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Instructional Strategies Teachers use to Assist Students with Convergence Insufficiency in Notetaking

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This is to certify that the doctoral dissertation by

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has been found to be complete and satisfactory in all respects,
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MAT, Columbia College of Missouri, 2016

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Dissertation Submitted in Partial Fulfillment

of the Requirements for the Degree of

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Abstract

Two to three students per class suffer from visual-motor deficits such as convergence insufficiency. Though there are treatment plans to assist with the disability over time outside of the school, there are no general inventions set in place in the public school system to assist visual-motor deficit students from systemically falling behind academically each year. The purpose of this study was to explore instructional strategies secondary special education teachers of an inclusive setting use to assist students who struggle with notetaking due to visual or visual-motor deficits known or unknown as convergence insufficiency. Using the universal design for learning theoretical framework promoting differentiated educational practices, the research questions helped explain the engagement of learning, recognition of what was needed for learning, and strategizing tools used by teachers to support visual-motor deficit students in notetaking. Twenty teachers with a background in special education took part in the semistructured interview process. The data were coded and analyzed by using Atlast.ti to categorize and compare analysis. The results showed (a) large print was used most for visual deficits, (b) tactile methods were used most to accommodate traditional writing, (c) teachers had a lack of knowledge of resources to assist students with visual deficits but believe audio inputs would be beneficial, and (d) teachers generally provided a copy of notes for students with notetaking challenges. The study contributes to positive social change by identifying and conceptualizing ways for teachers to manage the impact of visually impaired students being overlooked and falling between the educational gaps which increases the risk of dropout rates and social economic challenges.

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Dedication

I want to thank my parents Franklin Wiggins, Sylvia and Raymond Spears for their endless support and unconditional love. My loving sister Frankie for her dedication and assistance. I thank my siblings, family, and friends for their motivation and ideas. I also want to give a big thanks to my children Ronchael, Alyssia, and Gavin Lambert for their inspiration and encouragement. Most of all, I dedicate this dissertation to God for being all of the characteristics mentioned above plus more. He has truly blessed me throughout this entire journey and continues to allow me to reach my goals. With him, all things are possible.

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Table of Contents

List of Tables

List of Figures

Chapter 1: Introduction to the Study

Primary school is the peak of a student's learning journey (Bower, 2020). But in secondary school, students expand their knowledge surpassing cognitive milestones to transition and explore interest while preparing for more significant career opportunities. In addition, as students reach high school, the capacity to problem solve, use critical thinking skills, analytical thinking skills, and writing skills evolve (Changwong et al., 2018). Therefore, an educator providing optimal learning is crucial to a child thriving academically. However, expectations for students to advance in reading comprehension, writing tasks, and taking notes all require good binocular visual skills. A visual deficit can make the student's learning process more arduous and negatively influence their educational journey (Wood et al., 2018).

A particular form of visual difficulty is called convergence insufficiency (CI). Convergence insufficiency is a driftage of the eye that can have a profound educational effect on a student. CI is a common eye disorder often misdiagnosed within children (Scheiman et al., 2018). CI is also known as strabismus as it is a disruption of the eyes to converge simultaneously (Ge et al., 2020). As a result of strabismus, phoria occurs because there is a misalignment in the vergence of the eye as they try to view and fuse images (Kommerell et al., 2015). When a person's eyes cannot properly fuse inward or outward, this is called binocular fusion. Binocular fusion occurs when the unification of visual depth and perception and eye motor coordination in binocular vision interrupts how a person can view images, text, write, and overall daily activities such as catching a ball. Visual information including how students encode and decode are vital components

of learning. A child must have a healthy vision to support them in their academic success, attention, social development, and overall well-being (Hilton et al., 2019). If there are problems with the visual system, a child may not properly maintain convergence, which can take a toll on their reading demands, writing, spelling, comprehension, processing speed, visual perception skills, and focusing abilities (Holland, 2012).

Though vision therapy techniques assist with the disorder, these interventions are usually available outside of the classroom (Scheiman et al., 2020). Large print and tactile materials such as videos, pictures, and computerized animations are commonly used tools to help students viewed as effective (Koehler & Wild, 2019). But it is unknown what methods teachers are using inside of the school to assist students who may have a visual-motor disorder such as convergence insufficiency, why to use those particular methods, and whether they be adequate to help students with visual-motor integration. My study aimed to determine if instructional methods such as large print and tactile material assist students of the public-school sector in their learning with notetaking.

Background

Vision is a critical component to education as it provides access to reading, writing, and sensory fusion such as depth of perception and visual-motor fusion (von Noorden & Campos, 2002). Good vision also has an association with social well-being and physical activities (Borsting et al., 2016; Willings, n.d.). School systems utilize a standard evaluation tool called a Snellen chart to detect abnormalities in visual acuity to determine students who may have visual impairments (Devarajan & Maheshgowri, 2020). Though testing for visual acuity is significant to determine if assistance is needed

academically, many visual disorders go unnoticed, although the student has good visual acuity (Trieu & Lavrich, 2018). Consequently, students with visual disorders such as convergence insufficiency continue to suffer academically (Scheiman et al., 2018). Several interventions are put in place to help individuals with CI, but these interventions are effective outside of the classroom (Alvarez et al., 2019 & Lazarus, 2020). However, there is a gap in knowledge on the lack of information on how public-school system teachers assist students in the classroom when challenged with visual-motor deficits such as CI in notetaking.

Convergence Insufficiency

CI is a binocular disorder (Scheiman et al., 2020), which is characterized by an outward driftage of an eye causing various symptomatic occurrences that challenge a person's ocular motor abilities and affecting their everyday lives (Ahn, 2021). CI affects more than 17% of people in a general population (Trieu & Lavrich, 2018), and the high school prevalence rate for students who may have CI is 12% per class (Hassan et al., 2018). Students with this disorder typically fall between the educational gaps (Hassan et al., 2018). CI is considered a visual deficit but not generally noted for its motor functioning problems, which cause challenges such as viewing the whiteboard and notetaking to be mutually exclusive (Kurokami et al., 2019; Scheiman et al., 2018).

Instructional Strategies

Instructional strategies are the catalyst of teaching tools to enhance learning (Weston & Cranton, 2016). One of the most commonly used instructional methods in classrooms that focuses on improving student learning and high-level achievement is

Marzano's nine instructional strategies (Almekhlafi et al., 2020). Notetaking skills are an essential concept utilized in Marzano's nine as it supports understanding and comprehension of concepts and the reiteration of material, all through writing (Almekhlafi et al. 2020). The most commonly used instructional strategies for visual impairment are tactile material and large print (Koehler & Wild, 2019). The tactile model uses touch receptors such as writing to help understand and build skills, and large print increases the size of the font to enhance recognition of the text (Koehler & Wild, 2019). However, no studies have yet suggested if the two strategies or any other technique could improve the integration of the motor component for students to take notes. Although the term CI is uncommon with public school teachers, it is still a requirement for special educators to implement instruction to support and meet all students' individual needs (Koehler & Wild, 2019).

Problem Statement

Professional development for special education teachers to understand and assist students with visual/motor disorders are rare (Koehler & Wild, 2019), unlike other disorders such as autism, mental health deficits, specific learning disabilities, and emotional/behavioral disorders (Blanton et al., 2011). Though professional development training is available for visual deficits (National Association of Special Education Teachers, 2021), teachers do not receive this training. Yet the issue for CI still exists and is expected to be handled by the educators under visual difficulties (Koehler & Wild, 2019). The problem being addressed by this research is that there is a lack of professional development training on visual-motor deficits such as CI for special educators in public

school systems to instruct students on one accord effectively. Though there are treatment plans for individuals with CI, there are no interventions provided inside of the classroom. There are no general inventions set in place in the public school system to assist visual-motor deficit students from systemically falling behind academically each year. This prospective study explored inclusive special education teachers' perceptions of instructional strategies used to assist students with a combined visual and motor deficit in notetaking a public school. I wanted to explore the instructional strategies special education teachers use to assist students with visual-motor deficits, which techniques they believe to be useful, and whether the educators think they need more training for this disorder to prevent students from struggling academically.

Purpose of this Study

The purpose of this qualitative study was to explore special education teachers' perceptions on the instructional strategies used in an inclusive general population in high school to assist with notetaking for students with CI to determine if professional development is necessary. Visually-impaired associates recognized visual images, tactile models, 3D models, verbal descriptions, extended time, and enlarging materials to be effective classroom pedagogical practices (Koehler & Wild, 2019). However, these instructional techniques of the study stemmed from information received by educators of a private vision institution (Koehler & Wild, 2019). The techniques teachers use inside inclusive public institutions are unknown, and there is no research to determine if these effective methods assist with the motor integration of the disorder, such as notetaking. Knowing the methods used for students with a visual-motor deficit, such as CI by special

educators of public institutions, can lead to the understanding of how to assist them in learning in an inclusive environment effectively.

Research Questions

In the reviewing literature, different strategies could be used inside a classroom to assist students with visual-motor disorders such as convergence insufficiency, but little is known on how teachers assist students in an inclusive environment. The research questions (RQs) developed were specific and formulated to support, identify, and explore this problem. The RQs are instrumental in adding focus to the problem and the purpose of the literature (Ratan et al., 2019). The following questions was used to support this study:

- RQ1: What instructional strategies do special education teachers use to assist students who have CI with visual-motor deficits?
- RQ2: How do instructional practices for visual deficits assist students with notetaking as perceived by special education teachers?

Theoretical Framework

The theoretical base for this study was the universal design for learning (UDL), which was used to better understand that unconventional individualized and instructional strategies can provide optimal learning opportunities for students. Because this theory is an instructional strategy that promotes differentiation, it allows educators to meet the individual's needs per student (Boothe et al., 2020). The logical connections between the framework presented and the nature of my study include multimodal representations of content engagement and access by which disabled students may be supported in their learning by special education teachers to understand better the different types of

strategies used inside a classroom. It allowed special education teachers to explain various instructional strategies to promote differentiation to meet the individual needs per student and explain why these methods are chosen. The UDL approach provided details on various untraditional pedagogical strategies that can assist challenged student learners and provides insight into how specific instructional strategies can benefit some students and not others (see Capp, 2017).

Nature of the Study

In this qualitative study, to address the research questions, the specific research design included phenomenological research interviewing special education teachers' responses on their instructional strategies. After exploring the instructional strategies teachers use, coding was applied to develop patterns, organize, and analyze the responses to increase understanding of what is most used in the classroom to best support students with CI in notetaking (Elliott, 2018). The qualitative methodology is most appropriate for the objective of this investigation to understand what practices best assist students with CI more in-depth or determine if further professional training is necessary. This study also aligned with a qualitative approach because there is little currently known within the existing literature about instructional strategies to assist students with CI or professional training that can be provided (Gammelgaard, 2017). The qualitative methodology further complemented the theoretical framework of this study as its methodology allowed special educators to explain and inform their pedagogical practices used to assist a specific population of students. A phenomenological approach was selected for this study to investigate and explore the lived experiences of special education teachers as they discuss

their instructional strategies to help those with visual-motor deficits or characteristics of CI (Capp, 2017). The interviews focused on relevant content to inform the basis of the study (Davidsen, 2013).

I recruited special education teachers for individual interviews for my planned research design. Interview protocols were developed to address the problem and purpose of the study by aligning the questions and having inquiry-based collaboration with participants (Thelwall & Nevill, 2021). Primary data were collected using an open-ended semistructured line of questioning. It was held via virtual conference (such as Zoom) or telephone call with 20 secondary special education teachers from one high school. Zoom conference calls can be as effective as face-to-face interviews (Gray et al., 2020). The data included responses to the special education teacher interview questions regarding instructional strategies used in classrooms to support students with CI in notetaking.

