early on in reading acquisition are promising strategies for reducing the achievement gap (Ryder et al., 2007).

The study by Vellutino et al. (2006) was an extension of a previous study by Vellutino et al. (1996) where researchers took children that were identified in the middle of first grade as struggling or average readers. The children were chosen from a larger group that had been assessed at the beginning of kindergarten. This study looked to evaluate the effects of preschool and home literacy experiences on early reading achievement. They had concerns over the current way students were diagnosed and labeled as disabled readers. They wanted to find a way to identify the primary cause of early reading difficulties and distinguish between those that are cognitive and those that are deficits due to lack of experience or instruction by using interventions. The current study wanted to extend that and evaluate if identifying children at

risk when they enter kindergarten and then implementing interventions could actually prevent long-term reading difficulties.

Vellutino et al. (2006) was a longitudinal study conducted from the spring of 1997 to the spring of 2002. Participants were children from rural schools in New York and were taken from the initial sample of 1,373 that were assessed at the start of kindergarten. Two groups were formed from that sample and all children were tested on letter name knowledge. About 30% of the children were considered at risk from this assessment alone but to better show that they should be considered as such, these children were also given phonological awareness, rapid automatized naming, counting, and number identification tests. The group of children identified as at risk was split in half and assigned to either the treatment group or the school-based comparison group. Children in the treatment group were given early literacy interventions in a small group setting of two to three students throughout their kindergarten year. The intervention activities focused on letter identification/recognition, print concepts awareness, letter-sound mapping, sight words, shared/guided reading, and listening to read-aloud stories. To test progress along the way the children were given the phonological awareness and letter identification tests again in December, March, and June. All the children were reevaluated at the beginning of first grade to determine which students were still deemed at risk. The tests used were: letter identification, letter sounds, letter sound decoding, word identification, and word attack subtests from the Woodcock Reading Mastery Tests-Revised (WRMT-R). All participants were also IQ tested so that researchers could look at the way kids are typically labeled as reading disabled (LD) to see if it is accurate after interventions. The children identified as at risk now were labeled poor readers and split into three groups. Two of the groups received

one-on-one interventions and the third group received whatever interventions were offered by their home school. The two treatment groups offered interventions focused on different skills. One group's interventions focused on phonological awareness and letter-sound decoding while the other group's intervention focused on text-processing skills such as code and meaning-based word identification strategies and monitoring of reading comprehension (Vellutino et al., 2006).

The results of Vellutino et al. (2006) showed that in kindergarten, the treatment group outperformed the school-based group on most measures. The tests that showed to be statistically significant for the treatment group were measures of letter name/sound knowledge, phoneme segmenting, word identification, spelling, and decoding. When students were tested at the beginning of first grade about half of them still fell in the poor readers category but 60% of the kids in the comparison group and 80% from the school that did not offer their own interventions fell into the poor readers group. Students from the original treatment group that did not qualify as poor readers at the beginning of first grade were put into the no longer at risk (NLAR) group. The NLAR group scored solidly in the average range on all measures. Of the students that received interventions in kindergarten and continued to need remedial assistance in first grade, 58% scored solidly in the average range on all measures at the end of first, second, and third grade. These findings provide additional evidence that early and long-term reading difficulties are caused by experiential or instructional deficiencies for most children. Vellutino et al. (2006) stated:

> These findings suggest that early and long-term literacy difficulties can be prevented in most children at risk for such difficulties if they are identified at the beginning of

kindergarten (if not sooner) and if appropriate intervention to establish foundational literacy skills is undertaken at the outset. (p.163)

The study by Foorman et al. (2003) investigated several curriculums to see what effects the incorporation of PA and curricular choice of activities would affect the growth of literacy skills in kindergarten and first-grade reading and spelling outcomes. They aimed to answer questions regarding characteristics of effective PA instruction such as: how much should be only auditory or in the context of letters, and how much choice should the teacher have in selecting activities for PA instruction? “Never has such a large and diverse database of actual classrooms been brought to bear on these important questions,” stated (Foorman et al., 2003, p.291)

