Impact of Phonological Awareness and Rapid Naming Deficits in Elementary Aged Beginning Readers

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Table of Contents

Abstract

Chapter 1: Introduction
    Background of Problem
    Areas of Deficit
    Statement of the Problem
    Definition of Terms
    Theoretical Framework
    Effects of the Double-Deficit
    Research Question
    Summary

Chapter 2: Literature Review: Effects of phonological and rapid naming in beginning readers
    Relation to Reading
    Rapid Naming
    Interventions
    Conclusion

Chapter 3: Results and Analysis Relative to the Problem
    Double-Deficit
    Student Performance
    Interventions

Chapter 4: Recommendations and Conclusions
    Recommendations
    Areas of Future Research
    Conclusions

References
Abstract

Reading improvement in our nation’s schools continues to be an area of concern for many. The past two decades of reading research has focused on phonological awareness deficits, and the creation of phonological awareness interventions. With the best phonological interventions, many students continue to struggle to learn how to read. Attention has focused on exploration of the double-deficit hypothesis, which looks at phonological awareness and rapid naming as two separate areas of deficit. Studies indicate students who exhibit deficits in both phonological awareness and rapid naming have the lowest overall reading ability. Screening children for both phonological awareness and rapid naming will aid in the early identification, and the appropriate use of interventions. Further research needs to look at ways to increase processing speed, which will aid in increased rapid naming skills.

Chapter 1: Introduction

Almost thirty years have passed since the initial passage of the Education for All Handicapped Children Act, now the Individuals with Disabilities Act (IDEA). Influence of the law has been profound, strengthening and expanding special education service. However, even with expansion of special education services, reading remains a dominant issue for educators. Attention has focused on exploration of the double-deficit hypothesis to understand the nature of reading problems.

Background

The ability to read fluently continues to remain difficult for many young children. The issue regarding reading failure in the United States continues to be a major social and political issue. “Although improvements have been observed since the nation’s original 1992 report card, the National Assessment of Educational Progress (NAEP) in 2007 estimated 34% of fourth-grade children are significantly below average in reading skills” (Morris et al., 2012, p. 99).
Since reading is an important aspect of school success and success in life in general, educators need to provide the best possible opportunities to help children who are most at risk for reading failure. Much of the focus has been on phonemic awareness. However, to understand what type of interventions help students learn how to read, educators need to investigate the area of rapid naming thoroughly.

Wolf and Bowers (1991) proposed the double-deficit hypothesis. The basis for the double-deficit hypothesis, explains phonological awareness and rapid automatized naming as two separate areas of deficit in dyslexic children. The separation of the two areas is a deviation from the idea rapid naming is a phonological processing skill (Schatschneider, Carlson, & Francis, 2002). Students can be grouped into separate groups based on a phonological deficit, rapid naming deficit, or both. These groups were created using scores from norm-referenced tests.

Areas of deficit.

A quantitative study of 144 children in grades 2 and 3 participated in a four year NICHD-funded reading intervention study (Wolf, et al., 2002). The participants were all from the three large metropolitan areas of Boston, Atlanta, and Toronto. Researchers screened all participants for eligibility prior to the study and given pre-treatment, mid-treatment, post-treatment, and one-year post treatment evaluations. Participants were administered the Kaufman Brief Intelligence Test (K-BIT), Rapid Automatized Naming Test-Letter (RAN), Comprehensive Test of Phonological Processing – Elision and Blending Phonemes-Words (CTOPP), and the Woodcock Reading Mastery Test – Revised (WRMT-R).

The standard scores of phonological and naming-speed were significantly correlated to word attack ($p < 0.001$) and Word Identification ($p < 0.001$). Phonological and naming speed
accounted for independent variables of reading measures when accounting for social economic status, age, and IQ ($p < 0.001$). The study went further to classify the participants based on the double-deficit hypothesis, which showed 19% of participants had a phonological deficit, 15% had a naming speed deficit, 60% had the double-deficit, and 6% could not be classified (Wolf et al., 2002). These percentages clearly indicate a number of struggling readers have deficits in both phonological awareness and rapid automatized naming.