Definition of Terms

The following definitions were listed to bring meaning to each concept throughout the study.

Binocular fusion: The ability of the brain to form a single perception from both eyes (Ding & Levi, 2021).

Binocular vision: This is the ability to maintain depth perception through sensory unification and optical motor coordination (Martino, 2021).

Convergence insufficiency (CI): CI is a binocular disorder causing the eye to drift outward (Scheiman et al., 2020).

Convergence: Simultaneous movement of the eyes rotating towards an object

(Ahmad, 2021).

Diplopia: Double vision (Kremmyda et al., 2020).

Exophoria: Outward eye driftage (Hong et al., 2020).

Instructional strategies: A combination of teaching techniques and materials educators use to assist students in learning (Weston & Cranton, 2016).

Phoria: This is an eye misalignment consisting of a deviation of binocular view, causing an imbalance to manifest when fusing images (Kommerell et al., 2015).

Strabismus: A condition of eye misalignment (Ge et al., 2020).

Suppression: An unperceived view of one eye (Lew et al., 2021).

Vergence: Vergence is the movement of both eyes turning in or outward simultaneously (Kim et al., 2010).

Vision therapy: Interventions used to treat and restore an individual's binocular vision and improve control of convergence deviations (Shainberg, 2017).

Visual acuity: Visual acuity is the ability to distinguish between two separate stimuli from their background with a sharp and clear view (Kniestedt, & Stamper, 2003).

Visual perception: This is the ability to process differential information (Knudsen, 2020), including shape, color, location, size, form, illuminance, and location (Sample et al., 2020).

Visual-motor integration: Visual-motor integration is the ability to coordinate visual information perceived with fine motor skills (Ahn, 2021).

Assumptions, Scope and Delimitations, and Limitations

Assumptions

I used assumptions to guide this qualitative phenomenological research study. My goal was to examine the instructional strategies special education teachers use to assist students with visual-motor impairments in notetaking in determining if professional development for the disability should be implemented more in schools. The critical assumption in this study was that public school teachers may not be aware of CI by specific name but do know some of its characteristics and instructional strategies to assist visual deficits. Additionally, I assumed that all participants (special education teachers) utilize various methods to differentiate student learning in an inclusive classroom (Blanton et al., 2011) and that all information from participants was honest and accurate. This study included substantial elements that could be an addition to the field of educational psychology (Dick, 2020). For support, a qualitative methodology was appropriate to answer research questions to receive an extensive understanding of the study as participants can describe their insights into their classroom experiences (Austin, 2014).

Delimitations

In this study, I explored the experiences of secondary special education teachers in an inclusive classroom. I focused on the teachers' techniques or methods to assist students with visual-motor deficits such as CI. The population used for this study was culturally diverse (Vasileiou et al., 2018). The American Psychological Association (2017) suggested that investigators will not be informed of the names of students

diagnosed with a visual or visual-motor deficit. The study results were utilized as a potential modifier of instructional techniques to assist student learning and notetaking visually impaired individuals such as those with CI.

Scope of the Study

In this qualitative study, the exploration focused on the perceptions of inclusive special education teachers and their instructional strategies for visual deficits used in the classroom through conference call interviews—the recommended sample for a qualitative study was 20 participants (Vasileiou et al., 2018). The instruments for the research were similar to those used by researchers such as Byrd and Alexander (2020).

Limitations

There were limitations to this research study. A potential barrier when collecting primary data included difficulty recruiting participants for interviews. In addition, the characteristics of participants need to be suitable to eliminate poor responses for the research (Patel et al., 2018). An additional limitation considered was the sample size and geographic area. With having such a small number of participants, the results may not be relevant to a larger population (Vasileiou et al., 2018). This study also focused on the learning of high school teacher techniques of a public-school area, but results in other school-age students may not be applicable. Another limitation of the study is the techniques used to assist students with visual-motor deficits that may differ in other geographic populations from the southeast area.

Significance

This study is significant because it addresses the gap in the literature by exploring

pedagogical practices public high school special education teachers use to support students with convergence insufficiency in notetaking. Researchers have noted the need to explore how students with visual impairments can have access to a general education curriculum by a different or entire population of teachers (other than that of the opinions noted by the educators with an association to the visually impaired groups listed; Koehler & Wild, 2019). With the probability of two to three students per class having CI (Hassan et al., 2018), teachers considered motor functionality and visual deficits hindering their access to the instruction. With little to no current research on instructional strategies that can be applied for CI, this research provided an original contribution by focusing specifically on what visual or visual-motor practices were used in a general high school inclusive classroom to support students of this disorder with their notetaking skills. School board administrators could use the results to either equip teachers with necessary tools to assist or include professional development training for teachers to assist with students who fall under the scope of visually impaired.

This study contributes to positive social change by identifying and conceptualizing ways for teachers to manage the impact of visually impaired students being overlooked and falling between the educational gaps. Demographic factors such as ethnic origins and socioeconomic status play a significant role in students falling between the achievement gaps, and more than 50% of those students have vision difficulties (Teacher College, 2022). Without adequate support, these students are more likely to drop out of school, become incarcerated, and are not likely to extend their education (The Children's Defense Fund, 2022), costing the United States trillions of dollars because of

the human potential that is not meaningfully utilized (Auguste et al., 2009). Finding ways to bridge the academic gaps can support students academically, teachers instructionally, and the nation economically making positive social impact.

This study supports the practice of educational psychology by providing insight into supportive ways to assist both educators and students by discovering tools needed to conceptualize and aid in the students learning process rather than let them continue falling between the educational gaps. In addition, because there is not a broad spectrum of students who have CI in a given public inclusive classroom, learning of various ways for teacher adequately accommodate the needs of each student allowed for an increase in instructional performance using differentiation as well as academic performance in students that can prevent them from being overlooked and falling behind.

Summary and Transition

In Chapter 1, the importance of vision and education was specified. I also described how visual-motor deficits such as CI can affect a student's academic success. The background discussed how visual-motor integration is relative to education and instructional strategies are the roots of progress in an inclusive institution. The research's problem and purpose were indicated as the instructional strategies used in a public institution to assist CI are unknown. The research questions and methodology for the study correspond with the study's scope, significance, and purpose. Finally, precautions for the study were noted.

In Chapter 2, a comprehensive analysis of the literature CI and its educational implications is provided. Themes such as visual systems, the prevalence rate, treatments,

and educational strategies are presented to address the problem's severity and the need for a school-based intervention plan.

Chapter 2: Literature Review

Public school special education teachers in an inclusive general education population undergo training on managing autism, mental disorders, behavioral disorders, and learning disabilities. However, teachers are less likely to have professional development or even hear of ways to assist students with binocular vision disorders such as CI. Although private institutions focusing on vision may be more equipped or trained in this area, CI is a common eye disorder that causes students' academic challenges and is often seen in the public-school system. Yet there are no general inventions set in place in the public school system to assist visual-motor deficit students from systemically falling behind academically each year. This research was conducted to explore special educators' instructional strategies to assist students with visual-motor deficits. The goal was to determine if special educators should have training to assist with this disorder to prevent students from struggling academically.

Literature Search

The keywords and databases searched included *Convergence Insufficiency, Visual Impairment, Special Education Teachers (inclusion/role), Convergence Insufficiency therapy, Universal Design for Learning, Instructional Strategies,* and *Students with Disabilities* in the databases Education Source EBSCOhost, as well as in the IEEE Xplore and ScienceDirect using the Thoreau multi-database search and Google Scholar. Though the literature was researched since 2015 to address unknown literature, the search expanded to 1980 to determine if instructional strategies were discussed for individuals with CI.

Theoretical Framework

The UDL was founded in 1984. Ron Mace first envisioned it to promote products appealing to individuals with disabilities (OCALI, n.d.). The Center for Applied Special Technology (CAST) applied the idea into an educational framework for curriculum reform, basing it on Lev Vygotsky's prerequisites for learning: effectiveness (engagement), recognition (identifying), and strategizing (apply tools to process data). Though all three networks are used as a brain function, each person receives the information and proceeds differently; the idea of creating a curriculum to accommodate differences resulted from this concept.

The theoretical base for this study was the UDL to better understand that unconventional individualized and instructional strategies can provide optimal learning opportunities for students. Because this theory is an instructional strategy that promotes differentiation, this allowed the educators to meet the individual's needs per student (Boothe et al., 2020). With the incorporation of three principles—engagement, representation, and action/expression—the UDL approach provides details on various untraditional pedagogical strategies that can assist challenged student learners (Koehler & Wild, 2019). The term engagement under the UDL is referred to as the effective network or the *why* that focuses on student autonomy and choice, relevant learning, and support for individual learners. Representation is the recognition network or the *what* that focuses on visual displays and accommodating ways. Lastly, the phrase action and expression are the strategic networks or the *how* that adds purposeful options such as flexibility, timing, pacing, various instructional tools/strategies to support learning, and access to assistive

technology (Posey, 2021). The UDL allowed for insight into how specific instructional strategies can be beneficial for some students and not others, which align with a previous study on students with visual impairments described by visually impaired or blind educators' associates.

Literature Review Related to Key Concepts

Physiology of the Eye

Humans use their eyes through a complex visual system to view their surroundings (Goering et al., 2020). Sight is formed by the function of the inner layer called the retina (conversion of light into neural signals to form images), the middle layer called the choroid (nutrients for the eye), an outer layer called the sclera (shaping the eye) and cornea (focusing of light that enters the eye). The oculomotor system is how the eye can rotate (left, right, upward, down, clockwise, and counterclockwise) with the use of motion through various control systems. In particular, vergence movements are a neuronal control system that simultaneously moves the eyes in opposite directions for its best visual acuity. This system is called binocular vision, where both eyes work together to form a single visual picture.

The vergence system is comprised of two movements: convergence, which is the inward motion of the eyes to focus at a close range, and divergence, which is the outward motion of the eyes to focus on a target that is far away (Goering et al., 2020). The term vergence is also characterized by four functions: proximal vergence, accommodative vergence, fusional vergence, and tonic vergence. Proximal vergence uses binocular cues relative to size, perspective, shading, and texture, known as monocular cues.

Accommodative vergence uses cues for focal length (called a blur cue), fusional vergence uses binocular cues for focal depth (called disparity), and tonic vergence is a resting state of the eyes where there is no use of accommodation and an absence of stimuli.

According to literature, a physiological position of rest is also known as phoria (an error of the visual alignment) and is primarily associated with eye driftage. Phoria is an imbalance manifestation with binocular vision (Goering et al., 2020). There are various classifications of phoria: esophoria, exophoria, hyperphoria, and hypophoria. These types of phorias pertain to the coordination of eye muscles called heterophoria. It is broken into two categories: horizontal strabismus (esotropia and exotropia) and vertical strabismus (hypertropia and hypotropia). Esotropia is when the eyes move inward. Exotropia is the eyes moving outward. Hypertropia is when the eyes turn upwards, and hypotropia is when the eyes move downward (Makgaba, 2006). Binocular misalignment such as phoria can also result in problems with viewing distance and cause issues with sensory-motor functioning. Sensory-motor deficits is a result in abnormal interpreting and reacting functions as it pertains to the coordination with both the senses (such as vision that corresponds to retinal areas with size, sharpness, and brightness) and the motor movement (such as fine motor skills, coordination, and body movement; Von Noorden, 2002). Consciously or not, individuals receive connections from others in the world through a series of visual and auditory stimuli. The retina of the eyes reacts chemically and physically when light refracts in its receptors. As a result, these changes charge the neurons, signaling the central nervous system through physiochemical and electrical change stimuli. The signals, in turn, message the central nervous system to the

newly presented stimuli. CI can result from vergence eye dysfunction as it disrupts the binocular alignment for near-vision, which can profoundly affect the subject's vision or visual-motor skills (Das, 2016; von Noorden & Campos, 2002).

