The Impact of Language Impairment on Learning Disabilities in Writing for K-12 Students: A Meta-Analytic Investigation

by

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Abstract

Children from all cultural backgrounds and socioeconomic statuses demonstrate speech and language disorders that can have implications on their reading and writing abilities. It is the role of speech language pathologists to help remediate these foundational skills to allow further development of encoding and decoding in the educational setting. The presence of underlying speech and language disorders are often to blame for student deficits in writing abilities that present as writing disorders. School staff need to understand the role of speech language pathologist and the implications of untreated speech and language deficits. Graham et al. (2020) shares a large body of work that aims to strengthen the argument that there is a strong correlation between the presence of speech and language impairments and the effects that they have on student writing. The current investigation is a meta-analysis that replicates and improves on Graham et al.'s research. The current investigation utilizes their existing body of work with the following additions to examine if race, gender, socioeconomic status, location of the study, type of assessment utilized, or publication status generate any significant differences in students' writing abilities. Results of this study support Graham et al.'s conclusion. Both bodies of work agree that the presence of speech and language impairments have a negative impact on students' writing abilities. There was not enough available data to determine if a student's racial background, gender, or socioeconomic status plays a part in the development of encoding. Teachers and school staff need to understand the importance of speech and language disorders and when speech and language intervention is needed to help students' writing skills progress. Language skills are necessary foundational skills that are required to participate in both functional and educational activities.

Keywords: learning disability, speech and language impairment, reading, writing, development

Dedication and Acknowledgements

I dedicate my dissertation work to my family. To my adoring husband, Daniel, who has been a constant source of support and encouragement during my doctoral journey and throughout our married life. I am truly thankful for you and our new baby, Charlotte. It is my hope that Charlotte embraces a growth mindset and pursues a passion for lifelong learning. A special feeling of gratitude to my loving parents, David and Mary Ann, whose words of encouragement, unwavering support, and push for tenacity ring in my ears. I am forever grateful for the relationship I have with both of you.

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Chapter 1

Introduction

School districts are legally obligated to provide students with interventions specifically related to their educational needs. Oftentimes, students are pulled from the classroom to address one skill with one provider at a time. Early elementary students who are struggling in the classroom often receive a combination of services such as Title I reading, pull out speech, and small group intervention inside the classroom. These services can be academically ineffective and create confusion for the student due to the overlap between reading disorders and speech sound disorders. When these students are compared to their typical peers, children with speech sound disorders performed poorly on phonological awareness tasks and letter knowledge (Raitano et al., 2004). The reason behind multiple professionals providing different levels of instruction and skill to already struggling students is unclear.

Years of experience in the field of speech language pathology have demonstrated the limited public knowledge of the overall profession, as well as the professional scope of practice. The general public, school staff, and other professionals typically view the role of a speech language pathologist as someone who works to correct speech sounds such as /s/ and /r/. The scope of a speech language pathologist runs much deeper and has the ability to positively impact the lives of students and patients in a more comprehensive manner by improving their overall quality of life.

Problem Statement

Children in early elementary school are often not getting their needs met by skilled speech language pathologists. Students with speech sound disorders and other

comorbidities, such as early literacy difficulties, are typically not receiving speech intervention in the area of phonology because of time, caseload size, or additional barriers. Speech pathologists are skilled interventionists who are able to treat reading and writing disorders within the scope of practice (American Speech-Language-Hearing Association, 2010). Yet, for some reason, speech language pathologists are being underutilized in the academic setting. School districts have been known to limit the scope of speech language pathologists and shift responsibilities to intervention specialists. Additionally, speech language pathologists in schools may demonstrate regression of their skilled service due to limited continuing education funds, limited time to obtain reading certifications, or limited interests in this specific area of their practice. No matter the present barrier, children with language disorders, articulation disorders, reading disorders, or any combination of these three are grossly underserved by the appropriate interventionists in schools today.

Purpose and Significance of the Study

The purpose of the study is to examine the impact of race, gender, and socioeconomic status for students with speech and language disorders, as well as the impact that these demographic factors have on their writing abilities. This updated information will provide readers with insight regarding treatment and long-term objectives.

Research Questions

Comparisons between the writing differences of students of different genders, races, and socio-economic statuses will be explored.

The following questions will be discussed through this research:

1. What is the effect of speech and language disorders on writing?
2. Are there differences in the writing of children classified with speech and language impairments and their same-aged peers?
3. Are there differences in the writing of children classified with speech and language impairments and peers of the same language abilities?
4. Are effects moderated by:
    a. the child's age, grade, race, gender, reported SES, identified disability (i.e., Receptive Language Problem (RLP), Expressive Language Problem (ELP), or Speech Problem (SP))?
    b. the included test type, assessment norming, peer-review status of the study, or publication location (i.e., domestic or international)?

Significance of the Study

Evaluating the effect that a student's speech and language impairments may have on writing could vary depending upon the child's race, gender, and socioeconomic status. There is limited research conducted in this area based on a meta- analysis conducted by Graham et al. (2020). Research on a child's speech and language impairment and their writing abilities is also limited by the outcome measures available. Test scores are one sort of outcome, but they are often unreliable depending on a student's disorder and severity. In addition to the testing inconsistencies and variability from school district to school district, not every student with a speech and language impairment receives the same testing accommodations. Some students may receive extended time or tests read aloud where other students may not receive testing accommodations at all. Results must be interpreted with caution. Researchers can only assess the outcomes of students with

properly documented disabilities and testing accommodations. Since statewide testing data provides limited information for students with disabilities, there is a significant gap in the data being reported regarding students with language impairment and writing disorders. A meta-analytic study that combines the research that has been conducted for a number of years would assist in examining the impact of speech and language disorders. Writing outcomes provide the appropriate mechanism to better understand the diversity that exists between students of different races, genders, and socioeconomic statuses. Similar to other meta-analyses that list data, there are always limitations including the time-consuming task of identifying appropriate studies. Not all identified studies provide heterogeneity of study populations or the appropriate data for inclusion and analysis, thus making it difficult to determine if studies are truly appropriate. Additionally, meta-analyses require advanced statistical techniques.

Overview of Methodology

The current investigation is a meta-analytic study. This meta-analysis replicates the work of Graham et al. (2020); however, the current investigation includes variables such as gender, race, and socio-economic status, which were not included in Graham et al.'s research. Additionally, the current investigation incorporates all of the new research that has been disseminated since Graham et al., which adds five more years of results to the meta-analysis. After a comprehensive review of the existing and available research, only studies meeting predetermined criteria are incorporated into the research.

Rationale and Significance

This study provides valuable information about students with speech and language disorders and how these may impact their writing based upon their diverse

backgrounds. As a synthesis of the existing research, this study provides practitioners with a richer understanding of the impacts of speech and language disorders on writing, and the research dissects that synthesized knowledge by identifiable subgroups. The results of this study contribute to the current body of research and allow speech language pathologists to develop a better understanding regarding reading and writing intervention and their role in school-based interventions. By developing a better understanding of students' diagnostic profiles, speech language pathologists and other licensed providers are able to provide the appropriate amount of support required for increased student outcomes.

Definitions of Terms

Testing Accommodations: "adjustments to the environment, instruction or materials that allow a student with a disability to access the content or complete assigned tasks. Accommodations do not alter what is being taught" (Lightner, 2020, para. 13).

Speech Language Pathologists: experts in the area of communication sciences, working with all ages ranging from babies to adults. These professionals treat patients in the areas of speech sounds, language, social communication, voice, fluency, literacy, cognitive communication, and feeding and swallowing. These professionals can be found in many settings including private practice, physicians' offices, hospitals, schools, universities, rehabilitation centers, and long term and residential healthcare facilities. (American Speech- Language-Hearing- Association, 2022).

Phonological Awareness- "the ability to recognize and manipulate the spoken

parts of sentences and words. Examples include rhyming, alliterations, segmenting sentences into words, identifying syllables in a word, and blending and segmenting onset- rimes" (Reading Rocket, n.d., para. 1).

State Testing: tests administered to students at all grade levels to provide pertinent information to parents and the general public regarding student ability, overall school performance, and overall school district performance. The information obtained through this testing is used to improve instruction by identifying areas of weakness. (Rothman, 2021)

Organization of Study

This study is organized into four additional chapters. In Chapter Two, a thorough review of the literature is provided for readers. Disabilities are discussed, as well as information and demographics from the Ohio Department of Education. In Chapter Three, the methodology, variables, procedures, and sample size are provided. Chapter Four focuses on the results for each of the research questions outlined in Chapters One and Three. Specific data are shared, analyzed, and discussed to demonstrate overall significance. Chapter Four provides the results of the data analysis. Finally, Chapter Five provides a discussion of the results and a synthesis of the findings based on the extant literature.

Chapter 2

Review of Literature

The Ohio Department of Education provides students with disabilities with academic support through Individualized Education Program (IEP). These plans often provide students with extra layers of intervention in an attempt to gain age-appropriate academic competency, functional/life skills, and modifications or accommodations that allow students to progress forward while gaining new abilities. As of 2019, 15.2% of students receive special education, which means they are identified under at least one of the thirteen disability categories (Ohio Department of Education, 2021). The largest category of students identified fall under *specific learning disability* at 37%, while students with *speech and language impairment* fall in the third largest category at 14%. (Ohio Department of Education, 2021). While these numbers do not provide readers with statistics regarding who receives speech therapy as a related service in addition to their academic goals, it is not a coincidence that these two categories are commonly correlated amongst struggling learners (Koutsoftas, 2015).

Students are getting support; however, they may not be receiving the amount or type that they need. This is evidenced by the number of students who do not perform well on state assessments after having intervention. A large gap in knowledge and skill still persists due to the number of disordered children receiving 'limited' assessment scores. As students get older, the gap grows wider, and these students are farther away from typical achievement. However, students with more significant physical and cognitive disabilities receive alternative assessments and are thriving with pass rates exceeding 90% (Ohio Department of Education, 2021). Educators appear to be missing the students

whose abilities require an extra layer of intervention either inside or outside of the regular education classroom. Every student has a great deal of potential to be a functional member of society and integral member of the workplace when provided with the appropriate education.