Students can still be classified by the double-deficit hypothesis by using either low achievement or ability achievement discrepancy (Katzir, Young, Wolf, Morris, & Lovett, 2008). The study included 158 participants selected from children in public and private schools in the three large metropolitan areas of Boston, Atlanta, and Toronto. Researchers classified children into the subgroups of low achievement and ability achievement discrepant. Students were administered the WISC-III to measure cognitive ability. Other tests administered included: Rapid Automatized Naming Test (RAN), Comprehensive Test of Phonological Processing (CTOPP), Peabody Individual Achievement Test (PIAT), the word attack and the word and word identification subtests of the Woodcock Reading Mastery Test (WRMT), and the Gray Oral Reading Test (GORT).

Students in the ability achievement discrepant group had an overall higher IQ. No major differences found in rapid naming, phonological, or word attack skills were found to be significant ($p < .001$) for rapid naming, phonological skills, and word attack (Katzir, Young, Wolf, Morris, & Lovett, 2008). The students could still be grouped according to the double-deficit hypothesis by either a naming speed deficit, phonological deficit, or both with the children classified as both having the lowest overall reading ability. The children chosen for
studies are important because as the field shifts away from the discrepancy model, the children who qualify for special education may change, thus serving students with lower IQ’s.

A longitudinal study consisting of 200 children and completed in two time cycles, from second grade to fourth grade and from third grade to fifth grade contradicted the double-deficit hypothesis. Researchers administered phonological, rapid naming, and reading assessments over the period. Conclusions indicated rapid naming and phonemic awareness did predict reading skills in second and third grade, but by fifth grade, rapid naming did not uniquely account for any of the variation in reading outcomes measured (Torgesen, Wagner, Rashotte, Hect, & Burgess, 1997). Researchers used different cutoff scores to create the different deficit groups, which could explain the difference in findings (Wolf et al., 2002). The differences in the group classifications seem to be garnering different results from these two sides of the issue.

Statement of the Problem

For many elementary school aged children, the ability to both read fluently and comprehend written text is a difficult task. The last two decades of reading research have been characterized by the systematic building of knowledge about one principal locus of disability, the phonological system (Wolf et al., 2002). Bowers and Wolf have developed the term double-deficit hypothesis, which incorporates both phonology and naming-speed as two separate sources of reading breakdown. The double-deficit theory operates under the assumption students can have a deficit in phonological awareness, naming speed, or both. The double-deficit needs to be thoroughly examined so educational professionals can very early on identify those students who are most at risk for reading failure, and provide the necessary interventions to remediate those deficits. Educators must use progress-monitoring tools, which measure phonological awareness, and rapid naming skills
**Definition of Terms**

The following terms and definitions are included to clarify concepts and vocabulary used in relation to double-deficit hypothesis and learning how to read.

**Phonological deficit.** Difficulty decoding words, and poor awareness of the sound structure of words (O'Brien, Wolf, & Lovett, 2012).

**Developmental dyslexia.** Having a difficult time acquiring the skills necessary to read and spell words accurately and fluently (Katzir, et al., 2006).

**Word finding deficit.** A difficulty in producing the needed word by a given situation (Faust, Dimitrovsky, & Shacht, 2003).

**Rapid automatized naming.** Naming 50 items in a 5-row, 10-column, and array as quickly as possible using the four conditions of letters, numbers, colors and objects (Waber, Forbes, Wolff, & Weiler, 2004).

**Double-deficit.** When deficits in both phonological awareness and naming speed occur in the same child (Schatzchneider, Carlson, & Francis, 2002).

**Vocabulary depth.** The continuum of shared word knowledge about individual word meanings (Wolf et al., 2002).

**Orthographic skill.** Skills related to processing letters and letter patterns in word and word parts (Bowers & Wolf, 1993).

**Reading Fluency.** Translating written text into an oral output with speed and accuracy. Most measures of oral reading fluency contain two important components, accuracy and automaticity (Wise et al., 2010).
Lexical access. Requires the participant rapidly transfer presented visual symbols to phonological codes retrieved from long-term memory store (Logan, Schatschneider, & Wagner, 2011).

Theoretical Framework

Reading failure continues to be a problem nationwide, as educators should be able to make reading possible for all children. The goal for this review will be to explore in depth the double-deficit hypothesis, when children have deficits in both phonological awareness and naming speed. The double-deficit hypothesis argues most individuals with reading difficulties fit into one or two single deficit groups are independent of each other or the combined deficit (Wolf et al., 2002). The double-deficit hypothesis indicates the importance of not only phonological skills but also rapid automatized naming as another skill tied closely to reading performance. The double-deficit hypothesis possesses several key and interesting research questions.