Convergence Insufficiency

CI is a binocular dysfunction that affects the functioning of both eyes working in unison (Nunes et al., 2020). Specifically, the rotation of the eyes does not sufficiently move inward as it asserts to control image fusion into a single image with near vision. It is characterized by blurred or double vision, eye fatigue (Nunes et al., 2020), difficulty concentrating and recalling information, headaches, eye pains (Migrants et al., 2019), and abnormal eye movement (such as driftage of one eye; Kurokami et al., 2019). Further, typical CI symptoms are asthenopia and diplopia (Lavish et al., 2019). Asthenopia is the association of eyestrain and headaches when using vision. This disorder is usually brought on by overuse of the eye muscles due to activities such as staring at objects for long periods or exposing the eyes to oppressive air quality. Diplopia is a double or blurred vision that can suppress as neuro signals send messages to one eye to shut off. This disorder usually begins with how the eyes are positioned when doubled or blurred images occur. Relative to asthenopia, monocular diplopia is an effect of oppositional refracted light in a single eye, which has lasting effects on the eye and will warrant corrective eye ware, cataract surgery, or the use of artificial tears (Iliescu et al., 2017). In addition, binocular diplopia is a disorder of both eyes. With this condition, the eyes are displaced, causing an interruption to the nerves that help control the eyes. Therefore, binocular diplopia requires a diagnosis before treatment can begin. (see Appendix E for

The General Approach to Diplopia Diagram).

Due to the related causes being neurological and ophthalmological, clinicians must be meticulous with their diagnosis and often treat the symptoms associated with the disorder (Danchaivijitr, 2004). With a predominant eye, objects seen by the other are not perceived. Additional notable symptoms of CI include deficits in reading comprehension, a form of dyslexia (with print moving when reading), difficulty concentrating, and sleepiness (Goering et al., 2020). Aggravation of symptoms can occur if the subject is stressed, ill, or in need of sleep (Triantafilou et al., 2014).

History

CI has been around for a very long time. Albrecht von Graefe was the first person to describe the symptoms of CI. Symptoms have been noted to have occurred in the mid-1850s. von Graefe presented the disorder as psychogenic (or being psychological, not physical). He suggested that the disorder greatly mimicked an ocular motor paralysis called abducens palsy, which stemmed from nerve damage to the eye. However, the presentation of the eye disorder was documented differently in later dates as an orthoptic disorder. In 1918, researchers presented it as “spastic hysterical convergent strabismus,” but it was not until 1983 that it was viewed as a conversion disorder (Ghosh et al., 2014, p. 332).

Etiology of Convergence Insufficiency

The etiology for CI is not yet known. However, it is speculated that various health conditions and possibly genetics could be leading factors in the disorder. The pathophysiology behind CI is neurological. Premotor commands are disrupted by

midbrain lesions leading to retinal blur (lacking the sharpness of an image) and retinal disparity (images separated; Searle & Rowe, 2016). The health conditions associated with being the cause of CI are head injuries/concussions (Suleiman et al., 2019), Parkinson's, or Alzheimer's disease (Holden et al., 2019). Vergence is often seen in neurodegenerative diseases and is more prominent in individuals with Parkinson's disease (Irving et al., 2017; Machan et al., 2020). Parkinson's disease is a progressive movement disorder with symptoms like diplopia. Alzheimer's disease has also been linked to CI (Holden et al., 2019), due to an interconnection between the brain and ocular functions (Javid et al., 2016). CI affects patients' ability to read and balance due to abnormal eye movement (Parkinson & Maxner, 2005).

In addition to Parkinson's and Alzheimer's disease, myasthenia gravis is another marked disorder that may lead to CI (Sehgal et al., 2017). Myasthenia gravis is an autoimmune disease attacking the skeletal muscles. According to researchers, individuals with myasthenia gravis are likely to report symptoms of migraines after reading by which onsets CI. Reports also indicated that the symptoms cause significant difficulties reading (Singman et al., 2017). Another common symptom seen with myasthenia gravis is diplopia because it negatively affects both the medial rectus and rectus (Nair et al., 2014).

Graves disease is another disorder associated with CI (Huston & Hoover, 2014). In comparison to all the disorders, Graves disease is the most typical ocular movement disorder that leads to CI (Xia & He, 2021). This disease can affect an individual's extraocular muscles (Law et al., 2017). Having an increase or reduction in the sarcomere is developmentally delayed, the reduction of artificial accommodation, components of

Maddox divergence (i.e., tonic, proximal, fusion, regulation divergence), head injuries, Lyme disease, aging, mental disabilities (i.e., excessive sadness) are all pathogenesis leading to CI (Xia & He, 2021). Additional causes leading to CI are genetics because its generally seen in families, debility, endocrine disorders, tobacco usage, drug intoxication, toxemia, hepatis, anoxia, encephalitis, malnutrition, mononucleosis (Cooper & Jamal, 2012). Patients have also been reported to have CI after specific surgeries (i.e., cataract surgery and situ keratomileusis; Cooper & Jamal, 2012).

Populations Affected by Convergence Insufficiency

Although the implications for the etiology of CI are unknown, various factors indicate who could be at risk for the disorder. CI affects all ages but is generally noticed in school-age children and adulthood (Ghadban et al., 2015). It can also be hereditary so that additional family members could have it or post a potential risk to their children. Additional risk factors could stem from elongated computer usage and visually demanding professions. When individuals conduct near-work tasks, they remain at a delicate but constant distance (Cooper & Jamal, 2012). The distance allows the eyes to balance both convergences while working and accommodation. Retinal disparity decreases while performing a reading task, making maintaining visual fusion difficult and causing eye fatigue (Cooper & Jamal, 2012).

Women are also reported to be more likely to have CI than men; however, results could be biased because women are more likely to seek medical attention than men. As with age, a child could be born with the disorder (due to genetics or developmental delays), anyone could acquire the disorder throughout life (i.e., as with head trauma from

a car accident), and it can affect aged individuals (i.e., as with Alzheimer's disease or cataract surgery; Cooper & Jamal, 2012).

Classifications of Convergence Insufficiency

The misalignment of the eye or strabismus characterized by an individual eye(s) turning outward is called exotropia. Exotropia is seen most in individuals with CI. Eye movement outward can be constant or deviates sporadically (intermittent exotropia). There are three classifications of exotropia: sensory, intermittent, and consecutive exotropia (American Association for Pediatric Ophthalmology and Strabismus-Exotropia, 2019). Intermittent exotropia occurs in the driftage of one eye that may occur when the individual is daydreaming, tired, or viewing an object at a distance. Bright light often affects a child with intermittent exotropia causing them to squint or close their eyes. The closure of the eye causes an irregularity of eye usage together. This disorder may lessen with age but does not entirely resolve (American Association for Pediatric Ophthalmology and Strabismus-Exotropia, 2019). Intermittent exotropia is considered primary, affecting between 50 and 90 percent of people, including other types of exotropia (Jain et al., 2017). With this being the most common of the three exotropia's, the mission involves surgery to maintain binocular vision while preventing further ocular problems such as loss of vision (Chougule & Kekunnaya, 2019).

Additionally, surgery can restore vision and alignment, improve head posture, fix blurred/double vision, restore visual acuity, enhance psychomotor development, and advance eye motility (Jain et al., 2017). According to Jain et al. (2017), exophoria typically follows this form as an outcome due to illness, exhaustion, or manifested due to

extended near work. It is essential to know that the same eye movement characterizes exophoria and exotropia; however, exotropia is a more noticeable outward eye movement (Jain et al., 2017).

Sensory exotropia is also a primary exotropia. It is characterized by poor eyesight, causing the eyes not to work together and drifting out. Sensory exotropia is defined by deviations causing retinal or optic nerve abnormalities, cataracts, and corneal opacity (Jung & Kim, 2018). Lazy eye (amblyopia) is a cause of sensory exotropia (Lajmi et al., 2020). While sensory exotropia is primary, consecutive exotropia is secondary because it happens as a result of treatment (Bradbury & Doran, 1993). Consecutive exotropia is characterized by outward driftage after surgery to correct crossed eyes (American Association for Pediatric Ophthalmology and Strabismus-Exotropia, 2019). A developmentally delayed, lazy eye, repeated surgeries, or high hypermetropia are at a greater risk of manifesting consecutive exotropia (Ganesh et al., 2011).

Prevalence

The prevalence of convergence insufficiency varies based on demographics. The term prevalence is the proportional statistics of a general population. The word convergence stems from the movement of both eyes to focus on a single object, and insufficiency is the inability of the eye not to function correctly. Convergence Insufficiency disorder is common and affects individuals of all ages, sexes, and countries. According to Goering et al. (2020), up to 13% of school-aged students in the US are identified with CI, and the statistics expand to about one in every six people in adults 19 or older. In reference particularly to secondary schools, more than eight percent, or one of

every twelve high school students in a given school, has convergence insufficiency (Hassan et al., 2018), and those odds can increase to 17% (or one in every six people) in a general population (Trieu & Lavrich, 2018). A study conducted in India also concluded that girls are more likely to be identified as having convergence insufficiency than boys in the 12 to 16-year-old age group (Arvind, 2014).

Diagnosis

Good vision is often correlated with visual acuity (the distance of letters based on a fixed standard). School systems often utilize the Snellen chart to evaluate acuity problems in primary-age students. Nevertheless, even with perfect visual acuity (20/20 vision), the individual may still experience difficulty reading, have poor academic performance, and see print moving. Educators and nurses must consider binocular vision problems rather than attribute this to a focusing issue (Goering et al., 2020). Convergence insufficiency disorder is often undiagnosed or misdiagnosed (i.e., ADHD or dyslexia) (Migrants et al., 2019). The additional differential diagnosis for CI accommodative insufficiency, convergence paralysis, dyslexia, decompensated phoria, uncorrected refractive error, divergence, thyroid eye disease, and some medical issues (Triantafilou et al., 2014).

The condition may go unnoticed because it is not detected by general eye exams (Trieu & Lavrich, 2018), which leads to misdiagnosis. Due to the unpredictable nature of the CI diagnosis, a doctor would have to conduct a series of tests such as the Near Point of Convergence Test, Positive Fusional Vergence Test, and given a routine eye exam. The initial eye exam is used to identify the depth of the problem. As the visional concerns

increase, the eye examiner may complete one or both tests. The Near Point of Convergence (NPC) test assesses the focal distance of the eyes. The closest point of sight will be determined and compared to a national norm. According to the Oman Journal of Ophthalmology, the normal range of convergence is less than 10 centimeters from the focal point (i.e., the nose). A convergence is considered unsatisfactory if the NPC indicates a range greater than 10 (Abraham et al., 2015).

A different assessment method to test if the eye is converged is the Positive Fusional vergence test (PFV). This test measures the eye's ability to balance convergence with objects nearby. According to the Oman Journal of Ophthalmology, the norm of PFV will vary based on a subject's ability to see clearly, which is scaled at the point of a blur (2015). According to research, treatments for convergence deficits will vary based on the diagnosis. These treatments may include eye exercises, technology therapy, and eyewear (Abraham et al., 2015). Eye exercises are pivotal in increasing eyes functions and improving the eye's muscles, coordination, and circulation. The method of technology therapy is to promote eye and brain coordination. With better coordination, a diagnosis such as ocular muscle dysfunction and learning-related vision disorders will improve significantly (Ciuffreda, 2008). Additionally, reading glasses are a preferred method of treating convergence. Contrary to prescription glasses, those designed for reading do not integrate prisms, assisting those with conditions such as presbyopia to focus better (Smith & Erin, 2002).

Vision is more than the ability to read small/large letters from 10 feet away. Instead, it can even be described as an entity. From birth to death, our site is the most

significant of our senses. It allows us to explore and make connections with the world. We rely on it heavily to make choices and identifications, and we feel lost without it. In contrast, the lack of sight is just as powerful. When we cannot see or see things clearly, the rest of our senses become heightened to compensate for our understanding of what we cannot see.