The state of Ohio provides the public with minimal information regarding long-term outcomes for students who received special education. In a longitudinal study conducted by Kent State University, students who graduated between 2010-2017 with the assistance of special education participated in a survey to collect post-graduation outcomes. According to Kent State University, of the 9263 students surveyed, 7718 students participated and provided data for analysis. Data utilized from the survey identified 4322 students who qualified under the category of specific learning disability. Following graduation, these students either attended a two-year college, a four-year college, participated in other training, or participated in some college. Students from each disability category anticipated participation in post-secondary education or training but often struggled to follow through with their plans. According to research conducted by the National Center for Family and Demographic Research at Bowling Green State University, the amount of Ohioians who are unemployed and identify as having a disability is slightly higher than the national average (Mador, 2017). Nationally, 12% of those who identify as having a disability are unemployed (Mador, 2017). In the state of Ohio, 17% of those who identify as having a disability are unemployed (Mador, 2017). Of the information collected, there is limited data reported regarding students who are unemployed or minimally satisfied with their current working environment/profession (Ohio Department of Education, n.d.). This is a significant limitation in the data provided

and warrants further investigation.

Theoretical Framework

Vygotsky, a psychologist from the Soviet Union (Wang, 2009), provided contributions to the field of education, as well as special education. Vygotsky's paradigm for special education is multifaceted and holds a strong stance in the area of inclusive behaviors and actions for students who have documented disabilities (Wang, 2009). Similar to the information provided by Pavelko et al. (2017), Vygotsky believed that students with disabilities develop their intellectual skills in the same manner as typically developing students (Wang, 2009). Due to the strong overlap in skill attainment and development, Vygotsky was among the first to believe that students with disabilities should be educated alongside their typically developing peers (Wang, 2009). Vygotsky's ideals regarding inclusion were progressive for the 20th century and are continuing to become widely accepted.

Due to Vygotsky's belief system, the paradigm for students with disabilities discusses the importance of believing in students and their abilities rather than focusing on their limitations (Wang, 2009). This is important for educators, as well as related service providers, to keep in mind while providing interventions and supporting these students in the classroom. With this mindset, educators focus on the students' successes and strengths rather than focusing on their lack of skills and limited forward progression, as compared to their typically developing peers. Grounded in Vygotsky's paradigm for special education, students with disabilities are capable individuals who should be treated as such.

Vygotsky's theory provides psychologists with additional insights regarding

student abilities and how these limitations are perceived by others. According to Vygotsky's paradigm for special education, students with disabilities and typically developing children are differentiated in social cultural situations (Wang, 2009). Students with developmental differences are first identified by society and cultural norms. This creates a larger gap in the inequities between students with disabilities and typically developing students. This viewpoint from Vygotsky provides further evidence that students with both visible and invisible disabilities are treated differently by society and educators alike. Pavelko's (2017) ideals directly align with Vygotsky's paradigm for special education. Pavelko describes the importance of receiving speech and language intervention early to prevent students with disabilities from facing long-term effects, such as limited educational happiness paired with vocational satisfaction.

In addition to Vygotsky's paradigm for special education, Piaget's theories provide relevance for students with disabilities (Wang, 2009). Constructivism theory is derived from the work of Piaget's theory of knowledge and the acquisition of knowledge. Piaget states that knowledge is constructed in the mind of the learner (Wang, 2009), meaning that all students look for meaning in lessons provided from educators. Regardless of whether they fully understand the presented topic or not, learners work to make sense of the newly shared information (Bodner, 1986). Students with reading and writing disorders work to understand the presented concepts and tie them to their current reality and ability level. For example, students who struggle with emergent literacy skills may understand how to rhyme, blend, and segment sounds on an inconsistent basis, but they are able to memorize words. Splinter skills, such as the ability to rhyme, segment phonemes, or blend phonemes, paired with a strong visual memory, create the illusion

that students with disabilities are emergent readers because they have constructed knowledge from the lessons provided. These coping strategies, along with the ability to construct their own learning reality, allow these students to appear to be fluent readers until the provided texts increase in length and complexity. Piaget's constructivism theory allows struggling students with reading disabilities to organize, structure, and restructure the lessons provided by educators to overcome their limitations and become fluent readers.

Disability Overview - ODE

According to the Ohio Department of Education Operating Standards (2021), a group of educated professionals, such as a school psychologist, occupational therapist, speech language pathologist, and physical therapist, works to identify students who have disabilities. The team meets to determine if the student qualifies and what services the student qualifies for based upon their limitations. Students are able to qualify for special education services under 13 disability categories (Ohio Department of Education, 2020):

- specific learning disability
- other health impairment
- speech and language
- Autism
- intellectual disability
- emotional disturbance
- multiple disabilities
- developmental delay
- hearing impairment

- orthopedic impairment
- traumatic brain injury
- vision
- deaf-blind (para. 3)

Learning Disabilities / Reading Disabilities

> The Ohio Department of Education (2020) defines specific learning disabilities as:
>
> …a disorder in one or more of the basic psychological processes involved in understanding or using language spoken or written, that may manifest itself in the imperfect ability to listen, think, speak, read, write, spell, or do mathematical calculations, including conditions such as perceptual disabilities, brain injury, minimal brain dysfunction, dyslexia and developmental aphasia. (para. 3)

Specific learning disabilities comprise the largest percentage of students who receive special education in Ohio, making up over 36% of the total number of students who are on Individualized Educational Programs (Ohio Department of Education, 2020).

Speech Disorders

"Childhood apraxia of speech (CAS) is a neurological pediatric speech sound disorder in which the precision and consistency of movements underlying speech are impaired in the absence of neuromuscular deficits (e.g., abnormal reflexes, abnormal tone)" (American Speech-Language-Hearing Association, 2021, p. 1). According to the American Speech-Language-Hearing Association, the term speech sound disorders is an umbrella term referring to any disorder or combination of disorders pertaining to the perception, motor production, or phonological representation for speech segments,

including phonotactic rules governing permissible speech sound sequences in language.

According to the American Speech-Language-Hearing Association (2021), speech sound disorders have two classifications, functional and organic. While organic disorders have a known cause (e.g., neurological, structural), the etiology of functional speech sound disorders remains a mystery. The functional speech sound disorders can either be classified as articulation, which relates to the motor aspects of speech or as phonology, which relates to the linguistic aspects of speech. Articulation disorders demonstrate errors, such as sound distortions and sound omissions (American Speech-Language-Hearing Association, 2021). These distortions or substitutions are exclusive to the sounds in error as compared to phonological disorders. Students who present with phonological disorders demonstrate predictable, rule-based speech errors, such as fronting or final consonant deletion. While phonological disorder errors are more predictable, they are often more severe due to the widespread error patterns demonstrated in disorder speech and/or reading.

Speech and Language

Speech relates to how people say words and sounds, while language is the combination of the words people use to communicate with one another (American Speech-Language-Hearing Association, 2021). Language is composed of phonology, morphology, syntax, semantics, and pragmatics (American Speech-Language-Hearing Association, 2021). Language includes the meaning of words, how to create new words using suffixes and prefixes, grammar, and social language that determines how communicative messages are received (American Speech-Language-Hearing Association, 2021). Receptive language is comprehension and how students understand

what is being said (American Speech-Language-Hearing Association, 2021). Expressive language is the language that students produce, including their word usage and grammatical features (American Speech-Language-Hearing Association, 2021).

Students may have trouble with speech because they may struggle to pronounce different sounds and words. Students may have difficulty with their language because they have deficits in their receptive language and/or expressive language. Both of these skills, and many others, are addressed by speech language pathologists.

Speech, Language, and Writing

Speaking, writing, and reading require mastery of specific language domains. Reading requires skill mastery in word recognition and reading comprehension, which utilize different language domains and skills (Al Otaiba et al., 2009). Word recognition requires skill mastery in phonology and semantics, while reading comprehension requires mastery in morphology, syntax, semantics, and pragmatics (Al Otaiba et al., 2009).

Similar to reading skills, the skills required to be a successful writer include the writing process, the writing product, and spelling. All of these skills require mastery of different language-based domains (Al Otaiba et al., 2009). The writing process requires a student to have foundational skills in semantics and pragmatics, and the writing product requires students to have mastery of skills in all language domains (Al Otaiba et al., 2009).

Similar to the writing process, spoken language directly affects reading and writing because the language domains of phonology, morphology, syntax, semantics, and pragmatics are required to be a successful writer and speaker (Al Otaiba et al., 2009). Without a strong command of skills in each language domain, students are unable to

further develop their writing products.

Speech Developmental Stages and Literacy Norms

In clinical and educational settings, play is often discussed as the work for children. Language skills are developed through play skills and language scaffolding opportunities are created within the environment. Language is broken into two separate domains, receptive language and expressive language. Receptive language is known as language comprehension. These are listening skills that allow children to understand the language, such as following directions and concept knowledge. Expressive language is language output. Expressive language is used to communicate wants and needs across environments (Zimmerman et al., 2008).

Birth to Five Months. Language development begins at birth and advances as a child ages. From birth to five months, receptive language is developed by the acknowledgement of people and sounds. A baby begins this journey by glancing at a person talking to them, enjoying a caregiver's attention, and reacting to sounds in an environment (Zimmerman et al., 2008). As the baby reaches about five months of age, they should be able to turn their head to locate a source of sound as well as respond to a new sound (Zimmerman et al., 2008). Expressively from birth to five months of age, a baby will begin to produce soft sounds that originate in the throat as well as vary their pitch, length, and volume of their cries (Zimmerman et al., 2008).

Six to Eleven Months. As a baby's receptive language skills begin to strengthen around six months of age, they reach a new stage of development spanning from six months to eleven months of age. During this period of development, the baby begins to acquire new skills such as actively searching to find a person who is talking, mouthing objects in their

environment, shaking and banging items in play, and anticipating what will happen next (Zimmerman et al., 2008). In addition to these newly developed skills, babies will begin to develop object permanence by looking for items that have fallen out of sight (Zimmerman et al., 2008). Children in this age range will also begin to understand gestural cues paired with words (Zimmerman et al., 2008). When a caregiver extends their hands and says "come here," a child with typically-developing language will understand this cue and attempt to respond appropriately. A baby's receptive language skills are expected to develop simultaneously with their expressive language skills. During this period of development, a baby will begin to smile when they are spoken to, create vocalizations to express pleasure and displeasure, vocalize while moving their arms and legs, protest with both gestures and vocalizations, and begin to imitate the facial expressions of others (Zimmerman et al., 2008).