The foundation of rapid naming comes from the hypothesis of Norman Geschwind in the 1960’s. Geschwind hypothesized one of the best predictors of reading ability would be a child’s color naming ability, which uses many of the same cognitive abilities one uses to read (Wolf, et al., 2002). Many researchers ignored Geschwind’s theories until one of his students, Martha Denckla, started working with children to test the theories out.

The findings of Denckla and Rudel indicated color-naming speed, not accuracy, separated the dyslexic reading groups from all other groups of readers. Such groundbreaking research opened up a completely new line of questioning and thinking in the educational field (Denckla & Cutting, 1999). Theories and research from the 1960’s and 1970’s would lay the groundwork for further research on rapid naming and the impact on a child’s ability to learn how to read. Theories regarding rapid naming research allow further investigation into how rapid
naming affects reading ability. The impact of rapid naming deficits will be considered further through the literature review.

**Effects of double-deficit.**

Given the discoveries over the last decade and a half about the importance of phonological awareness and naming speed as predictors of reading outcomes, researchers studied what children are most at risk for learning how to read. A 5-year longitudinal study, which tracked students from preschool through fifth grade who, in preschool and kindergarten, were placed in four different groups: no deficit (ND), phonological deficit (PD), rapid automatic naming (RAN), and both, referred to as double-deficit (DD) (Cronin, 2011). The participants were 130 children from Nova Scotia, Canada ranging from all different types of socioeconomic backgrounds. In the study were 63 boys and 67 girls. The students were administered phonological assessments (PA), rapid automatic naming tests, and subtests from the Woodcock Reading Mastery Tests 10 times over the seven years.

The growth trajectory from kindergarten through fifth grade with word and pseudo word reading was significantly higher for the ND group than for the other three groups and the DD group had the lowest growth curve (Cronin, 2011). The growth curves of the RAN and PA grew at the same rate over time, but were lower than the ND group, and higher than the DD group. The growth trajectory for Passage Comprehension represented the scores from kindergarten through fourth grade and the differences for all the groups reached a significance level of .01 (Cronin, 2011).

The rate of growth for pseudo word reading for the DD children was much lower than the other groups, and by fifth grade, the difference was quite large. However, with the Passage Comprehension task by fourth grade the DD children had lessened differences from the other
groups (Cronin, 2011). Students in the double-deficit group had the lowest overall reading ability. These findings stress the importance educational professionals are able to test and identify students who have deficits in both phonological awareness and rapid naming. Once educators identify the students, then the critical step of providing interventions to help remediate missing skills.

**Research Question**

Does building automaticity for syllable recognition help to increase reading fluency in children?

Does using a phonemic awareness and word identification intervention run during the same intervention period increase reading outcomes?

**Summary**

Over the past decade, a large amount of evidence has accumulated indicating deficits in phonological awareness are closely associated with difficulties in learning how to read. Educators now know a child’s ability to represent and manipulate individual phonemes in our language is extremely important in acquiring the grapheme-phoneme rules in a child’s mind build the foundation for decoding, fluency and comprehension (Wolf et al., 2002). Researchers have developed interventions to help children acquire the necessary phonological skill. However, recent research has also focused on deficits in the process, which underlie naming speed as another possible source of reading difficulties (Schatzneider et al., 2002).

Students found to have deficits in both phonological awareness and rapid naming performed significantly below students with just a single deficit or no deficit (Cronin, 2011). Since the focus of reading research has mostly centered on the phonological aspect of reading, the single focus has left out other possibilities for reading failure. Educational professionals need
to be able to accurately test and identify those students who exhibit the most severe deficits in both rapid naming and phonological awareness.
Chapter 2: Literature Review

The last several decades of reading research have been marked by an influx of knowledge about phonological deficits and the impact phonological awareness has on learning how to read. Researchers and educators now clearly understand the importance of developing phonological intervention programs. However, a group of students still exists who have not responded to some of the best phonological-based interventions (Wolf, 1999). Lack of progress has caused researchers to focus attention on rapid automatized naming as a second and independent deficit to influence a student’s ability to learn how to read.