With a diagnosis of CI, which is considered a trainable disorder, without treatment, there is no health risk associated with the disorder. However, the symptoms will persist (Goering et al., 2020). In addition, without treatment, it is essential to note that symptoms can worsen for the child academically, causing them to fall behind or between the educational gaps (Scheiman et al., 2018).

Eyesight and Education

According to Patrice Milewski (2017), in a study of health and education, research showed a link between eyesight and learning (2017). Nearly 80% of learning stems from visual pathways, and approximately one in four children have visual problems that negatively impact his/her learning. Difficulties with vision cause reading, writing, classroom performance, spelling, visual arts, homework completion, concentration/attention, and reading comprehension. Vision and learning are significant because reading builds language skills, spelling facilitates a student's reading capabilities, writing builds visual perception, fine visual-motor skills, and comprehension. Vision difficulty can disrupt those functions from working correctly.

In contrast, reading comprehension is needed to process, understand, build visual memory and convergence. Visual arts are essential for facilitating daily life development

(social-emotional, cognitive, and physical development), and concentration is crucial as it allows the child to increase his/her peripheral vision and gross visual-motor skills (Lazarus, 2020). According to Robert Poppe (2014), in a study of poor eyesight and educational outcomes, learning achievement is affected for both sexes, but there is also a link between vision difficulty and school dropouts with a higher probability rate seen more in girls than in boys.

According to the American Optometric Association (n.d.), to be effective in reading and learning, a child needs visual acuity, eye focusing, eye tracking, eye teaming, eye-hand coordination, and visual perception abilities. Visual acuity will allow the child to see things clearly at a distance, such as using a computer, viewing the whiteboard/chalkboard, and reading a book up close. Eye focusing will allow the child to maintain vision clearly and accurately from a distance which is needed to view the whiteboard that is far away then back to the paper on their desk that is close up. Eye-tracking is needed for the child to view an object and stay on target when viewing another, such as eye movement of a printed page and being able to follow an object that is moving. Eye teaming is vital because it allows students to coordinate their eye movements when reading a printed page simultaneously. It is used to judge distance and visual depth when playing sports. Eye-hand coordination is significant because it allows the student to perform the appropriate movements of the hands directed by visual information, as with hitting a baseball or drawing an image. Visual perception is essential to a child's education because it allows the student to organize printed images into words or letters, ideas and comprehend and remember the information they have read. These

visual skills are essential in a child's learning journey, and the demands of these abilities will become extensive throughout their educational experience. As a child extends his or her education, the font size of textbooks will decrease, and the time spent reading, studying, and course load will increase. With vision difficulties, the demands needed to learn efficiently and successfully can be disrupted (American Optometric Association, n.d.). All children must have a healthy vision, leading to tremendous academic success, social development, and wellbeing (Eyes on Learning, 2021).

Impact of Convergence Insufficiency

Academic Effects

Educational implications surrounding CI affect a student's visual and motor abilities. Many of the symptoms cause academic challenges, particularly in reading and writing, which includes reading while writing (the visual-motor component; Kurokami et al., 2019). Students with CI particularly find glancing up at the instructional board and looking down to take notes to be mutually exclusive. Moreover, educational-impairing behaviors such as challenges to complete tasks/assignments can also manifest (CITT-RS Study Group, 2018). However difficult for these students, visual-motor strategies are not typically supported by the general education public school systems. The type of accommodation that should be included, if at all, is questioned, despite its alarming prevalence within the school.

Keohler and Wild (2019) argued that visual impairments could fall under No Child Left Behind or the IDEA (Individuals with Disabilities Education Act). However, there may not be appropriate tools or accommodations/modifications for students with

visual deficits, and teachers lack the training to accommodate students in the public school systems (Koehler & Wild, 2019). While the term visually impaired is considered a disability under the IDEA (Koehler & Wild, 2019), the term CI may or may not fall under the same umbrella of the visually impaired as it is defined by partial sight or being blind and having an adverse effect on academic performance even with treatment. Studies have shown that students who undergo treatment for CI progress rather than regress, and CI also has the motor functioning that applies to the learning process.

Visual-Motor Effects

Binocular anomalies play an essential role in reading deficits. Reading deficits can include dyslexia, reading disability, reading comprehension problems, writing disabilities. Factors surrounding these deficits are primarily due to sensory and motor coordination, which are in disarray of one another. While the motor system works to align the eyes and focus them, the sensory system interprets what they see and creates visual perception. With convergence having a motor component by which both eyes rotate to meet at a single object, the individual is most likely to feel tired when reading (Raghuram et al., 2019 and McGregor, 2014). When there is a problem with convergence, the student may have difficulty focusing from far to near or vice versa, have problems maintaining the work requirements in front of them, or see double images. The terms far and near refer to the focal distance of an object.

Nevertheless, when there are issues with the sensory-motor components, the brain’s sensory fusion or perception interpretation will become suppressed by shutting off the vision for a single eye. Suppression profoundly limits the individual’s ability to see

from both eyes simultaneously (Borsting et al., 2005, and von Noorden & Campos, 2002). According to the National Center for Learning Disabilities (n.d.)., visual-motor deficits or visual processing disorders can cause implications with spatial relations. Spatial ability pertains to generating, retrieving, retaining, and transforming images. For example, reading and math heavily utilize symbols. These symbols could include signs, numbers, and variables in math, and letters and punctuation with reading. For instance, an individual experiencing difficulty with visual processing may have difficulty distinguishing letters b/p/d/q due to their shape.

In contrast, a student with good spatial ability is more adept at understanding and distinguishing the differences in shapes, symbols, numbers, and letters (Fusco et al., 2015). Visual discrimination and visual closure are other influences of visual-motor deficits. Interference with visual processing may cause challenges with visual discrimination or differentiate objects, especially their patterns, colors, size, shape, and position. Like visual discrimination, interference with visual closure can cause problems with identifying/recognizing symbols or things he/she may see, causing it to be unrecognizable because of a single missing feature. An additional visual-motor dysfunction is visual cues, which guide the way they move. Problems in this area of gross and fine motor skills can result in clumsiness and lead to educational, social, pragmatic, and athletic conflict (Molloy et al., 2015 and Fusco et al., 2015).

Social Implications

Treatment for CI could include vision therapy interventions, prism lenses, and surgery in some cases. Without proper treatment, a child can express various social-

emotional and academic problems. According to Eric Borsting and colleagues (2016), an individual with CI that is untreated can express internalizing problems such as anxiousness or depression, withdrawal, and somatic complaints. They may also show externalizing issues such as disobedience (breaking the rules) and aggressive behaviors. In addition to these behaviors, academically, they may be inattentive, gives up quickly, easily distracted, do not pay attention, interrupt, do not listen, fidget, have trouble organizing, and are restless or overactive. These are symptoms typically seen in students diagnosed with ADHD, but diagnosis for CI should be screened as measures of the student's behavior are closely related to how they perform academically (Borsting et al., 2016). Because vision therapy is not applied in most schools, it is challenging to address some behavioral, social, and academic issues symptoms.

Optometrists are aware of how CI can affect a student while in school. Understanding that their visual needs can profoundly affect the student's academic performance, they may recommend general interventions to assist students. These may include using a line guide, utilizing a bookmark when reading, using a slant board/incline for the student's books, preferential seating closer to the board, and copying notes for the student. In addition to a student's academic performance, other areas of a student's life can also be negatively impacted, such as eye contact, coordination, motion sickness, sports, and more. Since vision therapy is provided in offices or home, the question remains if the optometry accommodations will be efficient and effective to assist students academically and with their daily life skills (Willings, n.d.).

Treatments

Office-Based Treatment Versus Home-Based Treatment

CI is a manageable condition over time with proper treatment. One solution is therapy as a form of treatment. Previous researchers believed the two most effective forms of treatment include office-based treatment accompanied by home-based treatment. However, there is also controversy on suggested methods to take. For instance, Momeni-Moghaddam et al. (2015) found office-based therapy impractical, expensive, and a far commute depending on the individual, making home-based therapy the better, more affordable alternative. Home-based therapy uses pencil push-ups (i.e., an exercise moving a pencil or small paper towards the eyes) and computer vision therapy (Scheiman et al., 2020). However, researchers Alethaha et al. (2018) argued that the office-based approach to be a relatively more effective approach to treatment. While some investigators suggest the use of both office-based and home-based together (known as office-based vergence/accommodative therapy) to be the most effective (Alvarez et al., 2019) as the instruments used with this method focus on fusional vergence and consistently/frequently incorporates motor learning principles as well as positive feedback (Scheiman et al., 2020). It is important to note that the description of what office-based therapy entails is vague as it is only described as consisting of a significant amblyoscope and glasses (Scheiman et al., 2020).

Office-Based Vision Therapy

Vision therapy is a technique used by those in the field of optometry. These therapy exercises include strategies of visual training. Visual training aims to provide

support for the brain as it processes incoming visual input (Willings, 2017). While researchers do not typically list procedures used in OBVT, investigators Michael Goering et al. noted several techniques that can be used. The authors included the use of vectograms, Brock stings, eccentric circles free-space fusion cards, barrel cards, and Life-Saver free-space fusion cards (2020). The vectogram uses polarized filters such as 3D glasses to stabilize fusion and control suppression with a base-in and base-out method. The individual is allowed to view a single image with a single eye and a different picture to the other. The Brock string instrument is utilized as a focusing mechanism for the eye's lens and prisms and consists of a ten-foot white string with three different color beads spaciously attached. Another technique used to improve image fusion is eccentric circles free-space fusion cards, which consist of 2 circles that are labeled with a word mirroring one another with two cards. The barrel cards are used to converge and maintain visual focus on a single image using both eyes by holding a card with three dilated barrels of the same color up to his/her nose. Then similarly to the eccentric circle's cards is the Life-Savers cards that require a convergence of fusion by the view of separate color circles on a single sheet of paper separated by a pencil to form a different color (i.e., red and green fused by the last circles forming blue, the middle circle floating, and the words within the circle become apparent) (Optometry.osu.edu., 2005). Trained eye specialists work with an individual experiencing vision problems such as convergence insufficiency for one hour once a week, utilizing four to five practices. Then following the office visit, the individual is asked to reinforce similar methods from home with given instructions.

Home-Based Therapy

On average, the home-based therapy following the office requires several procedures to be carried out on a weekly five-day regime. Home-based therapy consists of the following procedures to increase fusion and acuity, relieve symptoms, and improve poor academic performance: computer therapy and pencil push-ups (Goering et al., 2020). Pencil push-ups are a form of vision therapy that can reduce near the point of convergence. It requires the individual to hold an object within arm's length to concentrate on a particular image, bringing it towards them slowly until diplopia occurs for the need to refocus. Diplopia is the idea of seeing a double of the same object with or without an eye being closed (Aletaha et al., 2018) and (Triantafilou et al., 2014). The computer-based orthoptic program is similar to the vectogram in office-based therapy. It provides exercises such as the base-in/-out stereograms or the saccades in a game-like format that can be engaging. An additional method that assists with increasing convergence is the prism recession exercises. With this technique, a target can be placed on the wall, such as rows of random letters, and the individual could have a smaller paper of the exact image in their hand, both at eye level. The purpose of this prism power is for the individual to jump convergence from one image back to the other, taking a step back, and repeating the cycle until he/she has reached 10 ft (Triantafilou et al., 2014). This exercise allows the patient to focus and refocus when viewing/switching to near to far images, such as viewing notes in front of them and looking back up at the whiteboard in a classroom. Another procedure that can assist both vision and motor functioning (or sensorimotor skills) is the Rosner dot/pattern exercises. The Rosner dot/pattern exercises

consist of dots with various drawings, and the client replicates those drawings. To take it a step further, the client could use a 25 dot Geoboard placing rubber bands around the pegs to create the existing drawings from the paper. This method focuses on spatial computation, visual perception, and fine motor skills (Scheiman, 2011).