The study included 4,872 kindergarten students from two school districts in Houston and one in Washington, DC. The participants were in 114 classrooms with 103 teachers in 32 different Title I schools. Eleven teachers taught two classes of half-day kindergarten per day but the rest were in schools with full-day kindergarten. There were seven different curriculums that when figuring in different publication dates and updates made 12 different ones to analyze. Each curriculum was rated and placed in one of four groups: more choice more PA (MchoiceMpa), more choice less PA (MchoiceLpa), less choice more PA (LchoiceMpa), and less choice less PA (LchoiceLpa). Professional development was given to all teachers both in the summer and throughout the school year. Measures used to assess students' growth were: letter names/sounds for alphabetic knowledge and the Comprehensive Test of Phonological Processing (CTOPP). These tests were given four times in kindergarten. Normative assessments used were: The Peabody Picture Vocabulary Test-Revised was given at the beginning of kindergarten, Letter-word identification, Word Attack, and Passage Comprehension subtests

from the Woodcock-Johnson PsychoEducational Battery - Revised (WJ-R), and The Spelling dictation subtest of the Kaufman Tests of Educational Achievement, all given at the end of first grade (Foorman et al., 2003).

The results of the analysis showed that the Mchoice/Lpa and Lchoice/Mpa groups scored consistently better than the other two groups on kindergarten literacy skills growth and first-grade spelling at the end of the year. The Mchoice/Mpa group had higher PA scores at the end of kindergarten but did not continue to show a difference in reading and spelling at the end of first grade. There were 19 schools that received more extensive professional development focusing on the importance of explicit phonic and phonemic awareness instruction, which created higher fidelity and greater teacher buy-in. These classrooms performed better even if their curriculum had less PA embedded. The less choice curriculums reduced variability among classrooms due to the scripted nature but the more choice curriculums showed to be more beneficial to higher performing students. The study also highlighted the importance of full-day kindergarten giving teachers more time to devote to reading instruction. Two-thirds of the Mchoice/Mpa classrooms were in half-day kindergarten classrooms and even with more PA instruction they performed lower (Foorman et al., 2003).

Chapter III: Discussion and Conclusion

Summary of Literature

Using phonemic awareness tests for predicting future reading achievement can help teachers/schools identify students at risk for reading difficulties and address those issues with interventions as soon as possible. Researchers tested a variety of measures such as phoneme blending, phoneme segmenting, phoneme deletion/elision, and first sound or initial consonant identification/isolation.

Blending and segmenting had some mixed results. Kilpatrick (2012) found that phoneme blending and elision were more significant predictors than segmenting. Clayton et al. (2020) and Catts et al. (2001) also studied phoneme elision/deletion and found them to be good predictors of future reading development. Other researchers studied blending and segmenting together and therefore concluded that both can serve as predictors (Burns et al., 2018; Paige et al., 2018). Tests of elision/deletion require students to omit one phoneme from a word such as cat without the /c/ would et al. Hogan et al. (2005), Catts et al. (2001), Kilpatrick (2012), and Clayton et al. (2020) all found these tasks to be predictive of reading achievement. Identifying the initial consonant in a word as in a test of first sound fluency (FSF) was also shown to be a good predictor of reading skills (Burns et al., 2018; Cummings et al., 2007; Gellert & Elbro, 2017; Hulme et al., 2002; Paige et al., 2018; Wilde et al., 2003).

Letter knowledge was found to have impressive predictive power when examining future reading successes or failures but there was some debate surrounding whether letter names or sounds were better. Catts et al. (2001), Evans et al. (2006), and Paige et al. (2018) all found letter names to be a better predictor of reading while Clayton et al. (2020) and Schatschneider et al.

(2004) found evidence that letter sounds did a better job of predicting later reading skills. Blaiklock (2004) and Smith et al. (2008) found both letter names and sounds to be good predictors of reading success. In kindergarten, letter names were a stronger predictor while in first-grade letter sounds were stronger.