Relation to Reading

Statistical data indicate relationships between phonological awareness, fluency, and reading comprehension. Researchers conducted a two-group study of students’ reading fluency skill and reading comprehension ability to understand the extent to which reading fluency affects reading. The first group of 305 students from Atlanta, Boston, and Toronto had difficulty with nonsense-word oral reading fluency, real-word oral fluency, and oral reading fluency of connected text (Wise et al., 2010). The second group of 949 students from urban Georgia, and suburban New Jersey consisted of students who had normal oral reading fluency of connected texts in but difficulties with typical oral reading fluency skills. The groups were uneven in size because participants were originally in a previous study on reading comprehension.

Students were administered the Comprehensive Test of Reading Related Phonological Processed (CTRRPP), Test of Word Reading Efficiency (TOWRE), Gray Oral Reading Test fourth edition (GORT-4), and the Wechsler Individual Achievement Test (WIAT). Real-word oral fluency was the strongest predictor of reading comprehension when compared to nonsense-word oral reading fluency and oral reading fluency of connected text (p < .05) (Wise et al.,
The findings are important because the study shows the importance of real word oral fluency, or the automaticity for words, for an appropriate level of reading comprehension skills.

**Rapid Naming**

When disabled and nondisabled readers are given the Rapid Automatized Naming Test interesting information can be garnered from the data. Rapid naming has become excepted as a reliable predictor of future reading skills, although there is still much information regarding rapid naming still to be understood. A two part study was conducted to relate rapid naming and reading skills. Part one of the study used a sample of 342 kindergarteners to look at how rapid naming develops in beginning readers. Part two was a longitudinal study consisting of 355 first grade students and then followed through 8th grade in the public school system of Wake Forest. Students were given rapid naming tasks which included colors and numbers along with the Woodcock Johnson Word Identification (WJWID) and the Decoding Skills Test-Real Words (DSTREAL) tests. The students were grouped into three groups based on rankings of reading abilities assigned by their classroom teachers. The purpose of completing a study designed this way, is to see how the rapid naming of colors and letters are predictors of reading outcomes (Meyer, Wood, Hart, & Felton, 1998).

The results of the first study indicated in Kindergarten, the ability to name letters and numbers in the average and above average reader was faster than the ability to name color and objects. The group was ranked as the poorest readers took statistically the same amount of time to name the letters and numbers compared to the colors and objects. The above average readers, who had perfect citation of the alphabet had the largest gap between the letters and numbers versus the colors and objects. The children in the lowest reading ability group also took the most amount of time to name the colors/objects and the numbers/letters. The group in the highest
reading ability took the least amount of time on all of the rapid naming tests. This study suggests there are two types of naming speed, the absolute speed of naming, and the advantage gained by having mastered the numbers and the alphabet (Meyer, Wood, Hart, & Felton, 1998).

The results of the second part of the study indicate the greatest improvement in rapid naming occur between first and third grade. The same letter/number advantage was discovered in kindergarten remained from first grade all the way to eighth grade. The study also found reading ability is clearly linked to naming speed. Although naming letters/numbers are a strong predictor of eight grade reading ability, colors/objects are a stronger predictor of eight grade reading over time (Meyer, Wood, Hart, & Felton, 1998).

**Interventions**

When students are separated to individual groups of deficit, as proposed by the double-deficit hypothesis, percentages of students in each group are usually about the same. Around 19% are usually found to have a phonological deficit, 15% have a naming speed deficit, 60% have a double deficit, and 6% can typically not be classified (Waber et al., 2004). Students who are most at risk for reading failure would have both a phonological deficit and a rapid automatized naming deficit.

A study grouped 188 children from a hospital outpatient program for the evaluation of children who were having learning problems (Waber et al., 2004). The researchers in the study used the Wolf and Bowers model of classifying children into deficits groups. Researchers created the groups based on scores in nonword decoding skills as measured by the Woodcock- Johnson Test of Achievement and rapid naming from the standard scores of the letter and number subtest of the RAN. Researchers then measured the children by demographic characteristics, IQ and attention, naming speed and phonological processing, and other neuropsychological measures,
using ANOVA to compare all of the group means. The results of the study indicated the students who had double-deficits were no different in their demographics characteristics, IQ, or level of attention problems. The double-deficit group did preform the lowest on all of the phonological and rapid naming tasks. The double-deficit group also was at-risk of low-level information processing. The results would indicate children found to have double-deficits may have difficulties not just in reading, but may extend to other academic areas (Waber et al., 2004).