Twelve to Sixteen Months. A baby's first birthday is an exciting milestone that also marks another six-month period of crucial language development. From twelve months to sixteen months of age, a child's receptive and expressive language skills begin to take off. Receptively, a child will begin to stop an activity when their name is called (Zimmerman et al., 2008). According to Zimmerman et al. (2008), they will also begin understanding common objects in their environments (Zimmerman et al., 2008) evidenced by a child's ability to look at objects that their caregivers point to and name. During this developmental period, children also begin to understand specific words or phrases without the use of gestural cues (Zimmerman et al., 2008). While these receptive skills are strengthened, their expressive skills are developing as well. Zimmerman et al. (2008) share that following a child's first birthday, they will begin seeking attention from

others, vocalizing at least two different vowel sounds, and combining sounds, which quickly leads to babbling (e.g., vowel-vowel, consonant-vowel, or vowel-consonant). As a baby is able to combine sounds, they will begin to be interested in communicating back and forth with their caregivers resulting in turn-taking using vocalizations (Zimmerman et al., 2008). The typically-developing child will also begin to play simple games using appropriate eye contact to initiate, modulate, and terminate an interaction (Zimmerman et al., 2008).

Seventeen to Twenty-Three Months. During the next developmental period from eighteen months to twenty-three months, play skills begin to emerge, and receptive language skills are strengthened as a result. At this stage, children also begin to establish functional play, relational play, and self-directed play (Zimmerman et al., 2008). Functional play is demonstrated when a child is able to use objects appropriately; relational play is demonstrated when a child is able to use two items together in a play scheme; and self- directed play is when a child uses an item towards themselves, such as pretending to feed themself or combing their own hair (Zimmerman et al., 2008). Each play skill continues to build a solid foundation for language development. In terms of expressive language, once babbling is mastered, the baby will produce its very first word around twelve months of age and will begin combining different consonant sounds (e.g., b, d, m, n, p). Throughout this developmental period, the use of representational gestures emerge including waving hi/bye and clapping hands (Zimmerman et al., 2008).

Two Years and Beyond. As the child's second birthday approaches, they begin to have a stronger understanding of items in their environment and are able to identify items from a group, follow familiar routines with gestural cues, identify photographs of familiar

objects, and follow basic commands with the use of gestural cues (Zimmerman et al., 2008). These skills are often more manageable when children are in their own homes with their caregivers because they often rely on context to complete some of these tasks. A child's strong receptive language skills continue to allow their expressive language skills to advance. By age two, children are able to produce syllable strings with inflection that is similar to adult speech. Children in this age group are also able to begin playing with another person for at least one minute while using appropriate eye contact, imitating words, and producing a variety of consonant-vowel combinations (Zimmerman et al., 2008), thus further expanding their vocabulary.

In the later part of year two, children begin to identify body parts and clothing items outside of nursery rhymes and songs, as well as increase their play skills in many other ways (Zimmerman et al., 2008). Pretend play emerges at this age, and children are able to begin to understand the verbs eat, drink, and sleep in context (Zimmerman et al., 2008). By this point, children will be able to utilize at least five words functionally (Zimmerman et al., 2008). With this increase in expressive language, children will also be able to initiate a turn-taking game, use both gestures and vocalizations to request, and demonstrate joint attention (Zimmerman et al., 2008). Joint attention is an expressive language based in play where children are able to look at an item they are playing with and then shift their gaze and attention back to their communication partner to share a moment before returning their gaze and attention back to their toy or game.

By the time a child turns three years of age, they will begin to understand pronouns (e.g., me, my, your), follow commands without the use of gestural cues, recognize action in pictures, and understand the use of objects (Zimmerman et al., 2008).

Additionally, children at this developmental stage will also begin to engage in symbolic play (Zimmerman et al., 2008). Symbolic play refers to a child's ability to pretend an object is something that it is not. This may look like a child pretending a block is a cup for use at a tea party because a teacup is not available for use. Expressively, a three-year-old child will begin naming objects seen in pictures, using words more often than gestures to communicate, and using words for a variety of pragmatic functions (Zimmerman et al., 2008). By age three, a child should be using words to express at least five pragmatic functions, such as requesting objects, labeling objects and actions, requesting repetition, requesting assistance, answering yes/no questions, and using words to get attention (Zimmerman et al., 2008). In addition to the aforementioned pragmatic functions, children at this developmental stage should be utilizing at least three different word combinations such noun/pronoun + verb, verb + noun/pronoun, noun/pronoun + verb + location, noun/pronoun + verb + adjective (Zimmerman et al., 2008).

In the latter half of year three, children will begin to increase their concept knowledge and understand spatial concepts such as in, on, out of, and off without the use of gestural cues (Zimmerman et al., 2008). According to Zimmerman et al. (2008), children will also begin to understand quantitative concepts such as one, some, rest, and all. With this increase in concept knowledge, their ability to create inferences increases (Zimmerman et al., 2008). Due to a child's increased receptive language skills, they begin to name more items from pictures, combine three-, four-, and five-word phrases during spontaneous speech, and use a variety of nouns, modifiers, and pronouns in their spontaneous speech (Zimmerman et al., 2008). This is a critical year in development, and children will begin determining if words rhyme (Robertson & Salter, 2007).

As a child turns four and has years of language exposure, their ability to understand analogies and negatives in sentences emerges (Zimmerman et al., 2008). This is also a time of academic growth where children begin identifying colors and sentences with post-noun elaboration (e.g., point to the black puppy that is eating) (Zimmerman et al., 2008). Concept knowledge continues to develop as well. Children understand more spatial concepts (e.g., under, in, behind, next to, in front of), demonstrate understanding of more pronouns (e.g., his, her, he, she, they), and understand quantitative concepts (e.g., more, most). From an expressive language progression, a four-year-old will begin to understand grammar and use present progressives (i.e., verb + -ing) and plurals (Zimmerman et al., 2008). In addition to grammar, a child present in this developmental stage will begin to answer "wh" questions starting with what and where, as well as being able to name described objects, answer questions using logic, and use possessives (Zimmerman et al., 2008). Vocabulary knowledge continues to strengthen, and children are able to identify more objects and concepts depicted in photos, as compared to pictures of actual objects (Newcomer & Hammill, 2019). In addition to vocabulary knowledge, children will begin to produce rhyming words when provided with a target word (Robertson & Salter, 2007), thus expanding on the three-year-old skill of discriminating between words to determine if they rhyme or not.

A five-year-old child continues to develop their concept knowledge that was introduced during their fourth year of life. During this year of development, a large shift is noted expressively. Receptively, children are able to point to letters, identify advanced body parts (e.g., elbow, eyelashes, wrist), and demonstrate understanding of quantities. Zimmerman et al. note that expressively, a five-year-old child will be able to:

- describe how an item is used
- answer questions about hypothetical events
- use prepositions (e.g., in, on, under)
- use possessive pronouns
- name categories
- complete analogies
- form questions that are grammatically correct (pp.15 -17)

From a preliterate perspective, phonological awareness skills begin to strengthen at this age. For example, a five-year-old should be able to consistently produce rhyming words and identify if words do or do not rhyme (Roberson & Salter, 2007). In addition to rhyming, segmentation of sounds will be introduced but not yet mastered (Robertson & Salter, 2007). Blending will also emerge during this time (Robertson & Salter, 2007). Blending is an auditory task where a child is asked to listen to a word presented in a segmented manner. The child will then listen to the word presented and blend it into a real word.

By age six, a child will be able to understand the following: complex sentences, modified nouns, qualitative concepts (e.g., biggest, smallest), and additional quantitative concepts (e.g., each, every) (Zimmerman et al., 2008). In addition to these receptive language concepts, the child will be able to demonstrate emergent literacy through book-handling and through concepts such as showing a page or pointing out words (Zimmerman et al., 2008). Expressively, letter naming occurs during this age, as well as using phrases with modified nouns, responding to ‘why’ questions, repairing semantic absurdities, and using -er to indicate who does a job (Zimmerman et al., 2008). The

ability to explain how items are alike, in addition to the ability to verbally define words and concepts, will also develop during this stage (Newcomer & Hammill, 2019). Children will begin to imitate sentences of increased length and complexity, which strengthens their working memory skills (Newcomer & Hammill, 2019).

Knowledge of grammar will also increase during this year of life. Children will be able to utilize more grammatically correct sentences using a variety of word tenses (Newcomer & Hammill, 2019). The ability to segment sounds is one example of an additional emergent literacy skill present at this stage (Robertson & Salter, 2007). Segmenting sounds involves a child breaking apart each sound in a word by naming the sound rather than the letter (e.g., sounding out d-o-g rather than saying the letters d, o, and g). The ability to segment allows a child to isolate phonemes in all word positions. Phoneme isolation occurs when a child is asked to identify the first sound in a word, the middle sound in a word, or the last sound in a word (Robertson & Salter, 2007). This mental manipulation skill is vital for later developing literacy skills, and it allows children to have a firm grasp of phonemes within a word. Through the use of mental phoneme manipulation, children will begin to understand phoneme and syllable deletion (Robertson & Salter, 2007). Phoneme and syllable deletion allow a child to manipulate a word by removing one of its parts (i.e., syllables) or one of its sounds (i.e., phonemes). This is another phonological awareness task that is vital for reading and writing development (Robertson & Salter, 2007).