Occupational Therapy

Although optometrists typically use vision therapy as a form of treatment to assist with the eye lens and prisms, occupational therapy can also be utilized to assist with daily functional activities that are affected due to an impairment. The term occupation is underpinned by activities performed to display essential life qualities such as one's ability to flourish in their well-being. Occupations require more than just survival, but also include the development and by way of maintaining families, opportunities, roles, jobs, and everyday actions (Rudman et al., 2018). The occupational therapist offers rehabilitation as well as prescribes interventions with technology to assist with vision disorders. To improve functionality, the therapists can provide compensatory strategies. Compensatory strategies are considered modifications that can be used to assist an impairment such as a visual deficit. Compensatory strategies that can be utilized are enlarged print, enlarged objects, increased light, high contrast backgrounds, non-glare paper, black-on-white print, use of solid colors in items or bright colors for labels, Dynavision, head-turning techniques, anchoring techniques, saccadic training, and more to assist with oculomotor functioning (Blanchard et al., 2016).

School-Based Therapy

In addition to the home and office vision therapies, Bush and colleagues (2019)

found that binocular vision school-based therapy plans provided in institutions early on would increase students' visual performance in math and reading. School-based therapy focuses on both binocular vision and oculomotor functioning. This form of therapy uses sensorimotor techniques that require occupational therapy that can be employed while in school. School-based therapy could include but is not limited to fine motor development and sensory processing/integration procedures (Bush et al., 2019). Although this method decreases academic regression and challenges in academic performance, like the previous two therapies mentioned, it is most effective over time and not used in the classroom, where the students spend a third of their day. It is also important to note that it is not typical for schools to offer school-based therapy and no single procedure alone is effective in improving the client's binocular vision (Lazarus, 2020).

Surgery

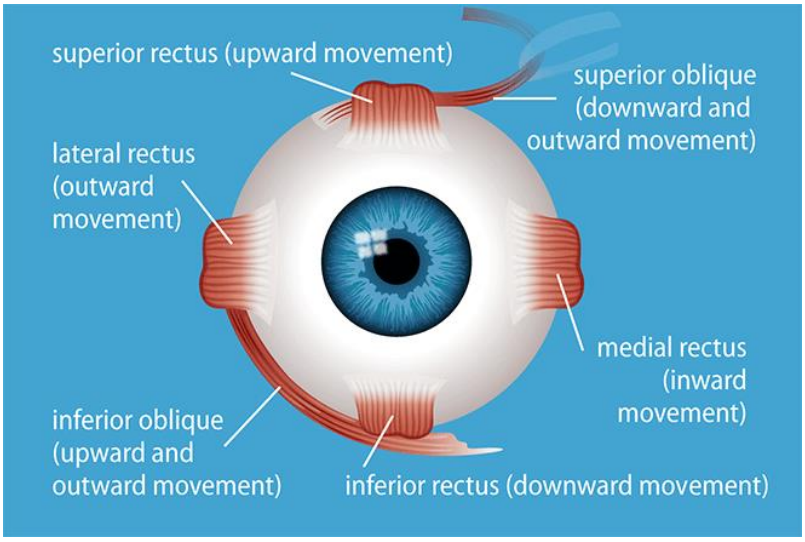
Surgery is a method to correct convergence insufficiency that may be recommended if vision therapy is not practical. In such refractory cases, the deviation of their eyes is either poorly controlled or either too large of a near or distance deviation to be treated with glasses or therapy (Luan & Wang, 2014). There are several operational procedures developed to correct CI, specifically intermittent exotropia. However, it is essential to note that there is no standard protocol. These procedures include bilateral rectus recession, medial rectus resection or plication, and unilateral lateral rectus recession (Luan & Wang, 2014).

Intermittent exotropia is often seen in patients with exotropia and the two methods commonly used are bilateral lateral rectus recession (with resection of medial rectus

muscles for a single eye). Bilateral surgery is to be performed on both sides of the eye, and unilateral is one side, while lateral just means to the side of the eye (O. Spierer & A. Spierer, 2021). The term strabismus is used to describe how the (bi)lateral rectus recession is performed on the medial rectus muscles because of its misalignment of the eyes moving together simultaneously. The medial rectus muscle is the largest of the six extraocular movement muscles. The lateral rectus, inferior oblique, inferior rectus, superior oblique, and superior rectus are the other types of extraocular muscles (Healthline Medical Network, 2018). See Figure 1.

Figure 1

Muscles of the Eye



(Knobbe, 2019)

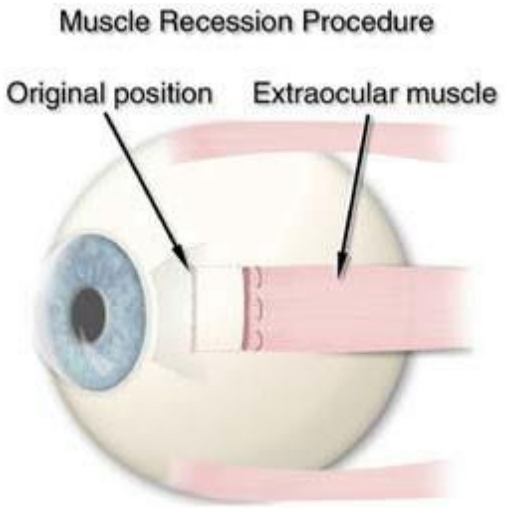
Lateral Recession, Resection, and Plication Procedures

The recession of the medial rectus is retro-placement for the weakening of the medial rectus by altering the eye muscles. This procedure (also known as strabismus

surgery) either tightens or alleviates the restriction of the eye muscles. In addition, the muscle's detachment and reattachment occur in this process, placing the muscle further to the back of the eye to relieve the tension of the eye muscle (American Association for Pediatric Ophthalmology & Strabismus, 2019). See Figure 2.

Figure 2

Recession Procedure



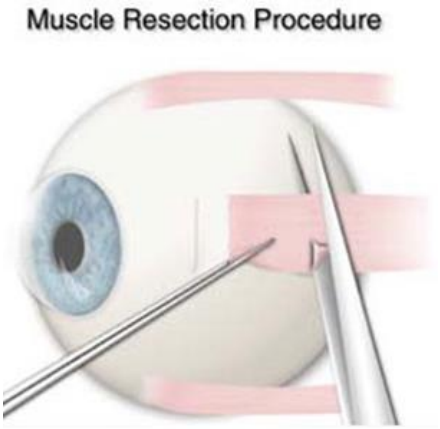
Note. Recession Procedure- an incision is used cutting the muscle from the eye's surface, then reattached further back to loosen the muscle (American Association for Pediatric Ophthalmology & Strabismus, 2019)

Strabismus surgery requires anesthesia which will vary depending upon the patient. To approach the eye muscles, the surgeon does not make any incisions to the skin but does use instruments to cut the conjunctiva (tissue of the eye) to gain access to the muscles. For this type of surgery, the eye itself is never removed. In addition to the recession, resection or plication may be required for some cases. With the resection procedure, the surgeon corrects esotropia by shortening the lateral rectus muscles on each

eye (removing it and reattaching it in another location) (American Association for Pediatric Ophthalmology & Strabismus, 2019). The bilateral medial rectus resection approach not only strengthens the medial rectus but can also collapse and decrease deviations of the near-distance differences. In contrast to resection, plication is a similar process, except it requires the muscle to be folded rather than cut (Wang et al., 2019). See Figure 3.

Figure 3

Resection Procedure



Note. Resection Procedure- a portion of the extraocular muscle is cut and removed, then reattached to shorten the muscle to restrict elongated movement of the eye.

Both bilateral lateral rectus recession and unilateral lateral rectus recession methods have proven to be effective in corrective measures for exotropia. Researchers Oriel and Abraham Spierer (2021) found both methods effective, but the unilateral lateral rectus recession procedure had more advantages than the bilateral one. With a unilateral procedure, the time needed for anesthesia can be lessened, the surgical risk such as blindness (scleral perforation) is diminished if further intervention is necessary, some

muscles are spared, and it reduces overcorrection. Investigators Oscar Oliva and Alvaro Morgado (2018) also found unilateral recession to have more significant advantages, such as under-correction, although the bilateral recession is the most performed procedure. In contrast, the long-term outcomes showed bilateral lateral rectus recession to have greater success results because it reduced the recurrence rate of exodeviation (Lee et al., 2019 and Choi et al., 2011). In a study to determine if resection was more effective than plication, researchers results reported that bilateral medial rectus plication is the better alternative to resection not only because it decreases the risk of overcorrection, but it is also safer, easier and less traumatic to the eye (Wang et al., 2019).

Glasses

In cases with unsuccessful exercises of convergence insufficiency therapy, base-in prism glasses are prescribed. Base-in prism glasses are different from the typical optical lenses making regular glasses a different method because CI is not a problem of eyesight. As CI surrounds the eyes not working together correctly simultaneously with an eye(s) turning inward, prism lenses can assist as it bends light for an object that can appear to be in another location. These lenses also help alleviate symptoms of blurred/double vision. However, it is essential to note that these lenses do not have a correct deviation of the eye going outward and do not treat the actual underlying issue (McGregor, 2014).

In some cases, an eye patch was used to treat CI, but recent studies have shown it to be a less effective method because it causes the uncovered eye to work overtime to converge. It is also known to cause a decline in in-depth perception and profoundly affect the individual's daily life performances (Josefson, 2002). According to the American

Association for Pediatric Ophthalmology and Strabismus, base-out prism glasses also force the eyes to converge by making them work more extensively than they should; therefore, they should only be used for a short duration of time to prevent the eyes from tiring. Although it may help a patient read with its artificial alignment, even with base-in prism lenses, this does not mean that their eye convergence will become stronger on its own (American Association for Pediatric Ophthalmology and Strabismus- Convergence Insufficiency, 2019).

Academic Interventions

Even though therapies are not used inside the classroom to assist students with CI, many teachers do, however, use Marzano's nine instructional strategies for students to be successful in the classroom, which entail notetaking, recall, and visual representations (Almekhlafi et al., 2020). However, when this training is used, a deficit in those areas remains unanswered in the public-school system.

Acknowledgment of this disorder being a problem in the public-school system encourages awareness and allows understanding of the issue to be considered for a resolution, intervention, or treatment. However, there is little to no current literature in the past 40 years that discusses how students with CI can be educated in the public classroom, nor instructional strategies widely known for the teacher to follow that can be done in the classroom to assist students with CI or visual-motor challenges. In a survey within the private sector (i.e., Schools for the Visually Impaired/Blind) investigators, Koehler and Wild (2019) found tactile material and large print to be most often used to assist students with visual impairments. However, this study does not focus on both the

visual and motor components. It showed that teachers had very little to no access to specific equipment and materials that could be used to assist students, and appropriate accommodations may not be utilized due to a lack of knowledge and materials (Koehler & Wild, 2019). While there is research on visual impairment by private school educators to support students' improvement in academic performance with instructional strategies for reading, the scholarly community needs to investigate the visual deficit subcategory convergence insufficiency and how it relates to the public sector of instructional strategies to assist with reading while writing.