Although outside the scope of this literature review, educators must understand how children with double-deficits will have slower overall processing which may have an impact on the ability of these students to perform academic tasks in the classroom quickly.

Children, who exhibit the double-deficit, are at risk for reading failure and have slower processing speeds. A one-year study set out to look at ways to improve reading fluency in children with dyslexia (Tressoldi, Vio, & Iozzino, 2004). The study consisted of 63 children, 41 boys and 22 girls. Researchers assigned treatments based on proximity to the closest clinic. The three treatment groups consisted of a linguistic group and two sub syllabic groups. Researchers administered a pretest, training phase, and posttest of reading fluency as measured by the MT Battery.

In the linguistic group, participants worked with a speech and language pathologist on methods to increase phoneme blending. The other two groups used computer software, which allowed words to be broken down into syllables and displayed on the screen. One sub syllabic group was self-paced, meaning students would push the space bar when done reading a word. The other moved at an automatic pace set by the computer. When researchers administered the post-test, the automatic sub syllabic group had made the most gains in reading fluency. The results were statistically significant (\( p = .001 \)) (Tressoldi, Vio, & Iozzino, 2004). Being able to
quickly identify and chuck word parts is important to fluent reading. Building automaticity syllable recognition helped to increase the reading fluency of the participants in the study.

How to remediate reading failure and dyslexia in children is complex, and to maximize reading progress in a given time, it may require more than one intervention being given at the same time. A study that took place at The Hospital of Sick Children in Toronto Canada, looked to see what intervention or combination of interventions would help to make the most progress in the reading development of children identified as having significant reading disabilities (Lovett et al., 2000). The study consisted of 85 participants, 61 boys’ 24 girls, ranging from age 6 years, 9 months to 13 years, 9 months. All children had been part of a cumulative sample referred to the Learning Disabilities Research Program at the hospital. Children in the study had to have at least a low-average I.Q. and show a discrepancy between their ability and achievement. On average, each child was at least two standard deviations below the age-norm. The intervention programs used were the PHAB/DI (Phonological Analysis and Blending/Direct Instruction) which looks to improve basic phonological and blending deficits. WIST (Word Identification Strategy Training) which instructs students on word identification strategies, CSS (Classroom Survival Skills) which helps students with academic self-help skills, and the Math program which teaches children core math concepts and word problems. Students in the CSS and MATH programs served as the control groups for the study.

Students were assigned to one of five program sequences of 70 hours and were assessed five times, one before treatment, three during, and once after using the WRMT-R(Woodcock Reading Mastery Tests-Revised) and the GFW(Goldman-Fristoe-Woodcock Sound-Symbol Tests). Results of the study indicated students who participated in the PHAB/DI and WIST programs together made the most gains in their reading ability over the 70 hours of intervention.
The results also transferred to real word reading as measured by the norm-referenced tests. The results were significant (p = .001) (Lovett et al., 2000).

RAVE-O is an intervention program designed by Maryanne Wolf after almost a decade and a half of research regarding the double deficit hypothesis. RAVE-O stands for Retrieval, automaticity, vocabulary elaboration, and orthography. The overall goal of RAVE-O is to build fast and accurate identification of letter patterns in words (Miller, Wolf, & Donnelly, 2000). Rave-O is a program developed to supplement a phonological based program. Recent studies look at what combination of interventions work best with students since we know children perform the highest on a task when students have been explicitly taught the skill (Morris et al., 2012). As research on reading breakdown moves forward, researchers need to discover interventions to build fast and accurate recognition of words and word chunks.

Conclusion

The goal of the literature review was to look at in depth the double-deficit hypothesis as proposed by Wolf and Bowers. Over the last couple of decades, a considerable amount of research on phonological deficits and the effect on reading ability are completed. More recently, research has focused on the impact of rapid naming as a second core deficit. A great body of research, which backs up the double-deficit hypothesis, exists. Although some studies indicate rapid naming as part of the phonological skill set. An overwhelming amount of research backs the double-deficit hypothesis. There are also longitudinal studies supporting rapid naming as a predictor of future reading outcomes, and which rapid naming tasks are the strongest predictors of future reading. Being able to identify the children who are most at risk for reading failure will give educators another tool in the toolbox to early identification. Once educators identify the most at-risk students, interventions can take place. There is a growing body of research
suggesting more than one intervention run during the same intervention period increases reading outcomes.
Chapter 3: Results and Analysis Relative to the Problem