At age seven, children will gain a greater understanding of time-based concepts and sequencing, as well as develop a variety of receptive literacy skills. A seven-year-old will be able to recall story details, identify story sequence, identify the main idea, make

inferences regarding a story, make story predictions, and identify pictures that do not belong (Zimmerman et al., 2008). Additionally, children will be able to follow multi-step directions, understand false beliefs, make grammatical judgements, identify what does not belong in a category, and begin to understand prefixes (Zimmerman et al., 2008). Expressively, a large growth in working memory occurs. Zimmerman et al. share that children will be able to:

- complete similes
- repeat nonsense words
- repeat sentences
- retell stories
- retell stories with four events
- retell stories with logical conclusions
- use synonyms
- use irregular plurals
- use past tense words
- describe similarities
- increase their knowledge of quantitative concepts (e.g., empty, more)
- use time concepts (e.g., late, before) (pp. 21-25)

As a child progresses from ages seven to nine, phonological awareness grows in importance, and they begin to learn a variety of skills. Emerging in this group of skills is phoneme substitution, which strengthens from ages seven to nine (Robertson & Salter, 2007). These tasks include taking a CVC word, removing a sound, and then adding a sound in its place to create a new word. For example, a child may be asked to manipulate

the word rip and make it rap by changing out the middle manipulative. As phonological awareness skills increase and strengthen, children will begin decoding words. Decoding words appear in a variety of syllable shapes and are based upon the foundations learned in phonological awareness tasks (Robertson & Salter, 2007). Decoding patterns can include VC words, CVC words, consonant digraphs, consonant blends, vowel digraphs, r-controlled vowels, CVCe words, and diphthongs (Robertson & Salter, 2007).

Speech Pathologist Preparation, Knowledge, Sub-Par Interventions

Speech language pathologists (SLPs) have a large scope of practice and undergo intense training to service a variety of populations. While the "speech teacher" in a local school district is the building expert when it comes to speech sound disorders, this professional has also spent the majority of their training focusing on many different areas in the scope of practice for an SLP. According to the American Speech-Language-Hearing Association (2021), SLPs address speech sound disorders, fluency (e.g., stuttering), language disorders, reading disorders, social communication disorders, cognitive-communication disorders, swallowing disorders (e.g., dysphagia), aural rehabilitation for deaf and hard of hearing, augmentative alternative communication, voice, accent modification, and other forms of communication enhancement. Graduate programs provide future SLPs with opportunities to grow and treat patients in each area; however, with a large scope of practice, these professionals are unable to become experts in each area within the short two and a half years of provided education. On-the-job learning paired with continuing education is required to enhance specific skills in the field of speech pathology. In order to retain their license with the Ohio Board of Speech Language Pathology, SLPs participate in 24 hours of continuing education every two

years; however, with limited funding provided by school districts and limited understanding of the profession from administrators, SLPs often opt for cost-effective options that may not directly enhance their learning and ability to service their students' unique needs.

Graham et al. (2020) provide readers with information regarding a comparison of writing abilities between typically-developing children and children with documented language impairments. The researchers aim to discover if there is a correlation between oral language and writing, as well as the consequences of language disorders and their manifestations in students' written language. The authors propose that children with language impairments often struggle with a variety of areas of writing due to their underlying difficulty with language.

Writing deficits and the correlation to language are explained in detail throughout the article. Graham et al. (2020) share that oftentimes students who struggle with vocabulary knowledge will produce less words when writing, which implies that a child's vocabulary has a strong influence on the amount of writing they produce. A child's vocabulary is not the only predictor of their written language abilities. Graham et al. also discuss the importance of other language domains, such as pragmatics, phonology, and morphology, as they pertain to written text. If a child struggles with pragmatic language or social language, how a child's written message is received by readers may be impacted (Graham et al., 2020). Phonology often affects the spelling errors in students' writing, and morphology often affects the tense that students choose when writing (Graham et al., 2020). Based upon these language domains and their implications on writing, it can be assumed that students require intact language to demonstrate adequate writing skills.

Graham et al. (2020) created a body of work to determine if these implications were valid.

The literature review produced by the authors is comprehensive and well synthesized. Graham et al. (2020) have a command of the current literature and were able to integrate authors from other fields of research such as the authors presented in the appendix. The literature review provides readers with an understanding that the current literature is limited and does not provide direct evidence that oral language and writing are correlated. This reveals a substantial knowledge gap. Graham et al. provide readers with the background knowledge to understand that writing is not only a language task but also a motor-based activity. The researchers provide strong information reflecting the notion that they are not concerned with the fine-motor skills required for writing, but the implications and connections associated with working memory and overall language skills are their focus.

Graham et al. (2020) utilize a robust theory section that correlates with their research question to help readers process the complex theories discussed. Multiple theories are woven into this body of work to explain learning difficulties that students with language disorders may encounter. These difficulties may include, but are not limited to, processing deficits, vocabulary limitations, grammatical errors, and deficits in semantics. Graham et al. utilize systematic reviews and a meta-analysis in their study to provide readers with a wealth of knowledge and applicable information on the given topic.

Following the theory section, Graham et al.'s (2020) methodology section discusses the differences between assessments. They share that norm-referenced

assessments often differ in scores from assessments that researchers design. While the authors have an adequate understanding of assessments and the diverse scores that they yield, they do not have appropriate inclusions and exclusions of participants for their study. Graham et al. leave a large gap in the outcomes of their study due to a gap in reporting. Graham et al. studied both preschool students who had typically developing language and preschool students who were classified as having a specific language impairment. The researchers discovered that students who have speech and language impairments demonstrate decreased writing outcomes as compared to their typically developing peers. The authors did not disclose the participants' race, gender, or socioeconomic status in detail to contribute to their overall findings. It can be assumed that these aforementioned factors often have their own implications and provide a greater depth of knowledge regarding the new information collected. While the authors' overall approach is appropriate in the techniques and application, this large gap in information may lead to a greater understanding for clinicians and educators alike.

Examining these gaps in the study conducted by Graham et al. (2020) is the priority of this body of work. Graham et al. found that students who were classified as having a specific language impairment scored almost a full standard deviation lower than their typically developing peers on a writing assessment. These assumptions support the research question and confirm that students who suffer from a language disorder score lower than typically developing students in the domain of writing.

Due to the lack of information regarding students' gender, race, and socioeconomic status, the gap in research cannot be fully closed until this is further explored, which is a focus in this study. The aim of the current study is to identify

whether race, gender, and socioeconomic status influence the writing outcomes for students with speech and language disorders, as well as typically developing students. Since Graham et al.'s (2020) article was published, there have been further developments in this area of research. The American Speech-Language-Hearing Association (ASHA) places written language directly in the scope of speech language pathologists. ASHA (2021) qualifies language-based disorders as deficits in written expression with or without deficits present in speaking, listening, or reading. As a professional organization, ASHA dictates the practice of speech language pathologists and clearly states that speech language pathologists have the skills and knowledge to provide intervention for individuals with reading, spelling, and writing deficits.

Pavelko et al. (2017) describe the importance of providing intervention for students with speech and language disorders and the adverse effects that can be seen in written language. Difficulties with spoken language and writing not only affect a person's academic outcomes, but also have long-lasting negative effects on vocational success and social-emotional health (Pavelko et al., 2017), thus demonstrating the overall importance of reading and writing in today's society.

The emergent literacy skills are present in four broad areas including: phonological awareness, alphabet knowledge, emergent writing, and overall print knowledge (Pavelko et al., 2017). Pavelko et al. remind readers about the emergent literacy theory and its role in oral and written language. The emergent literacy theory suggests that children who excel in speaking and listening skills will also excel when faced with early reading and writing tasks as compared to children who suffer from a language impairment (Pavelko, 2017). Children who have a language impairment

struggle in all domains: speaking, listening, and early reading and writing tasks (Pavelko, 2017). Earlier research by Gilliam and Johnson (1992) provided the scaffolding for the emergent literacy theory suggesting that children with diagnosed language impairments consistently demonstrate reduced skills in phonological awareness, print concepts, and alphabet knowledge when compared to their typically developing peers. In addition to reduced emergent literacy skills, children with language impairments demonstrate a decrease in skills in sentence composition, as well as encoding skills, when compared to their same-aged typically developing peers (Koutsoftas, 2015).

The emergent literacy theory has been identified and confirmed as a key predictor for later literacy outcomes (National Early Literacy Panel, 2008), which greatly explains why children who struggle with oral language concepts are struggling writers and readers as they age (Pavelko et al., 2017). Literacy development is a complex process that has been explored for many years. A variety of studies suggest that typically developing children are able to complete writing tasks by preschool age, and there is a typical sequence that children advance through as they begin to acquire writing and prewriting skills (Pavelko et al., 2017). Through the same bodies of work, connections are made that children with language impairments demonstrate difficulties with emergent writing as early as four years of age when compared to their typically developing peers (Pavelko et al., 2017). Additionally, Pavelko et al. establish that children with speech and language impairments follow the same developmental scope and sequence as their typically developing peers when it comes to reading and writing. A major difference between these two populations of children is the rate and accuracy at which the emergent literacy skills are acquired (Pavelko et al., 2017).

An advanced and primary form of emergent writing is name writing (Pavelko et al., 2017). Phonological awareness, alphabet knowledge, print knowledge, and letter writing are all necessary skills that are required for name writing. Deficits in these individual areas and deficits in name writing are often markers of a deeper issue and require further diagnostic information (Pavelko et al., 2017). Although phonological awareness, alphabet knowledge, print knowledge, and letter writing are all necessary components for name writing, Cabell et al. (2009) determined that print knowledge did not explain the variable skills in name writing for children who demonstrated language deficits. These findings from Cabell et al. shared that print knowledge was not a major contributing factor for later literacy skills. Cabell et al. demonstrated that alphabet knowledge, phonological awareness, and name writing were the strongest predictors for decoding, reading comprehension, and encoding. In an effort to support preschool-age children in long-term literacy outcomes, Pavelko et al. provided the following strategies to increase favorable outcomes:

- preschool-aged students should be frequently exposed to various types of print;
- writing should be facilitated in an enjoyable manner;
- opportunities should be provided for children to observe adults reading and writing;
- a variety of materials should be utilized during reading and writing exposure and practice;
- and children's interests should be met during writing practices. (p.684)

As preschool children age and become school-aged, writing intervention and exposure should be geared towards applicable writing tasks that they may be exposed to in school

(Richards, 2015). The use of applicable writing tasks increases overall learning and generalization of skills (Richards, 2015).

Due to the underlying language component involved in reading and writing, speech language pathologists need to continue to identify and treat individuals with encoding and decoding difficulties (Richards, 2015). ASHA (2021) recognizes speech language pathologists as literacy experts, and these professionals should be utilized as such in all rehabilitation and academic settings.

Summary

Students with language disorders greatly struggle with reading and writing due to their weak foundation in language. Early philosophers such as Vygotsky and Piaget expressed progressive ideals in the area of special education and the treatment of students with physical and cognitive disabilities. The Ohio Department of Education works to put support in place for students who are struggling through the use of an IEP; however, their good intentions often fail based upon limited support and educator knowledge. The importance of skilled intervention for students with documented disabilities continues to grow.