According to the National Interventions for Learning Disabilities, interventions should suit the child's needs with individual differences. Each student has a difference in their strengths and weaknesses; therefore, for an intervention to be effective, the examiner/teacher must build on the students' strengths to assist within their areas of need. Some common interventions that could be used for reading for an individual with a visual processing disorder, such as CI, are enlarged print. With an oversized print, the student may not have to strain their eyes as much, and the words can appear more legible and manageable whether it is my book, worksheet, computer, or paper. Another method that works with younger students is to block out distractions by removal of the peripheral surrounding while encouraging focus on the point at hand. To improve writing, one can add structure by darkening the lines of the paper, using raised lines for kinesthetic learning, modifying worksheets for a more controlled focus, and dividing the paper into large sections to differentiate topics may also help. Even more important is the teaching style. The teacher(s) can assist a student in various ways, but the key is being aware of

their strengths and weaknesses and monitoring their abilities progress. For instance, to reference work written on the whiteboard, the teacher may additionally read the information aloud or have given the student with visual processing disorder notes as a means to accommodate their learning (National Center for Learning Disabilities, n.d.).

Summary

There are two to three students per class set of 30 with CI in each general population inclusive classroom setting. This disorder was characterized by abnormal eye deficits that cause an adverse effect on a student's academic performance. Although CI is a common disorder, it is not well known by public school teachers, which results in a lack of knowledge on how to assist students with disabilities. Typically undetected, binocular visual deficits are often confused with learning disabilities due to their symptoms or lack thereof (the ability to read far away). It is vital for educational professionals to recognize/identify if there is a lack of focus or a visual deficiency for interventions to be geared towards assisting them effectively. This disorder is not easily identified by a general exam and is often undiagnosed or misdiagnosed; however, treatment plans are available to manage symptoms. The two most common types of therapy are office-based and home-based approaches. Occupational therapy is also an option to assist with visual and visual-motor impairments. In recent years, a school-based approach has also been found effective. Each form of intervention shows progression over time; however, there were no known approaches for special education teachers to use in an inclusive classroom setting. Although teachers understand their role is to accommodate students and instruct them by providing an individualized education plan, not all plans mention

this eye disorder. Therefore, teachers are left to adjust and find what works best for students based on their knowledge and experience. This study aimed to explore instructional strategies inclusive special educators use in classrooms to assist students with visual-motor deficits. This study aimed to determine if extensive professional training is needed to prevent students from falling behind or regressing each year.

Research Question(s): What instructional strategies do special education teachers use to assist students who have CI with visual-motor deficits? How do instructional practices for visual deficits assist students with notetaking as perceived by special education teachers?

The ULD is the conceptual framework that explains the multimodal representations of content engagement and access by which disabled students may be supported in their learning using different types of strategies in each classroom.

While Chapter 2 discussed background information for the research, Chapter 3 is the breakdown of methods that were used to conduct my study to determine the techniques that are used to assist students with visual-motor deficits such as CI. The research methods included provide a roadmap in answering the RQ questions.

Chapter 3: Research Method

The purpose of this qualitative study was to explore special education teachers' perceptions on the instructional strategies used in an inclusive general population in high school to assist with notetaking for students with CI to determine if professional development is necessary. There are no general inventions set in place in the public school system to assist visual-motor deficit students from systemically falling behind academically each year. I performed a study in southeast Georgia at a public high school. This school has nearly 2,000 students between Grades 9-12 with a 19 to 1 teacher ratio. Thirty-seven percent of students in the school have scored under proficiency on standardized test scores in reading. To better understand what instructional strategies the teacher uses and why, a qualitative research method provided the opportunity to explore the educators' experiences with students having difficulty with notetaking due to a visual-motor deficit. Chapter 3 discusses the research design rationale, methods, data collection, data analysis, and ethical considerations.

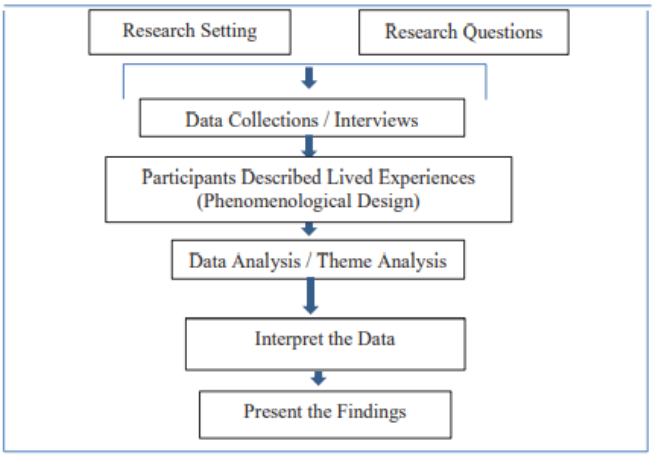
Research Design and Rationale

A research design refers to the different strategies used in a study to answer the research question, and the rationale is the justification for conducting the research (Moran & Carroll, 2020). A good qualitative research question will inform and extend knowledge through exploration. It includes relatable inquiries to guide and explain the issues of the study (Cresswell, 2016, 129). To answer the research questions, "What instructional strategies do special education teachers use to assist students who have CI with visual-motor deficits?" and "How do instructional practices for visual deficits assist students

with notetaking as perceived by special education teachers?" I used a qualitative research approach. The strategies listed in Figure 4 were used in this study to design my research: the research setting, research questions, data collections, described experiences, data analysis, interpretation of the data, and presenting the findings.

Figure 4

Qualitative Research Design Strategies



A phenomenological research design was specifically used to investigate strategies used by teachers in a public school system. The phenomenological approach was parallel to the research purpose, focusing on lived personal experiences (see Capp, 2017; Reiter et al., 2011). The phenomenon of interest created alignment and found relevant information to the theory to explore, describe, or understand the information (Neal, 2020). A phenomenological approach helped me understand the methods special education teachers use for the characteristics of CI and explore the various methods used in the classroom to support symptomatic individuals. An in-depth interview allowed me to ask open-ended questions to uncover detailed information and extend an investigation

for concern or strategies more in-depth when using this process (Reiter et al., 2011). This approach allowed me to interview the participants and utilize follow-up questions to obtain a more detailed outlook for the study. In using the phenomenological approach, I also viewed the participant's nonverbal language and their verbal responses. It challenged me to be more observant and receptive (Reiter et al., 2011). Other design choices were not conducive to this study to gather teachers' perspective experiences (Braun & Clarke, 2013). Though designs such as narrative research, case study, ethnography, and grounded theory all involve collective interviews of the participants, a phenomenological analysis was more suited for this study to explore lived experiences from multiple people.

Roles and Responsibilities

The role of a researcher can vary per individual skill; however, a good researcher should maintain a critical mind, perseverance, communication skills, and be non-biased. In addition, a good researcher requires the ability to comprehend problems and keep an open mind to others' understanding of the problem (Rumman & Alheet, 2019). Therefore, I carefully explained the study, eliminating biases and conducting interviews according to the design. It is also important to note that I did not interview any teachers I have a personal or professional relationship with to prevent biases and influence decisions to participate.

The role of the participants required the teachers' awareness of students who are potentially at risk academically and the ability to perform accommodations as they differentiate instruction. Inclusion is a term used to describe the incorporation of students with disabilities and students without disabilities learning the same content in a general

population setting. Special education teachers co-teach and collaborate with general education teachers to teach everyone in the classroom through planning. During planning, the components of student abilities, methods for incorporating a standard, and strategic strategies support the varied learning styles of all students. Although many public educators in an inclusive classroom may not be aware of CI, their primary role is to accommodate the students. It can be done by assessing the student's abilities (i.e., strengths and weaknesses), determining their academic needs, developing plans to meet students' needs, and implementing them. Their job is also to manage behavior, differentiate, and be flexible (Mah Tjun Lyn et al., 2020).

Additionally, the teacher should plan activities that will help teach the child, implement IEP, monitor progress, and collaborate with other teachers, administration, and parents on how to best help the student. Special educators typically find the students with disabilities are the most vulnerable. Supporting students of this classification is why most special education teachers chose the profession. Understanding their vulnerability, the service educators provide will significantly impact young scholars and society (Gavish, 2017). To accomplish meeting the goals of students, additional professional training is needed (Blandul & Bradea, 2017). Conclusively, the extra training made them feel more competent with essential skills and their continuing efforts in assisting all their students' disabilities and abilities.

Research Methodology

This research study focused on the experiences of inclusive special education teachers. The qualitative method phenomenological approach guided my investigation on

instructional strategies used by teachers at a public school system. This approach encouraged me to meet and observe the participants and develop a rapport during our dialogue.

In the interview process, the construct of questioning to facilitate semistructured interviews were thoughtful, carefully prepared, and flexible with my questioning. The interview process allowed me to develop a meaning for the participants' experiences (Kallio et al., 2016). Open-ended questions set the tone with the participants in a virtual conference via Zoom for collaboration and elaboration. Zoom allowed me to observe the facial expressions and interact with participants on a semi-formal basis while maintaining safety during this pandemic season. The participants were sent a copy of the questions a week before the interview. The participants' responses were recorded during the interview, using audio recording and transcription. Analyzing the data was followed with the use of open coding. A qualitative data analysis program called Coding Analysis Toolkit (CAT) was initially the tool I used; however, Atlast.ti was used to annotate and code raw data. A Microsoft Word document was also used to highlight the transcriptions with the input of the teachers' responses represented in categories to compare data (Cascio et al. 2019).

Participant Selection Logic

Primary data collected from employees of an educational institution in Georgia was the leading information resource. Because the problem of the study focused on instructional strategies related to deficits, it was befitting to analyze the responses of special education teachers specifically. The problem aligned with the role of the teacher

because special education teachers provide accommodations for students with disabilities, learning and behavioral challenges, social-economic problems, and cultural disadvantages (van Garderen et al., 2016). The selection of participants was on the recommendation of the special education department chair. Verification of the candidates' experience and qualifications for the study assisted in determining if they would be a good fit. A follow-up email was sent to all candidates afterward. After the follow-up, 20 selected candidates participated in the interview process.

In this qualitative research, sampling was deliberate and purposeful. A criterion sampling highlighted the predefined criteria and experience of being a special education inclusive teacher. However, their actual experiences and characteristics such as age, number of years teaching, race, gender, or education level may differ. Phenomenological research typically required less than 10 participants; however, the sample size can vary, especially when the content analysis is involved (Moser & Korstjens, 2018). To develop a rich understanding of perspectives for this study, an anticipated total of 20 participants was the goal. However, this number would have decreased if saturation was met early on. Research revealed that more than the recommended 10 participants can have an insufficient sample size that affects a study's trustworthiness, validity, and generalizability. Conversely, having more than the recommended can decrease biases and increase reliability of the data (Vasileiou et al., 2018).

The criterion on which the participation selection was based for this qualitative methodology was called inclusion criteria. The inclusion criteria guided potential participants referring to characteristics one must-have for consideration (Patino &

Ferreira, 2018). One inclusion criterion was that participants have served as special education teachers for at least 1 year and be employed for the school. In addition, the teacher must possess a special education teacher certification by the state. Another inclusion criterion was for the educators to have taught in an inclusive classroom because it can address accommodations provided for a lucrative number of students in the setting other than only students with disabilities generally in a self-contained classroom. Establishing such a criterion assured that the participants have substantial experience and know-how to address the research questions and provide the necessary information (Patino & Ferreira, 2018). The participants were known to meet the criterion as it was presented to the department chair for special educators and based on their suggestion.

There are specific procedures for how participants were identified, contacted, and recruited. Firstly, the director of testing and research provided me with permission to access the population. Next, potential participants were identified by request of the special education department chair, allowing me to facilitate the dissemination of online inquiries. Following the department chair's suggestions, potential participants were emailed to determine if candidates are appropriate for the study. If selected, the participants were to receive an email to inform them of their candidacy. The online correspondence also entailed a clear state of the research and its purpose, criteria for eligibility, informed consent, time and date of the study, and contact information for all parties interested. Lastly, a week before the study, the participants received a list of the interview questions that were to be asked to prepare them for what is to come.