Double-Deficit

Researchers are working towards changing definitions and concepts of dyslexia. Wolf, et al., (2002) concluded phonological and naming speed accounted for independent variables of reading measures when accounting for social and economic status, age, and IQ. Wolf, et al., (2002) went on further to classify the participants based on the double-deficit hypothesis, which showed 19% of participants had a phonological deficit, 15% had a naming speed deficit, and 60% had a double deficit. Katzir, Young, Wolf, Morris, and Lovett (2008) also found the existence of the double-deficit, and found researchers can classify children according to the double-deficit hypothesis by using either low achievement or ability achievement discrepancy. Torgessen, Wagner, Rashotte, Hect, & Burgess (1997) concluded rapid naming and phonemic awareness did predict reading skills in second and third grade, but by fifth grade, rapid naming did not uniquely account for any of the variation in measured reading outcomes.

Although there are studies which support the double-deficit hypothesis, several studies concluding rapid naming and phonemic awareness not as two separate areas of deficit. The studies, which do not give support to the double-deficit hypothesis, used different cut off scores when creating their subgroups. Using different cutoff scores to create subgroups is a weakness of these two studies because these could create different outcomes. Even with the use of different cutoff scores, a large body of research suggests rapid naming and phonological awareness are two separate areas of deficit. Looking at the double-deficit classification groups, most individuals who are struggling to read have both a phonological deficit and rapid naming deficit. As educators, when looking for curriculum planning for students it is important to know what areas of deficit each individual student is exhibiting.
Student Performance

Rapid naming and phonological deficits identified in children will give insight to the reading performance in an individual. Cronin (2011) concluded students in the double-deficit group had the overall lowest reading ability when compared to students with only a phonological deficit or rapid naming deficit. Wise et al., (2010) concluded real word oral fluency, or the automaticity of words, is a strong predictor of reading comprehension. These studies underscore the importance of how different skills in reading relate to one another. Children who have a difficult time building automaticity for words will struggle in other reading skills.

Rapid naming is a future predictor of reading achievement. Understanding rapid naming will give insight to another area of core deficit and advance the understanding of reading failure. Meyer, Wood, Hart, and Felton (1998) concluded there are two types of naming speed, the absolute speed of naming and the advantage gained by having mastered the numbers of the alphabet. In kindergarten students, the ability to name letters and numbers in the average and above average reader was faster than the ability to name color and objects. The poorest readers took statistically the same amount of time to name the letter and numbers compared to the colors and objects. This seems to indicate students are not developing the rapid naming skills for letters, and are not gaining speed by becoming more familiar with the letters. Early identification of children with rapid naming difficulties for letters would help to find students at the greatest risk for reading failure.

Meyer, Wood, Hart, and Felton (1998) also concluded from their longitudinal study the greatest improvement in rapid naming occurs between first and third grade. The study also concluded naming letters/numbers are a strong predictor of eighth grade reading ability; colors/objects are a stronger predictor of eighth grade reading over time. The findings of Meyer,
Wood, Hart, and Felton (1998) are important since in kindergarten, educational professionals should be looking at rapid naming of letters/numbers for reading progress. As students age, educators should switch their focus to the naming of colors/objects, since the rapid naming of colors and objects is a stronger indicator of future reading ability.

Early identification of students who are in need of intervention is crucial, since most rapid naming development occurs between first and third grade. These years are very crucial in the development of all early reading skills. Explicit fluency instruction, beginning as early as kindergarten, will help children who have rapid naming deficits. One weakness of this study is all children included in the study were from the Wake Forest School District.

**Interventions**

Waber et al., (2004) concluded students found to have double-deficits were no different in their demographic characteristics, IQ, or level of attention problems when compared to all children. Children who were in the double-deficit group performed the lowest on all phonological and rapid naming tasks. Children who have double-deficits are also at risk for having lower information processing skills. Additional research on how the brain processes information and how to increase the information processing ability in children needs to be completed.

phonological awareness are two separate areas of deficit, studies need to be completed which utilize different combinations of interventions which produce the most gains in the shortest amount of time. Weakness in all of these studies is just the use of a couple interventions in the studies. Larger groups of students, using multiple types of interventions would give a more complete picture of the best types of interventions to use. Interventions, which train the brain to identify and process information at a quicker pace, are essential in the intervention sequences.