Chapter 3

Methodology

The current investigation synthesizes the existing research findings to assess the effect of speech and language disorders on writing skills. Specifically, this study addresses the following research questions:

1. What is the effect of speech and language disorders on writing?
2. Are there differences in the writing of children classified with speech and language impairments and their same-aged peers?
3. Are there differences in the writing of children classified with speech and language impairments and peers of the same language abilities?
4. Are effects moderated by:
    a. the child's age, grade, race, gender, reported SES, identified disability (i.e., RLP, ELP, or SP)?
    b. the included test type, assessment norming, peer-review status of the study, or publication location (i.e., domestic, international)?

Sample of Studies

Studies included in this meta-analysis were collected through exhaustive searches. A variety of electronic databases were searched over the course of a month with numerous studies also being ordered through Youngstown State University's Maag Library and Akron Children's Hospital Library. Databases including Digital Dissertations, Educational Resources Information Center (ERIC), EBSCO, Electronic Journal Center (EJC), Google Scholar, and JSTOR are utilized in this analysis. This search examines research spanning from 2011 to 2021. The descriptive search criteria

employed to identify relevant materials included such combinations as speech sound disorders, encoding and decoding, encoding development, emergent literacy, as well as each of these criteria with the addition of gender, race, and socioeconomic status. Abstracts of articles were reviewed and evaluated. Articles that did not meet the initial inclusion criteria were removed. The inclusion criteria included:

- articles containing students with speech sound disorder and writing disorders;
- articles examining the implication of language disorders and emergent literacy skills; and
- articles examining outcomes for students who receive speech and language intervention to address their deficits.

Studies published prior to 2011 were excluded from the study; however, studies that include literacy data prior to 2011 were included.

Graham et al. (2020) concludes that further research must be done in the area of students with language disorders and writing. Graham et al.'s findings indicate that future studies need to more precisely define the type of language disorders of the participants. The relevant literature that is electronically available was printed, and other relevant sources were ordered through the Youngstown State University and Kent State University library systems. Next, the reference list of each relevant article was searched to find any additional publications that would fit the search criteria and assist in making the search exhaustive of past and current literature. More than 60 studies were identified by these methods and were examined for possible inclusion in this meta-analysis. A number of studies initially appeared to fit the search criteria for inclusion in this meta-analysis, but a careful review demonstrated that some studies did not meet the criteria

included in the search criteria.

Studies that failed to provide the necessary information, including student writing assessments, were excluded from the meta-analysis. These search and review procedures aimed to produce one usable study with approximately a $n = 277$ number of effect size estimates.

Data Analytical Method

Meta-analysis synthesizes the results from multiple studies, across multiple locations, from applications of a research project. To conduct a meta-analysis, the researcher finds all relevant research for potential inclusion in the investigation. These research studies must provide a quantitative outcome measure of interest and potential moderators for inclusion. Once studies have been determined to be appropriate for inclusion into the meta-analysis, the researcher extracts the usable data for analysis. Coding moderator variables is the first step in preparing the data for analysis. For the current study, each study was coded according to the following information: (a) disability status, (b) age of the child, (c) type of writing activity presented, (d) child socioeconomic status, (e) race of the child, (f) gender of the child, and (g) location of the study.

Disability Status (a)

The first study characteristic indicates if the child has a speech and language disorder. Categories for this variable include: a speech sound disorder, a motor speech disorder, a receptive language disorder, an expressive language disorder, or a mixed receptive-expressive language disorder.

Age of the Child (b)

The second study characteristic focuses on the age of the child. The ages or grade levels of the children were reported.

Type of Writing Activity Presented (c)

Students are presented with a variety of writing tasks including norm-referenced spelling tests, narratives, an expository, norm-referenced measures of narrative writing, handwriting, and norm-referenced tests of grammar.

Socioeconomic Status of the Child (d)

Socioeconomic status is the fourth study characteristic and is reported as the information is available. The information reported is coded as yes, socioeconomic status was reported, or no, the socioeconomic status was not reported.

Race of the Child (e)

The fifth study characteristic uses data regarding the race of the children who participated in the studies. This information is reported as: (1) Caucasian, (2) African American, (3) Hispanic, or (4) other.

Gender of the Child (f)

The sixth study characteristic examines the gender of the children who participated in the study. This information is reported as either (1) male or (2) female, if this information is given.

Location of the Study (g)

The seventh study characteristic examines whether the study took place domestically or internationally, and the information is reported as such.

Dependent Variable

The writing assessments provided by the authors serve as the dependent variable for all studies. To date, the research collected assesses the outcomes of students in the treatment group who have a diagnosed language impairment and students in the control group who are typically developing. A table with all studies considered for inclusion is provided in the Appendix.

Calculation of Effect Sizes

For this meta-analytic study, all statistics from each study were converted to Cohen's *d.* Cohen's *d* statistic is computed by dividing the mean difference between groups by the pooled standard deviation. Cohen's *d* can also be calculated from the value of the *t*-test of the differences between group means (Cohen, 1988). Once effect sizes are calculated for each study, the overall effect size measure for all the studies combined can be calculated. The overall effect size measure for all studies can be determined by calculating the mean of the individual effect size measures (Glass et al., 1981). Field (2018) suggests guidelines for interpreting effect size measures and indicates that a large effect size is one that is greater than 0.5; a medium effect size is at least 0.3; and a small effect size is less than 0.1.

Chapter 4

Results

The current investigation examines the impact of language impairments on learning disabilities in writing for K-12 students relative to their peers. This meta-analytic investigation of the existing data will answer the following questions:

1. What is the effect of speech and language disorders on writing?
2. Are there differences in the writing of children classified with speech and language impairments and their same-aged peers?
3. Are there differences in the writing of children classified with speech and language impairments and peers of the same language abilities?
4. Are effects moderated by:
    a. the child's age, grade, race, gender, reported SES, identified disability (i.e., RLP, ELP, or SP)?
    b. the included test type, assessment norming, peer-review status of the study, or publication location (i.e., domestic, international)?

This study replicates Graham et al.'s (2020) study. However, unlike Graham et al., all of the extant research studies included in the current investigation directly compared students who identified with speech and language impairments with their typical peers. Data and variables not considered by Graham et al. were also included. This chapter presents the results based on each of the stated research questions followed by a summary of the results.

Data Collection

Data was collected from existing research that compared the performance of

students with speech and language impairments and their peers on writing-type assessments. The collection of existing research resulted in a total sample of thirty-four studies resulting in $n = 278$ effect size measures. The resulting sample of participant data includes $n = 10942$ students identified with speech and language impairments and $n = 25077$ students without identified speech and language impairments.

Data were analyzed using *Comprehensive Meta-Analysis*. This is a software that is dedicated meta-analysis software. The extracted data included the means, standard deviations, and sample size information for the students in each group or pre-existing effect size measures, standard errors, and sample sizes for each group of students. This information was used to compute Hedges *g* effect size estimates for each study. This data was used to calculate weighted and unweighted effect size estimates for all studies and to compute effect size estimates for the moderating variables. The effect size estimates were evaluated based on the guidelines of Field (2013), with $g \approx .1$ considered as small, $g \approx .3$ deemed to be moderate, and $g \approx .5$ considered to be a large effect size estimate.

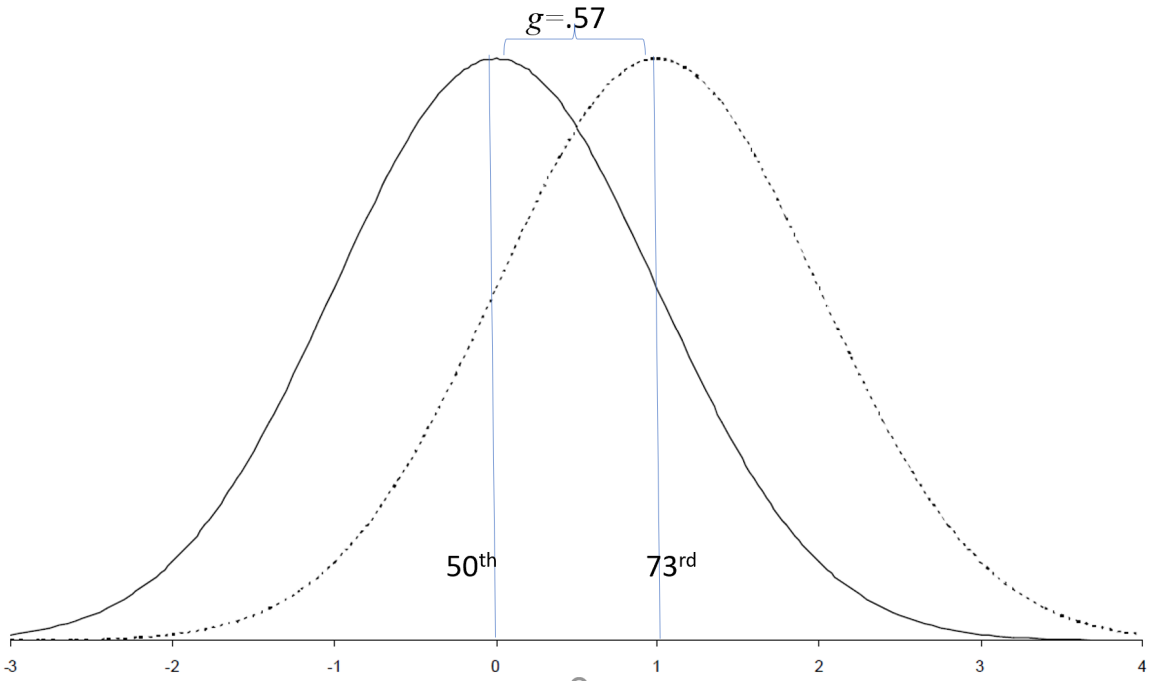
Research Question One

What is the effect of speech and language disorders on writing?