Rapid Automatic Naming (RAN) comes in many forms such as objects, colors, letters, or numbers but no matter what children are naming, they are scored on the speed at which they can name a specific amount of that item. (Catts et al., 2001; Clayton et al. 2020; Landerl et al., 2019; Smith et al., 2008; Schatschneider et al., 2004) all found RAN to be a significant predictor of reading success.

Not all PA tests are given in the same way, which can cause variations in findings too. Static tests seem to be more commonly used. The static tests do not give any feedback during the test. Dynamic tests do give students feedback and different levels of prompting during the test. Bridges and Catts (2011) and Gellert and Elbro (2017) both examined dynamic tests of PA and found them to be slightly better than static tests in predicting reading. Rhyming on the other hand was not found to be a significant predictor (Burns et al., 2018; Hulme et al., 2002).

Early identification of students who are at-risk was identified as key to supporting those students in moving forward in their reading development (Catts, 2011; Hogan et al., 2005). Cunningham and Carroll (2013) looked at PA a bit differently by examining phonological processing and its effects on reading. They found that low phonological processing before kindergarten leads to poor PA skills even 3 years later making a case for screening for PP too.

All students, but specifically those lacking in phonemic awareness skills, like the ones highlighted above as early predictors of future reading development, need explicit teaching in

PA (Boyer & Erhi, 2011; Gonzalez-Frey & Ehri, 2020; Yeh & Connell, 2008). It is largely thought that PA is an auditory-only, skill but since the ultimate goal is for students to transfer those skills to reading and writing, there has been some promising research on explicitly connecting the sounds to letters, phonemes, and graphemes aiding in even more growth (Hatcher et al., 2004; Ryder et al., 2007). Boyer and Ehri (2011) included picture cards with articulatory gestures for mouth formation of sounds and this also showed promising results. Vellutino et al. (2006) researched preventing reading difficulties with interventions for letter name/sound knowledge, segmenting, word identification, spelling, and decoding and found they can be prevented if students are identified early. Foorman et al. (2003) examined different curriculum options categorized into four groups. The Mchoice/Lpa and Lchoice/Mpa groups performed consistently better than the other groups of Lchoice/Lpa and Mchoice/Mpa. The lower performance of the Mchoice/Mpa was thought to be because two-thirds of that group's classrooms were in the half-day kindergarten classrooms. De Groot et al. (2017) studied RAN and PA in groups of students with and without RD and ADHD. They found that RAN was much more difficult for the students in the RD groups than the ADHD and normal developing students. Keesey et al. (2015) investigated the use of sound boxes during an intervention for teaching PA skills. Though this was a very small study, they found that the intervention successfully increased students' scores on phoneme segmentation, letter-sound correspondence, and spelling.

Limitations of the Research

Preparation for this research project started by finding and reading research studies on early literacy skills and teaching reading but quickly realized that the topic would have to be narrowed a lot. Due to the vast amount of research done on reading it was clear a very narrow

topic, most likely a specific skill would be needed. The National Reading Panel's 2000 report seemed like a natural starting place since they had conducted a thorough review of research up to that point on reading. They identified alphabetics, which included phonemic awareness and phonics, as one of the subgroups that would review research in those areas. Phonemic awareness was also identified as one of the five pillars of early literacy. With kindergarten teachers in mind, attention was focused on this area as the search continued. Teachers want all their students to be successful in school. One of the key components of success in school is for students to become skillful readers. Those of us that teach in grades kindergarten through second grade have been tasked with laying the foundation for this to happen.

To find the literature and information for this thesis, searches were conducted for studies published between 2000 and 2022 on EBSCOMegaFILE, ERIC, Academic Search Premier, ProQuest Education, Google Scholar, Semantic Scholar, and Academic Search Premier. The keywords that were used in these searches were "phonemic awareness", "phonological awareness", "early literacy", "early reading predictors" and "kindergarten literacy". When phonological awareness was used as a keyword there was still a lot of research that included more skills than phonemic awareness so deciding which ones fit the questions the best and, which ones should be left out took some time. Studies chosen were done in English except Landerl et al. (2019) which also included four other languages with alphabetic orthographies along with English and Gellert and Elbro (2017) which was done in Denmark. Studies about dyslexia were not included even if they included phonemic awareness because dyslexia would be a whole new topic beyond what questions were presented here.