The vast majority of children who are experiencing reading difficulty have deficits in both phonemic awareness and rapid naming. Since these areas are two separate core deficits, more than one intervention running in an intervention period will maximize results. Many phonemic awareness programs are available to increase phonemic awareness and blending skills. Phonemic awareness programs will help to increases student’s ability to decode unknown words. A second intervention targeting word identification, building automaticity for syllable recognition will help to increase reading fluency. These two types of interventions run together target the two skills deficits in the vast majority of children who are experiencing reading failure and will produce the greatest reading outcomes in children.

With massive amount of research conducted over the past couple of decades regarding reading, many unanswered questions about what causes reading breakdown in dyslexic children still exist. Additional research on the double-deficit and the effect on low ability groups need to take place. The field of special education is shifting towards low ability, rather than achievement discrepancy. Research and further discussions need to focus on the combination of interventions, which will work with students who identified as having double-deficits (Morris et al., 2012). Students perform best when explicitly taught the missing skill. As researchers complete further studies on rapid naming and information processing in the brain, educators can more accurately
target the specific skills missing, Once this research is finished, interventions aimed at specific student deficits, will lead to greater reading achievement. Researchers can develop new interventions based on current findings.
Chapter 4: Recommendations and Conclusion

Recommendations

Even with all of the research completed on phonological awareness deficits, a portion of the population experiencing reading difficulties who have participated in some of the best phonological awareness interventions remains. Educational professionals need to look at rapid naming as a second core-reading deficit. Understanding rapid naming and its connection to future reading outcomes is pivotal in creating a reading program, which advances proficient reading for all.

Schools should give all children – starting in kindergarten and continuing periodically through early elementary years - comprehensive phonological and rapid naming assessments. Early identification of children with phonological and rapid naming deficits is crucial to remediating deficits as most rapid naming growth occurs between the crucial years of first and third grade. Interventions should focus on phonological awareness and rapid naming. Explicit fluency instruction for students who exhibit rapid naming deficits should begin as early as kindergarten, and continue through the primary years.

Areas for Further Research

With the vast amount of studies completed on dyslexia and reading difficulties, educators need more information to clarify lingering questions about rapid naming and its ties to future reading abilities. Furthermore, researchers need to complete more studies on how the brain processes information, and how interventions can speed up those processes. As researchers gather more information about how the brain processes information, educators can develop new interventions based on the research. There are still many unknowns when dealing with brain functioning.
Researchers should construct a study consisting of 500 or more students from large metropolitan areas, and rural areas with equal amounts of boys and girls, using phonological and rapid naming assessments to group children according to the double-deficit hypothesis. Children in these groups should complete one of three intervention sequences, with progress monitoring taking place throughout the year to monitor achievement, culminating in a full achievement test administration at the end of the year. This will give information about which group of students gained the most in their reading ability over the course of the year. Using three distinctive intervention sequences should provide evidence for what types of interventions produce the best outcomes.

Conclusions

Scholars in the past decade have debated the double-deficit hypothesis. Some researchers have concluded rapid automatized naming does not predict reading ability (Torgesen, Wagner, Rashotte, Hect, & Burgess, 1997). Many published studies support the double-deficit hypothesis, giving ample evidence to support the theory. Looking at phonological deficits and rapid naming deficits as two separate deficits will have a profound impact on how researchers and educational professionals will look to diagnose, classify subtyping efforts, and interventions used with children (Wolf et al., 2002). Educational professionals must be able to early on identify students most at risk for reading failure and intervene.

According to recent studies (Morris et. al., 2012), children with learning disabilities in reading perform closest to their age equivalent peers when children are taught explicit strategy instruction. Reading fluency plays a very important part in reading comprehension, but students must also be taught specific reading comprehension and vocabulary skills along with reading fluency. As researchers gather more information about the connections between rapid naming
and future reading outcomes, teachers can use necessary interventions to help remediate reading failure in children. Educators and researchers must put a priority on developing new interventions as new information reveals how the brain works and processes information. Once fully understood, the educational community can move towards making sure everybody is a reader.
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