The current investigation's overarching effect size estimate is $g = .57$ based on a weighted estimate of the difference between students identified with speech and language impairments and their typical peers. This estimate suggests a significant difference between students identified with speech and language impairments and their peers across the various writing assessments included. Overall, students who do not have speech and language impairments perform better than their peers identified with speech and language impairments. Visually represented, this effect size estimate suggests that if a student identified with a speech and language impairment performs at the 50th percentile, their

same-age peers are performing at the 73rd percentile (Coe, 2002). This result is visually depicted in Figure 1.

Figure 1. *Graphical Depiction of Overall Effect Size Estimate Differences*



As indicated in Figure 1, students with identified speech and language impairments are underperforming their non-identified peers. According to Coe (2002), this effect size estimate is equivalent to at least one grade level.

Research Question Two

Are there differences in the writing of children classified with speech and language impairments and their same-aged peers?

Analysis of the data by the group indicates that the overall average performance of students identified with speech and language impairments is $M = 11.16$ ($sd = 20.82$). In contrast, the average performance of their peers is $M = 14.65$ ($sd = 27.38$). These results are statistically significant differences between the two groups, $t(2) = 6.28$, $p <$

.001. Results for each student group are provided in Table 1.

Table 1

Analysis by Group

Label	Mean	Standard Deviation
Students with Language Impairment	11.16	20.82
Students without Language Impairment	14.65	27.38

Research Question Three

Are there differences in the writing of children classified with speech and language impairments and peers of the same language abilities?

Analysis of the data for those students measured on language ability, results indicate that there is a significant effect size estimate, and therefore a large gap, between students with identified speech and language impairments and their peers, $g = .85$. Additionally, these results indicate that for students who speak English, the effect size difference from their peers is $g = .39$. For students who do not speak English, the differences between students with speech and language impairments relative to their peers' measured ability increase to $g = 1.63$.

Research Question Four

Are effects moderated by:

a. *the child's age, grade, race, gender, reported SES, identified disability (i.e., RLP, ELP, or SP)?*
b. *the included test type, assessment norming, peer-review status of the study, or the study publication location (i.e., domestic or international).*

Analysis for age, gender, grade, race, reported SES, and identified impairment included only those research studies that provided enough data to compute an effect size estimate for each variable. Results indicate no statistically significant differences based on age, gender, race, and reported SES ($p > .05$). This lack of statistical significance may be due to the few studies providing this information.

The identified impairments included RLP, ELP, and SP. Results for these different impairments are provided in Table 2.

Table 2

Effect Size Estimates by Impairment

Impairment	Number Studies	Effect Estimate	Standard Error	Lower Limit	Upper Limit
RLP	180	0.56	0.05	0.46	0.66
ELP	193	0.52	0.05	0.42	0.62
SP	43	0.68	0.07	0.55	0.81

The results suggest a significant difference between the students identified with different speech and language impairments and their peers on the writing assessments ($p < .05$). Table 3 provides an analysis of the effect size estimates across test types.

Table 3

Effect Size Estimates by Test Type

Assessment	Number Studies	Effect Estimate	Standard Error	Lower Limit	Upper Limit
Emergent Writing	7	2.49	0.77	0.98	4.00

Expository	29	0.09	0.23	-0.36	0.53
Informative	42	0.73	0.10	0.54	0.91
Narrative	122	0.35	0.05	0.25	0.44
NR Grammar	1	0.67	0.38	-0.06	1.41
NR Narrative	5	0.99	0.64	-0.26	2.24
NR Spelling	45	1.39	0.27	0.85	1.93
Spelling	26	0.15	0.26	-0.36	0.66

There is a significant difference in the estimated effect size for students identified with speech and language impairments relative to their peers across the different writing assessments, $p > .05$. Specifically, the most significant estimated gap between these students and their peers is with emergent writing ($g = 2.49$), followed by norm-referenced spelling assessments ($g = 1.39$). The smallest estimated gap between these groups is for expository writing ($g = .09$). Emergent writing tasks are considered pre-writing skills. These skills include line drawing and shape copying. Norm- referenced spelling assessments are derived from a closed set of words that act as an inventory from a literacy tool kit administered by educators. The large discrepancy in skill could be related to the language differences present in each group. The children with receptive language impairment would struggle to understand the directives as compared to their typically developing peers. These results differ from the scores collected from expository writing. Expository writing is used to explain or educate the reader. This type of writing assessment may be easier for students with language disorders to perform because they are creating content based upon their prior knowledge and experiences resulting in a

smaller knowledge gap.

Table 4 provides the effect size estimates for normed versus non-normed tests.

Table 4

Effect Size Estimates for Normed and Non-Normed Tests

	Number Studies	Point Estimate	Standard Error	Lower Limit	Upper Limit
Not Normed	226	0.408	0.049	0.312	0.504
Normed	51	1.338	0.252	0.843	1.833

As indicated above, the effect size estimate for the normed tests is significantly higher than the non-normed test. These results show that when measured with a normed assessment, the estimated gap between the students identified with speech and language impairments relative to their peers is significantly larger than the effect size estimate when a non-normed evaluation is used.

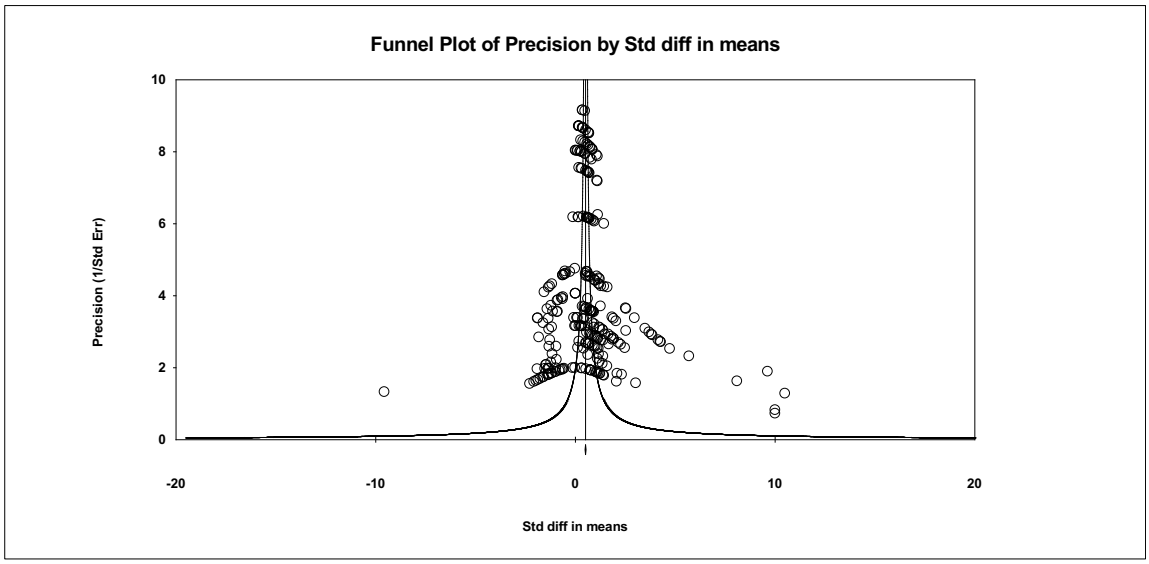
Lastly, the data were examined to assess if there were differences in the reported effect size estimates based on the publication status or location of the research. The results regarding location indicate that domestic studies (g = .417) reveal a smaller effect size estimate when compared to international studies (g = .816). Likewise, published research (g = .650) revealed a larger effect size estimate relative to unpublished studies (e.g., dissertations, thesis) (g = .266). Both revealed statistical differences ($p < .05$).

Publication Bias

Publication Bias was evaluated using Egger's Test of the Intercept (Eggers et al., 2003). Publication bias analyses focus on establishing a balance in the research included in a meta-analytic investigation. Ideally, the balance includes both positive and negative outcomes in the research. Egger suggests that bias should be assessed using precision

(i.e., the inverse of the standard error) to predict the standardized effect (i.e., effect size divided by the standard error). In this equation, the treatment effect size is captured by the slope of the regression line, while the intercept captures bias. This approach has benefits over other approaches in that it is more powerful and can assess the impact of the moderators, the sample size, and the number of studies on the overall treatment outcome (K. H. Larwin, personal communication, March 17, 2022). Results of the Egger's test indicate that the intercept is 0.59, CI_{95} [-0.40165, 1.58745], with $t(275) = 1.173$, and $p = .242$. This non-significant result suggests no statistical difference in the positive versus negative outcomes across the studies based on the number of studies, sample sizes, and moderators. These results are visually depicted in Figure 2.

Figure 2. Results of the Egger's Test for Publication Bias



Summary

This investigation examined the extant research of the impact of speech and language impairments on writing ability. These results provide strong evidence that

students identified with speech and language impairments are underperforming compared to their same-aged peers. The results indicate an average gap of 23 percentile points that separates the average performance of the students from the two groups. The most significant effect is found with students of similar language abilities and students who are identified as not speaking English. While no differences were found for the student-level moderators age, gender, grade, race, and reported SES, differences were revealed based on the student's impairment. Likewise, differences were found for the writing assessment, normed and non-normed testing, publication status, and publication location. Lastly, based on the Egger's Test, there is no evidence of publication bias based on the included studies.

Chapter 5

Discussion

This study set forth to develop a greater understanding related to the presence of writing disorders in students with speech and language impairments from a variety of backgrounds. A meta-analysis was conducted based upon the findings and information presented by Graham et al. (2020). Forty-three studies from Graham et al. (2020) were included in the initial collection of information. Three additional studies were utilized to determine if race, gender, socioeconomic status, or global location impacted the students' writing abilities. Upon initial review of the publications listed in the article from Graham et al., all 43 articles were considered for inclusion. In the second review of articles, four articles were excluded due to their limited availability and publishing limitations from their authors or institutions. A final collection of 39 studies were included that provided the necessary data and comparison between students with and without identified speech and language challenges.

First, data were analyzed to determine what effect speech and language disorders have on writing, as emphasized in the first research question. Based upon the calculations conducted, a significant difference was found between the writing performances of students with speech and language impairments as compared to the writing of their typically developing same-aged peers. This data provides strong evidence that students who do not carry a diagnosis of a speech and language impairment perform significantly higher than students who have a speech and language impairment. These results are similar to those produced by Graham et al. (2020). Graham et al. found that statistical significance was present in the writing differences of children classified as having a speech and language impairment (.97), which agreed with the results of the current

investigation (.85). The data directly aligns with the results from Pavelko (2017) and Al Otaiba et al. (2009). They shared that language-impaired children often struggle in all domains including speaking, listening, reading, and writing. According to the work of Al Otaiba et al., the writing process requires students to demonstrate mastery of foundational skills in all facets of language, particularly semantics and pragmatics. These results, rooted in research question one, provide substantial support for research question two.