Instrumentation

The instrument used for this qualitative phenomenology study is inquiry-based interviews. The interviews were semistructured to solicit detailed perspectives from the interviewees. Participants responded to each question freely to discuss the topic's account of how they experienced it. In utilizing the semistructured interviews, additional detailed follow-up questions were also asked to understand the phenomenon better. Though qualitative semistructured interviews consider the interviewee's experiences, it also allows the researcher to conduct formal or semi-formal questioning while the researcher observes the facial expression and body language of the participants (Kallio, 2016). Moreover, because face-to-face and online interviews are more personal than surveys, I was able to establish a rapport with the participants.

Semistructured interview questions were used in this study to tailor to interviewees' lived experiences and knowledge. In addition, open-ended questions were used in the study to explore the perspective of secondary inclusive special educators. Open-ended interviews can answer who, why, what, when, where, or how questions as a basis for questioning or as a follow-up to fully understand the interviewee's perspective. With this instrument, I was also able to include probing techniques both verbally and non-verbal by allowing them to think aloud (Kallio, 2016).

The protocol for the interview was essential in providing a detailed and rich understanding of the participant's experiences. An interview protocol comprises four phases: alignment of research questions with the interview questions, inquiry-based dialogue, feedback intake, and piloting the interview (Castillo-Montoya, 2016). The first

step for the interview procedure for this study was to design questions based on who, what, and why I am interviewing them. For this study, my questions were to explore special education teachers' perceptions on the instructional strategies used in an inclusive general population in high school to assist with notetaking for students with CI. To elicit an inquiry-driven dialogue with the participants, I constructed questions asking about types of interventions or methods used, why, and their effectiveness to improve students' visual-motor challenges to align the interview questions with the research questions and purpose. The preparation of questions supported the research, and considering follow-up questions allowed the investigator to stay on the script to gain additional data relative to the study (Castillo-Montoya, 2016). Questions were sent to participants before the interview, and feedback questions were asked for reliability and trustworthiness after the interview.

As part of the interview protocol process, conducting a pilot study allows the researcher to examine the interview questions (quality, reliability, and time) on a trial basis (Castillo-Montoya, 2016). Testing the feasibility of an approach is a crucial component of the main study as changes can be made to reformulate the questions to create a stimulating and relevant dialogue with the participants (Castillo-Montoya, 2016). Because this suggestion increases the reliability of the interview questions, although it implemented a lengthy delay of the actual research and wasting data, I conducted a pilot study. In the pilot study, interview questions were created to align with a research question and generate detailed, thick descriptions of participants' experiences.

In addition to the interview questions before the actual interview of the

participants, consent was given to each participant. The document also included the purpose for the interview, interview procedures, and request permission to audio-record the conversation. The audio-recording device was used as a data collection instrument and source. Using such a device allowed the research to focus more on what the participant is saying as an active listener and create a flow if follow-up or probing questions are asked during the conversation. In addition, eye contact was maintained during the interview, and it was replayed for a more accurate recall for data analysis (Gray et al., 2020). The audio recordings were transcribed using a talk-to-text software called Otter.ai. Otter.ai allows data from the audio to be scripted onto Microsoft Word with a quick and easy transfer (Bakker, 2017). The data were then analyzed with the use of open coding. A qualitative data analysis program called Atlast.ti would then be used to initially and efficiently annotate and code raw data inputting teachers' responses into categories to compare data. Using Atlast.ti enabled data to be analyzed using more extensive data sets while being efficient, valid, dependent, trustworthy, and reliable (Cascio et al., 2019).

Pilot Study

A pilot study was conducted to assess protocols of the phenomenological qualitative research and recruitment strategies. Researchers Hassan, Schattner, and Mazza describe a pilot study as a crucial stage to identify possible complications, problematic areas, or insufficiencies in the research instruments before carrying on with the study (2006). Implementing the pilot process can also lead to the familiarity of procedures as the full scope of the study proceeds (Hassan, Schattner, & Mazza, 2006). For this study,

to determine the feasibility of the protocol, the recruitment of two participant required an inclusion criterion for the subjects to be an employee at the school, to hold a special education certification, to have taught in an inclusive classroom, and service special education students for at least one year. The special education department chair was asked to recommend potential candidates that fit the criteria or asked if he/she would participate if they fit the criteria. The eligible participants then receive an email to inform them of candidacy if they would like to participate, followed by an explanatory statement of the research, its purpose, and a consent form. The first participant was asked a series of open-ended, inquiry-based questions in a semi-structured interview via Zoom conference call. The interview questions were aligned to address the research problem and questions on the types of interventions or methods teachers use to assist students' visual-motor deficits while in the classroom.

The initial interview questions that were asked are listed in Appendix D. Follow-up questions were also asked to support the research further. For the second participant, these questions may be reformulated, eliminated, or additional questions may be implemented based on the flow, responses, and richness of the data towards answering the research questions. However, no changes were made to the interview questions. During both interviews, with the participants' permission, an audio recording of the study was made. For insurance, a hand-held tape recorder (or Dictaphone) was also used as a backup for technical challenges. I used Otter.ai to transfer talk-to-text onto a Microsoft Word Document. A copy of this document was sent back to the participant for an accurate review. Once verified as accurate or once the transcript was amended, to analyze

the data, I then use Atlast.ti to annotate and code the raw data putting the teacher's responses into categories to determine the instrument's reliability.

Conducting a pilot study allowed me to gauge the time of the interview, identify problematic areas for amendments to be made, and determine if the data analysis tools are conducive for the study. The pilot study was relative to the main study as it provided a foundation for familiarity with the questions for flow and enhanced engagement practices. The pilot was also a baseline to determine if the implementation for issues such as comprehension of questions or the sequence for questioning is needed (Hassan, Schattner, & Mazza, 2006). Additionally, the pilot study related to the main study because it provided me with information to examine if further questions should be stricken or added for a thicker, rich, detailed response of participants' perspectives.

Procedures for Participation

The department chair of special education educator of the school(s) was notified of the study. Based on the selection criterion, a list of recommended participants was asked for recruitment. This study will select 20 special education teachers at a secondary high school. Two other secondary high schools in the area were considered to interview teachers if more participants were needed due to lack of participation unless saturation is met. After receiving confirmation of the names and emails of the teachers, they were contacted regarding the study. Via email, each teacher received an invitation letter explaining the study and asked if they would like to participate in the study. The email included that teachers replied to email to confirm Informed Consent. An attachment of the interview questions was also included in the email. Before the study began, the

participants were given research information, its purpose, process, terms of confidentiality, the option, and advantages of participating in the survey, and the option to withdraw. To determine the prospective participants, the teachers actively consented to the document by replying to the email. This reply documented a copy of informed consent with signature and willingness to participate. I sent a follow-up email welcoming participants, listing the time and date of the interview, and attached a list of the interview questions for preparation beforehand.

As mentioned in the previous paragraph, the subjects were sent a list of interview questions via email prior to the meeting date. The interviews were held via Zoom conference call. According to Gray et al. (2020), Zoom is a program using video conferencing software that allowed individuals to communicate in real-time through video imaging and audio. It is an excellent alternative to a face-to-face interview because the researcher and interviewee can still interact digitally and personally while developing a simulating rapport (Gray et al., 2020). Each interview was held one at a time with the researcher and one participant. An audio recording was used via Zoom, and a tape-recorder was used as a backup plan in case there are technical difficulties or disturbances (Gray et al., 2020). The duration of the conference call was approximately 20 minutes long. All interviews were completed within three months. Following the interview, a closing statement was provided to let participants know the study has ended and thank them for their participation. Once interviews were complete, member checking was conducted. Member checking entails returning the responses of the participants to them to ensure that the information transcribed is accurate and that no further implementations

to the data are necessary (Carlson, 2010). After the audio was transferred into a written script for this study, I emailed participants their responses for accuracy. An additional email was sent to all participants via email attachment after the interview. Contact information for questions or concerns, an offer of results when the study is complete, and references for participants to discover more about the topic were emailed after the interview. A formal debriefing form will not be used in this study because no deception will be involved (Allen, 2017). Interviews were concluded after three months, and no post-follow-up was necessary.

Data Analysis Plan

This qualitative study aimed to investigate the instructional strategies used by educators to assist students with visual disabilities, such as Convergence Insufficiency. The following strategies were used in this study to collect data for my research: Observations, protocols, interviews, audio recordings, transcripts, and coding and analysis (Busetto et al., 2020). The interview addressed the following research questions: 1- What instructional strategies do special education teachers use to assist CI students with visual-motor deficits? 2- How do instructional practices for students with visual deficits assist students with notetaking? The responses from the interview were tape-recorded and transcribed. The analysis process should not be performed without a written transcription (Braun & Clarke, 2013). The data collected from the interview was observed and analyzed using an open-coded transcription. The transcription was put into categories and validated.

Procedures for data collection included coding. Data collection for the study

consisted of open-ended interview questions, tape recordings, and transcribed files that used. Participants were asked questions via Zoom conference call. Data from the participants were assessed on instructional strategies used inside the classroom. The interviews were conducted in the participant's natural or preferred setting. The data collected was raw and considered primary. Otter.ai was used to transfer the audio into a script, and data was transferred onto Microsoft Word (Bakker, 2017). An analysis of the interview questions was then coded. The results of the coding were recorded and categorized for each subject.

Data analysis software will be used in the data collection process to code the participants' responses. Utilizing coding analysis Atlast.ti allowed me to categorize the participants' responses to look for patterns. The organization of the information brought meaning to the data (Provalis Research, 2021). Atlast.ti initially and efficiently annotate and code the raw data to input the teacher's responses into categories to compare data. Using Atlast.ti enabled data to be thematically analyzed using more extensive data sets while being efficient, valid, dependent, trustworthy, and reliable (Cascio et al., 2019).

Member checking was used to increase credibility. The participants returned a reply about the transcripts to ensure that the data is correct. Member checking also increased validity, credibility, confirmability, and trustworthiness (Carlson, 2010). To further enhance trustworthiness, an audit trail was documented for the entirety of the research. In addition, an audit trail provided confirmability to the research. This approach illustrated the findings that include the subject's perspectives, data collection methods, and an analysis of the information (Carcary, 2020). In this study, the audit trail was a

great tool to describe how themes were coded and rationalized, clarify results, and be used for replication. The audit trail combined with member checks and the data from the interview itself were all used to assure the validity of the research through a triangulation process. Triangulation corroborated evidence using multiple data sources to authenticity and enhances the trust of the conclusion (Ramsook, 2018). In this study, there were three methods checked against the other. Using more than one source in such a manner facilitates validating the authenticity of the information, providing an in-depth understanding, and creating a comprehensive, rich, accurate, and credible report (Ramsook, 2018).

Issues of Trustworthiness

Validity

Suter (2012) described an essential component in qualitative research as validity. Validity refers to the accuracy of what is being measured. Trustworthiness in the conclusions or results is the researcher's goal. Therefore, establishing trust within the conclusion should be credible, confirmable, dependable, and transferable (Suter, 2012). For this study, bias from the researcher was controlled, and there were consistency checks from the participants to see if the information from the transcription was accurate or should be modified in the research study to achieve validity. Finally, consistency across subjects was also promoted and identified to increase validity. Empirical confidence of the data was found by research when the data repeats and no additional data was reported. This term is referred to as saturation, and it can provide validity in qualitative research (Saunders et al., 2018).

Trustworthiness

Suter (2012) noted that triangulation could increase trustworthiness, including interview transcriptions, member checks, and an audit trail. All three were used for this research study. Triangulation requires multiple data sources to enhance the trust in the validity of the conclusions. The first method that was used to ensure trustworthiness is interview transcripts which provide a detailed account of events and thoughts during the interview. Member checking, used afterwards, provided validation to the data as the review of the interpretations made are accurate. Finally, an audit trail provided the roadmap of steps taken from the beginning to the end of the report investigated in the study (Suter, 2012).