Implications for Future Research

There is still research that needs to be done on phonemic awareness and early reading skills. It would have been nice to find a clear answer to what test or tests teachers and schools should use to assess students and what parameters should be used to classify students at risk. As with any research that involved the human brain, where everyone's is slightly different, there was no definitive consensus on this. They have found some promising results with tests of letter name and sound knowledge, phoneme blending/segmenting/manipulating, and a number of different cognitive tests. Several great resources for teachers were found where researchers have taken the research done and made it into easy-to-understand articles addressing how teachers can bring this research or "the science of reading" into their classrooms. Unfortunately, the science/research has not caught up to many published resources and curriculums. A great next step would be for researchers, publishers, teachers, and schools to work together to find what works best for most kids. Educators will always need additional resources for a small number of students but if they follow the research, they can reach a lot more children in general education classrooms. The easiest pair to make with those groups would be researchers and teachers, but getting publishers and school boards on board may be more difficult. Teachers need to come together and stop worrying about what curriculum has the biggest name or sells the best and do what is right for their students.

Another next step for researchers is to start studying the effects of the educational disparities that occurred during COVID-19. There were families and students that fully engaged and therefore did not get behind during this time, there were families and students that did not engage at all, therefore, missing a significant amount of instructional time, and everything in

between. This left huge gaps in every classroom across the country. Children always came into the classroom with varying abilities but the differences have grown exponentially in the past few years. How can educators take what they already know from research and design new studies to discover how to help teachers fill those gaps?

Implications for Professional Application

The educational system must stop failing students by sticking an RD label on them and just pushing them along to the next grade with lower expectations. Teachers need to take the time to effectively diagnose and remediate these early reading difficulties before it is so late that it is extremely difficult or even impossible to help a student recover. With a better understanding of just how vital phonemic awareness skills are to kindergarten students, teachers can make a more conscious effort to assess students for the purpose of identification of reading difficulties and place them into an appropriate intervention as soon as possible. As stated before, the human brain is complex and no two are exactly alike so it is likely that the key to reaching most students is to use a variety of research-based measures and interventions to make those decisions.

Many schools' Multi-Tiered Systems of Support (MTSS) teams are assessing and improving their screening tools used to identify at-risk students in need of interventions. Many schools in Minnesota and around the country are working to improve these systems to better serve students. After COVID-19 many students are not meeting the regular grade level targets and it is up to these teams to help identify students that just need interventions versus the students that have true reading disabilities and may need special education services. This was never an easy task and post-COVID-19 has become even more difficult.

Minnesota is a great place to be right now for struggling students. The state is offering support to cohorts of school teams for MTSS, Language Essentials for Teacher of Reading and Spelling (LETRS) training free of charge, and teachers have access to programs like MN Reading Corps to help us provide research-based interventions to our students without the extra financial burden of hiring more teachers. Many schools are taking advantage of all three of these services and are very committed to supporting students to the best of their abilities. Working with a supportive team makes a huge difference for teachers and their students. If teachers, administrators, and parents listen to the research and work together all students can be successful in school.

Conclusion

This literature review sought to answer the following questions. What phonemic awareness skill or skills best predict future reading success? How can those skills be measured? What can we do as classroom teachers to support our students that are found to be at risk of reading failure due to lacking specific phonological skills? The research reviewed from almost 30 peer-reviewed studies helps to answer these questions. Although not one specific test was found to best predict future reading development there are several that showed to be significant predictors and key to future reading development. Phonological awareness tests of phoneme blending, phoneme segmenting, phoneme isolation, and phoneme elision/deletion along with RAN and alphabetic knowledge have all been shown to help identify students at risk for reading difficulties. It’s time for educators and schools to take what research says and apply it to schoolwide systems such as MTSS, Title I, and other screening programs to support these students. By using these tests to identify students at risk as well as monitor students' progress

over time students can be remediated through interventions that improve PA skills and therefore support future reading success and prevent long-term difficulties.

"Do the best you can until you know better. Then when you know better, do better." **Maya Angelou**.

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