Data were collected to support research question two to determine if there are differences present in the writing of children classified with speech and language impairments compared to their same-aged peers. According to the data collected and analyzed, there is a statistically significant difference in the writing of children classified with speech and language disorders when compared to their peers of the same age. This analysis directly aligns with the findings from Graham et al. (2020). In the findings from Graham et al., the writing scores of children classified with speech and language impairments were considerably lower than typically developing students when examined collectively.

The current investigation supports the findings of question three. Significant differences for students identified with speech and language disorders relative to their typically developing peers across a variety of writing assessments. Specifically, the most significant estimated gap between these students and their peers is with emergent writing, followed by norm-referenced spelling assessments. The smallest estimated gap between these groups is for expository writing.

Additional data were collected to provide insight for research question four. Three additional studies and data sets were incorporated to provide insight regarding whether effects were moderated by the (a.) the child's age, grade, race, gender, reported SES,

identified disability (i.e., RLP, ELP, or SP) or (b.) the included test type, assessment norming, peer review status of the study or the study publication location (i.e., domestic or international). The additional data concluded that the child's age, race, gender, and reported SES did not have an impact on the child's writing abilities. The limited significance may be in part to the limited data available regarding this population of students. However, there is a significant difference related to the type of impairment present. Students who have a speech sound disorder demonstrate the largest gap in ability as compared to students who carry a diagnosis of receptive language impairment or expressive language impairment. Following students diagnosed with speech sound disorders, students with a receptive language impairment show the second largest gap in writing abilities. These results differ from Al Otaiba et al. (2009) who provided data that suggests students with language impairments show a greater deficit in writing when compared to students who carry the sole diagnosis of speech sound impairment.

The data compares the types of assessments administered to students with and without language impairments present, and a statistically significant difference was noted in student ability. There is the largest gap in ability in emergent reading skills between disabled and non-disabled students. The second largest gap appeared in norm-referenced spelling assessments, and the third largest gap appeared in expository writing.

Additionally, the data provided insight regarding assessment types. Norm-referenced assessments generated the largest difference between the students with language impairments as compared to the students without language impairments. This provides evidence that the administration of non-norm-referenced assessments demonstrates a smaller knowledge gap between the two groups of students.

The data set was also examined to determine if there was a difference present in location of the research categorized as domestic data or international data. The data revealed that studies conducted domestically had smaller variability of results as compared to the international data collected. Studies conducted in the United States demonstrated more consistent results as compared to studies conducted in other countries. Data were analyzed to determine if a difference was present between English-speaking students and students who do not speak English. There is a significant difference and a greater gap in abilities between non-English-speaking students with speech and language disorders as compared to their same-aged peers. These differences could be in part to the use of intervention available in other countries paired with the social constructs created around children with disabilities.

Lastly, publication status was examined and referred to as published or unpublished. The data revealed that published studies yielded a stronger relationship between the correlation of disordered writing in students with language impairments as compared to unpublished studies.

Context and Interpretation

The outcomes of this study pertain to students with underlying language impairments and their ability to write. The current data supports that reading and writing skills are directly affected by a child's overall language abilities. Children with language impairments demonstrate difficulties with emergent writing as early as age four (Pavelko, 2017). This is demonstrated in a variety of areas of phonological awareness. Pavelko (2017) and Cabell et al. (2009) both put a strong emphasis on phonological awareness, alphabet writing, print knowledge, and letter naming when discussing the ability to

develop literacy skills for both encoding and decoding. The strongest predictor for decoding and encoding is rooted in alphabet knowledge, phonological awareness, and name writing (Cabell et al., 2009). The results of the data suggest that these foundational skills should be addressed prior to the facilitation of writing interventions.

This current investigation continues to support a strong correlation between the presence of language impairment in students who struggle with limited writing abilities. The current and existing data support that students who carry a diagnosis of a speech and language impairment demonstrate significantly lower scores in writing (Graham et al., 2020). When comparing the types of writing assessments administered, the largest gap is present in emergent reading skills between students with a speech and language impairment and students without. This gap in achievement is followed by norm-referenced spelling assessments and then expository writing.

In an attempt to address student diversity, additional data were analyzed to include students' race, gender, and socioeconomic status. The additional data analyzed for this investigation did not provide significant evidence that a student's race, gender, or SES plays a role in their overall writing abilities when a language impairment is present. Although the data set was limited, this information places students from all backgrounds on an equal playing field, and they should be educated as equals in their least restrictive environment.

The statistical significance pertaining to the use of norm-referenced assessments was expected due to the nature of norm-referenced assessments. Norm-referenced assessments, such as the Test of Written Expression, are not normed for children with disabilities and are created to determine what "normal" achievement is for typically developing children (Maloney & Larrivee, 2007). This current investigation produced

information that provides clarity pertaining to use of norm-referenced assessments for students with speech and language impairments. The use of norm referenced assessments produces a larger knowledge gap for students with language impairments compared to utilization of non-norm referenced assessments. The use of norm-referenced assessments shows that students who have speech and language impairments demonstrate a more significant deficit in their writing as compared to their peers of the same age. When students are tested with a non-normed referenced assessment, they produce scores closer in nature to their same-aged peers.

Data were utilized to determine if studies conducted domestically produced similar and more consistent results as compared to studies produced internationally. As expected, studies conducted domestically produced smaller variability when compared to international studies. Similar results were true of published and unpublished studies. Expectedly, published studies provided a stronger correlation between students' writing abilities and the presence of language impairments. This is not unexpected, as it is easier to get studies published if they have significant results to present (Hunter & Schmidt, 1990).

Implications

This study aimed to reduplicate and improve the initial investigation conducted by Graham et al. (2020). The data in this study are consistent with the existing data to support that students with language impairments demonstrate poor writing abilities as compared to their typically-developing peers. While there is limited data available pertaining to the gender, race, and SES of students, this study's current findings are inconclusive regarding whether these factors truly play a significant role in the students' abilities and overall development. This study confirms that students who present with

disordered writing and/or decreased writing abilities should be evaluated by a speech language pathologist. The speech and language evaluation, which takes a better look at the different areas of language, will help school personnel to determine if the student has an underlying language disorder that will need to be resolved to see progress in encoding. For example, the Test of Language Development, given by a licensed speech language pathologist, utilizes six subtests: picture vocabulary, relational vocabular, oral vocabulary, syntactic understanding, sentence imitation, and morphological completion. These subtests are then computed into standard scores to determine where a student is struggling in the following areas: listening, organizing, speaking, grammar, semantics, and overall spoken language. The use of this detailed assessment helps practitioners create appropriate student goals.

Additionally, it is imperative that school staff and administrators understand the role and scope of practice of their speech language pathologists. The proper and efficient utilization of a school-based speech language pathologist could produce greater outcomes for students. School administrators should consider utilizing their speech language pathologists in conjunction with their Title I teachers and classroom teachers to provide students with a multi-sensory intervention approach that is both horizontally and vertically aligned to their classrooms, curriculum, and interventions, such as the use of Orton Gillingham and the Wilson Reading System. These interventions can be implemented with fidelity in conjunction with skilled intervention for a speech language pathologist to optimize student growth and development.

The current investigation also provides strong evidence that further teacher education may be required. Teachers need to be able to identify students with potential language impairments that do not manifest with speech sound disorders. In order to

provide an appropriate referral, teachers need to have an understanding of language norms in both written and spoken language paired with a greater understanding of the role of speech language pathology and how it can be utilized in the classroom. Speech language pathologists could be utilized in multiple capacities to assist in student learning, teacher education, and early identification of at-risk students. Administration could utilize their speech language pathologist to provide in-services for teachers on waiver days or at staff meetings. This would allow the speech language pathologist to educate staff on what is typical for student language development and what is atypical, thus providing a springboard for appropriate and timely referrals. Additionally, speech language pathologists could be utilized in the classroom. The ability to run a center or provide whole group instruction, would allow the speech language pathologist to provide skilled intervention to students who are currently identified as well as other struggling students.

Prior to addressing students' needs in the classroom, early intervention is a key factor that is often missing for school-aged students. When a child participates in early intervention, they have the opportunity to make progress prior to entering the educational system and may potentially require lesser intervention as they become school aged. Early intervention leads to the best outcomes for children and provides them with needed skills to participate in the educational environment as well as in the community.

The use of early intervention has the opportunity to give children a chance to remain in general education rather than being identified by the special education department. The reduction of students in the special education system would allow educators more freedom inside and outside of the classroom due to their increased ability to meet the needs of each student. The use of early intervention benefits the children as well as the educational system as a whole. While there can be costs associated with early

intervention, the use of this skilled service has the opportunity to create a long-term cost saving initiative. The resolution of a speech and language impairment may save future costs associated with Title I reading, counseling, tutoring, specialty testing/evaluations, and staffing to fulfill accommodations, thus reducing the greater need and demand on school districts and school personnel. Less students in special education means a small distribution of funds split between students who receive special education. These funds could be utilized to better serve students with more significant disabilities and limitations.

Limitations

This study was designed to analyze the student writing in the presence of speech and language impairments with the additional variables of race, gender, and SES. Since a meta-analysis was utilized, there are limitations to consider when interpreting the results. For example, data are limited to what is available in existing research (Glass et al., 1981). This is evident in the available data regarding the variables of race, gender, and SES. Heterogeneity in meta-analysis can skew data (Glass et al., 1981). This has not likely occurred since the current investigation includes applicable studies from Graham et al. (2020) that were found from an exhaustive review of the literature. Finally, publication bias may impact the available studies for analysis (Glass et al., 1981). The concern about publication bias was examined with the Egger's test, and it was concluded that publication bias was not a concern based on the studies included in this investigation.

Direction for Future Research

Speech and language disorders are a common developmental delay in the state of Ohio based upon the special education data. Prior to students attending school, it is the work of the pediatrician to screen children and make appropriate referrals for early intervention. Future research should be conducted on the practice of working

pediatricians across the state in order to determine if appropriate and timely referrals are being made. Oftentimes, practitioners rely on parent-reporting measures, which do not always demonstrate an accurate picture of their child and their current communication abilities, creating delayed and/or inappropriate referrals. For example, the Modified Checklist for Autism in toddlers (MCHAT), used to screen for Autism, can be distorted by the parents' perception of the child. This could delay the referral to a developmental pediatrician, speech language pathologist, and psychologist. The work of pediatricians is of the utmost importance and has the potential to have a huge impact on children and their access to a skilled diagnostic team.

Once referrals have been placed by the pediatrician, parents are required to pursue speech services by scheduling evaluations, attending appointments, and following therapist recommendations. More research should be conducted regarding the willingness of parents to follow through with pediatrician referrals for speech and language evaluations and therapies for children under the age of five. Future research in this area may also provide researchers with insight regarding family's access to care, which could directly relate to their socioeconomic statuses and cultural belief systems.

Future research should consider following children who are at risk for speech and language disorders from all racial and socioeconomic backgrounds in a longitudinal study. The use of the longitudinal data would allow researchers to understand where the individual differences occur and if there is a need for increased access to healthcare in certain communities or amongst different patient populations. The use of a specific speech and language screener would also be a place for future research. The use of a pediatrician observation list would provide pediatricians with the opportunity to make more timely referrals for early intervention. More research needs to be done to ensure

children of all ages are receiving the speech and language intervention required to be functional readers and writers.

Recommendations for Future Practice

Based upon the findings of the current investigation, speech language pathologists should be consulted early in the special education referral process. Rather than allowing classroom teacher to determine if a speech assessment is warranted, school psychologists should include speech pathologists on the planning form automatically when there is a student concern for reading and writing disorders.

The student profile would allow the speech language pathologist to determine which assessment is warranted. First, the use of a language assessment such as the Test of Language Development- fifth edition (TOLD-5) 5 or the Clinical Evaluation of Language Fundamentals-fifth edition (CELF- 5) allows the speech pathologist to determine if further testing is warranted and in what language domain. If the student is demonstrating in-tact language, the use of the Phonological Awareness Test- 2 (PAT-2) or the Comprehensive Test Of Phonological Processing-2 (CTOPP-2) provides details regarding the student's phonological awareness skills. If there is a discrepancy is scores between the student's language results and phonological awareness testing, it is important to rely on the scores of a school psychologist to determine next steps for qualification and invention plans. While it is not traditional in school systems, a speech language pathologist has the skills to provide evidence-based intervention to address deficits in phonological awareness, which directly impact the student's reading and writing abilities.

Conclusion

Speech and language disorders can go undetected in the educational setting until students demonstrate deficits in reading and writing. Teachers are often alarmed by these

deficits and do not understand why these students are making limited progress despite the interventions that are provided inside the classroom and outside of the classroom in Title I reading.

Speech language pathologists are being utilized inappropriately and are not receiving referrals for students with weak foundational language skills who demonstrate obvious deficits in encoding and decoding. Data from Graham et al. (2020) and the current investigation provide supporting evidence that there are significant writing differences in students with speech and language disorders as compared to their same-aged peers. The late identification by pediatricians and school personnel alike, put these children at greater risks for large educational gaps. The disability category, speech, or language impairment is the only related service category in special education that stands alone on an IEP (Ohio Department of Education, 2020); however, the majority of these students have speech sound disorders, and students with language disorders go undetected.

Evaluating and treating students with speech and language disorders would create improved reading and writing outcomes. These important educational skills have the power to provide improvements in the overall quality of life for many students who struggle with encoding and decoding.

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Appendix

Study	Age (Grade)	Writing Tasks	N	English	RLP	ELP	SP	Other	Gender	Race	SES	Location
Anderson (2010)	6-19	NR-Sp	74	Yes	X	X						Domestic
Bishop & Clarkson (2003)	6-20	Narr, NR-Sp	56	Yes	X	X	X					International
*Bird et al. (1995)	6-21	NR-Sp	62	Yes	X	X			X			International
Brizzolara et al. (2011)	6-22	NR-Sp	48	No	X	X						International
Broc et al. (2013)/ Favart et al. (2016)	7-18	Narr, Spelling	72	No		X			X			International
Connelly et al. (2012)/ Critten et al. (2014)	7-11	NR-Sp, Personal Narr, HW	66	Yes	X	X						International
Conti- Ramsden et al. (2012)/ Durkin et al. (2011)	16-17	NR- Sp, Email	96	Yes	X	X						International
Cordewener et al. (2012)	6-7	NR-Sp, Spelling	98	No				La				International
*Davidi & Berman (2014)	12-13	Informative	20	No				Lb				
de Bree et al. (2009)	8	Spelling	38	No				La				International
Dockrell & Connelly (2013)	7-10	NR-Sp, Informative	46	Yes	X	X						International
*Ferouhi (2006)	9-11	NR-Sp, NR-Narr	40	Yes	X	X						

Fey et al. (2004)/ McCarthy et al. (2012)	(2-4)	Narr	373	Yes	X	X			X	X		Domestic
Goulandris et al. (2000)	14-18	Spelling	50	Yes	X	X	X					International
*Hedberg & Fink (1996)	(1-6)	Narr	56	Yes				La				International
Jacobs (2009)	7-8	NR-Sp	84	Yes	X	X						Domestic
Kim et al. (2015)	grade 1	Narr, skills tests	304	Yes	X	X	X					Domestic
Koutsoftas & Gray (2011)	(4-5)	Narr, Exp, skills tests	56	Yes		X						Domestic
Larkin & Snowling (2008)	(4-5)	Spelling	46	Yes	X	X	X					International
Lawrence (2008)	6-8	Spelling	88	Yes			X					Domestic
*Lewis et al. (1998)	7-14	NR- Sp, NR-Narr	51	Yes			X		X			Domestic
Mackie & Dockrell (2004)	6-12	Narr	22	Yes	X	X						International
Mackie et al. (2013)	7-11	Narr	88	yes	X	X						International
*Magnusson & Naucler (1990)/ Naucler & Magnusson (1999)/ Naucler (2004)	(1, 5, 12)	Spelling	111	No				Lc				International
*McFadden & Gillam (1996)	7-11	Narr	20	Yes		X						Domestic

*Myklebust (1965)	7-17	Narr	636	Yes			X					
Nathan et al. (2004)	4	Sp. Narr	74	Yes			X					International
Overby (2008)	grade 2	NR-Sp	30	Yes			X					Domestic
Puranik & Lonigan (2012)	4-5	Emergent writing	219	Yes	X	X	X		X	X		Domestic
Puranik et al. (2014)	5-6	NR-Sp. Informative	219	Yes	X	X						Domestic
*Reily et al. (2014)	7-16	Narr	134	Yes		X						
Romaglia (2010)	(4-5)	Narr, Exp	16	Yes				La				Domestic
Scott & Windsor (2000)/ Windsor et al. (2000)	7-12	Narr, Exp	55	Yes	X	X					X	Domestic
Scuccimarra et al. (2008)	grade 2	Sp, HW tests	45	No	X	X	X				X	International
Tattersall (2010)	6-18	NR-Sp	111	Yes	X	X						Domestic
Vandewalle et al. (2012)	(2-3)	Spelling	32	No	X	X	X					International
Walz et al. (2000)	grade 5	State test	53, 242	Yes				La				Domestic
Williams et al. (2013)/ Larkin et al. (2013)	6-10	Informative, NR-Sp, NR-Grammar	30	Yes	X	X						International
Wolter et al. (2011)	10	NR-Sp	37	Yes	X	X						Domestic

Pavelko, Lieberman, Schwartz, Hahs- Vaughn, & Nye (2017)									**X**			**Domestic**
Wood (2020)										**X**		**Domestic**
Critten et al. (2014)									**X**	**X**		**Domestic**

Note: Studies with an *asterisk were omitted from the current investigation because their publication dates were too old or due to their limited availability. New studies that will be included are bolded in the table above.

Mar 14, 2022 2:59:00 PM EDT

Karen Larwin
Teacher Ed and Leadership St

Re: Exempt - Initial - 2022-136 The Impact of Language Impairment on Learning Disabilities in Writing for K-12 Students: A Meta-Analytic Investigation

Dear Dr. Karen Larwin:

Youngstown State University Human Subjects Review Board has rendered the decision below for The Impact of Language Impairment on Learning Disabilities in Writing for K-12 Students: A Meta-Analytic Investigation

Decision: Exempt

Selected Category: Category 4. Secondary research for which consent is not required: Secondary research uses of identifiable private information or identifiable biospecimens, if at least one of the following criteria is met:

(i) The identifiable private information or identifiable biospecimens are publicly available;

(ii) Information, which may include information about biospecimens, is recorded by the investigator in such a manner that the identity of the human subjects cannot readily be ascertained directly or through identifiers linked to the subjects, the investigator does not contact the subjects, and the investigator will not re-identify subjects;

(iii) The research involves only information collection and analysis involving the investigator's use of identifiable health information when that use is regulated under 45 CFR parts 160 and 164, subparts A and E, for the purposes of "health care operations" or "research" as those terms are defined at 45 CFR 164.501 or for "public health activities and purposes" as described under 45 CFR 164.512(b); or

(iv) The research is conducted by, or on behalf of, a Federal department or agency using government-generated or government-collected information obtained for nonresearch activities, if the research generates identifiable private information that is or will be maintained on information technology that is subject to and in compliance with section 208(b) of the E-Government Act of 2002, 44 U.S.C. 3501 note, if all of the identifiable private information collected, used, or generated as part of the activity will be maintained in systems of records subject to the Privacy Act of 1974, 5 U.S.C. 552a, and, if applicable, the information used in the research was collected subject to the Paperwork Reduction Act of 1995, 44 U.S.C. 3501 et seq.

Any changes in your research activity should be promptly reported to the Institutional Review Board and may not be initiated without IRB approval except where necessary to eliminate hazard to human subjects. Any unanticipated problems involving risks to subjects should also be promptly
reported to the IRB.

The IRB would like to extend its best wishes to you in the conduct of this study.

Sincerely,
Youngstown State University Human Subjects Review Board