Credibility

Credibility goes hand and hand with trustworthiness. Suter (2012) states that credibility can be met with the validity of data and strong evidence through the triangulation of multiple resources used. The data quality for this study was enhanced by organizing information utilizing an audit trial, transcriptions of coding from interviews, and member checks. In the transcripts, coding provided recurring themes, which entails data reduction. A data display of the rechecked data from the participants and the audit trail was included in the findings to increase credibility (Ramsook, 2018). Noting if saturation was met and developing a conclusion of the findings was also used to test the findings' validity. Additionally, a peer review consultation with the research team was also conducted to promote credibility and trustworthiness in the study (Suter, 2012).

Transferability

According to Suter (2012), research findings can be generalized across various participants. For this study, special education teachers were the participants. However, they can be substituted for general education teachers, the situation could focus on reading rather than notetaking, and the groups could also be changed from convergence insufficiency to one such as amblyopia. The data was understandable and detailed for reviewers to evaluate the findings to ensure transferability. Additional findings for this research study are applicable (Suter, 2012). The audit trails also provided clear and concise steps to how the data sources and analysis will be collected from beginning to end of the research, which allows the study to be repeated (Ramsook, 2018).

Dependability

Dependability is the stability of research and ensuring alignment was maintained (Ramsook, 2018). Evidence in this study provided dependability throughout the study to support the research. The research problem, purpose, theoretical framework, research question, methods, and design all aligned with the study to increase dependability. Audit trails, transcription, and triangulation were also used to enhance dependability. Dependability can also be increased by having an additional researcher audit the research (Suter, 2012).

Confirmability

According to Ramsook (2018), confirmability refers to the meaning of the participants and their likeliness to repeat the action or responses. Confirmability was the objectiveness within the study. It was used to control or eliminate biases. In this study,

the data remained neutral, and triangulation and coding were implemented to demonstrate the findings. After interviews, audio recordings were scripted and returned to participants for accuracy before being coded. An inquiry audit was also utilized as confirmation that the research is accurate (Suter, 2012).

Ethical Procedures

Ethical procedures refer to the scientific integrity of societal rights and wellbeing (Sivasubramaniam, 2021). Therefore, before conducting research, obtaining approval was essential to ensure that the study is legitimate, relevant, and protected by all parties. Approval of a study was obtained through the Institutional Review Board (IRB). The IRB is designed to review and make certain ethical principles met to ensure participants' welfare is protected (Jenn, 2006).

For this qualitative study, data collection was obtained only after confirmation from the IRB and board members from Walden University. Once approved by the IRB, additional approval from the school board testing department and principal were necessary. After approvals were in place, each participant was emailed. The email introduced the study document the purpose, problem, and nature of the study. It also included an attachment with the research questions and a request to reply for informed consent. Individuals that responded to the email gave their consent and were contacted with next steps. According to Sivasubramaniam (2021), informed consent is significant to the research process as it informs potential participants about the central components involved in the research and ethical considerations.

After approval was met and participants voluntarily signed the informed consent,

the interview process began. Participants had the right to withdraw from the study anytime throughout the study (Sivasubramaniam, 2021). The interviews were conducted over three months using a one-on-one procedure for privacy. No students' names were added to the data nor reported, and the teacher's names remain confidential. According to Nijhawan et al. (2013), a confidentiality statement should be made in the informed consent document and a description of viewers who can access the records. Therefore, data was anonymously analyzed for this study and assurance that no harm will be provided to the participants. Nijhawan et al. (2013) stated that any risk, no matter how minimal, should also be explained as the informed consent, and if the patient is undergoing any discomforts, the patient has the right to discontinue. All data received from the study was maintained and held in a locked isolated area for five years. In addition to autonomy, wellbeing, and confidentiality, it is also a principle to treat all patients equally and fairly (Harris & Gilbert, 2022). All patients involved in this study deserve respect, fairness, and equitable rights, which was implemented during the study.

Summary

During the research, various elements were used to explore inclusive special education teachers' instructional strategies to assist students with visual-motor deficits, such as CI in notetaking. Qualitative research was implemented to understand what educators use for in-depth information thoroughly. In the qualitative research, the phenomenological approach was used to develop an understanding of their techniques and methods of support. Open-ended questioning in a semi-structured interview was most appropriate to answer the research questions. The population size consisted of 20

educators in a public school system. Teachers were interviewed via virtual conference call in their preferred natural setting. Before the interview, teachers were provided with an email explaining the study and their option to participate, and a reply for consent to participate was provided to continue with the research process. A list of the research questions was also attached to the email. During the interview process, participants were audio-recorded via Zoom and, as an alternative, tape-recorded if there were technical issues. After the interview, data collection and analysis transferred the audio into written transcripts. The transcripts were converted onto Microsoft Word and emailed, and once participants confirmed their transcripts as correct, they were used for coding.

As member checks were implemented, an audit trail also reported findings from beginning to end. Biases were eliminated to ensure the validity of the research study by only reporting the teachers' responses. Triangulation was used to increase trustworthiness. Triangulation included member checks, transcripts, and an audit trail. Credibility, dependability, trustworthiness, and reliability were gained using the triangulation method's various features. This study was generalized and can be used for future research. Evidence to support the research was included to increase dependability without biases from the researcher and increases confirmability. Ethical procedures were put in place to support the participants and the research.

CI is a common disorder that is not well-known by public school teachers. Visual motor deficits such as CI are typically undetected or misdiagnosed even by common medical professionals. Although teachers may be unaware of this disability, their role is to accommodate students and find the best methods for students based on their

knowledge and experience. This study aimed to explore instructional strategies inclusive special educators use in classrooms to assist students with visual-motor deficits. This study aimed to determine what techniques can assist with visual-motor deficits and if extensive professional training was needed to prevent students from falling behind or regressing each year.

Chapter 3 displays the methods used to conduct my study to determine the techniques used to assist students with visual-motor deficits, such as CI. To answer the RQs, I use a qualitative phenomenological approach to explore special education teachers' methods in the classroom to support symptomatic students. Twenty participants are the anticipated goal to develop a rich understanding of perspectives. A selection criterion for the research participants was put in place. Using the phenomenological approach allowed me to focus on the teachers' personal experiences. The research design assisted me as a roadmap in answering the question. My role as the researcher was to maintain a non-biased attitude during the research process.

With the qualitative method, I interviewed participants using open-ended semi-structured questions via Zoom. Once the interviews were complete, member checking was made. A pilot study was conducted first to determine if there were any problematic areas with the research questions and instruments, with 11 inquiry-based interview questions. The data analysis plan included protocols for audio recordings of the interview and categorizing raw data; then, I coded using Atlast. to analyze.

An audit trail and member checking were used to increase the trustworthiness of the data. Validity, credibility, dependability, and transferability were established along

with triangulation. Ethical procedures were implemented to minimize the risk of harm to the participants. Chapter 4 explained the results answering all interview questions in depth with evidence of the coding.

Chapter 4: Results

The literature review revealed the various treatment plans that were used as interventions for a visual-motor deficit, such as convergence insufficiency. However, no known treatment plans were developed by medical professionals that teachers could use in the classroom. The instructional strategies implemented inside the classroom to assist with a visual disorder were helpful. However, there was little to no information on assisting students with a visual-motor deficit, such as CI, with techniques such as notetaking. There need to be general inventions set in place in the public school system to assist visual-motor deficit students from systemically falling behind academically each year. This study aimed to explore instructional strategies that secondary special education teachers of an inclusive setting use to assist students who struggle with notetaking due to visual or visual-motor deficits known or unknown as convergence insufficiency.

Pilot Study

Two teachers were interviewed to conduct a pilot study to assess the feasibility of the research questions and their processes. In the study, resources such as emails, Zoom, and recording devices were feasible, and the interview duration did not challenge the questions. Zoom allowed teachers to maintain a distance for health concerns, provided convenience for those with a busy schedule, and allowed me to observe their facial expressions when interacting with participants. The participants were also assessed to determine if eligibility criteria were appropriate for the recruitment. Though the eligibility criteria were also useful, the interview questions were fine for the participants. Using open-ended questions allowed the teachers to express their experiences. There was

no issue collecting the data needed, and the process was used for future interviews.

Research Setting

An email was sent to the special education department chair for the email address of special education teachers that could be viable candidates for the study to begin recruitment. An email was sent to all the special education teachers in three high schools in the same county to reach a significant number of participants. Purposeful sampling was used to reduce the number of participants based on the following inclusion criteria. The qualification for the study was for the educator to work as a special education teacher and have at least 1 year of experience in inclusive classrooms. They needed to work in a secondary educational institution and possess a teaching certification from the state. The participants were asked to respond to the email if they wanted to participate. Asking teachers to respond via email made the corresponding process simple and fast for both the teachers and me by eliminating having to schedule additional times to contact them via call or meet before and after the interview. The teachers were allowed to review research questions before the interview.

The interviews were conducted via Zoom conference call. The participants could remain in their classrooms or relocate if preferred to maintain comfort. Interviews were also scheduled based on teachers' preferred timing, before school hours, after school, or during planning when appropriate. The time the study was conducted did not significantly influence the interpretation of the study results. However, it is important to note that the participants who chose to interview plan lost preparation time for lesson planning. Preparation time for lesson plans was essential, especially for teachers needing

to assess student understanding of concepts, assisting students who have fallen below the average in the course during this timeframe, or those preparing students for the end-of-course assessments. Despite the timing, teachers were openly willing to assist with the interview showing a great representation of positivity as a part of their school climate.

Demographics

A total of 20 participants were selected to participate. Thirty potential special education teachers were emailed asking if they would like to participate in the study, but only 22 responded. Two of the candidates that responded were not selected. The remaining 20 candidates were selected to acquire enriched and authentic data to answer the research questions. The participants selected were all special education teachers who worked in an inclusive school setting with at least 1 year of experience. The participants' ages were between 33 and 56 years old. Six of the qualifying interviewees were men, and 14 were women. Thirty percent of the interviewees were from India, 40% were African American, and 30% were Caucasian. Participants were of different ethnicities, gender, and ages, all of which had no bearing on the teacher's ability to answer the questions during the interview. However, the number of years teaching played a crucial role in the teacher's experience with various students and academic interventions implemented. The number of years teaching ranged between 7 and 29 years of service.

Data Collection

In this qualitative study, I used the phenomenological approach to explore instructional strategies secondary special education teachers of an inclusive setting use to assist students who struggle with notetaking due to visual or visual-motor deficits known

or unknown as CI. In the recruitment process and the selection of candidates, the participants were asked to confirm their consent and participation via email. Once confirmation was received and validated, notification of selection letters, non-selection letters, and interview questions were submitted. For selected participants, the study process was explained, and a time/date to conduct the interview was developed. The non-selected participants were emailed a correspondence expressing appreciation for their consideration and explained that a sufficient number of qualified participants had been reached.

Twenty interviews were conducted via Zoom conference call lasting 6 to 30 minutes. The interviews were audio recorded via Zoom, tape-recorded, transcribed, and checked for errors by the participants in three months. Two Zoom audio recordings did not properly record, and a tape recorder was used to transcribe the data. The interviews were transcribed through Otter.ai transcriptions. The initial plan in Chapter 3 noted Expressed Scribed as my point of reference to transcribe. However, I experienced problems with the program, so I essentially used Otter.ai as a point of reference to transcribe the interview questions of the study. Confidentiality for participants was maintained throughout the study by numbering the participants.

Data Analysis

I copied the data from Otter.ai onto a Microsoft Word document to document transcripts. Before analysis, member checking was conducted to verify the data with the participants before extensive review. After participants specified changes if needed and confirmed the accuracy of the data, the coding process began. I used a qualitative coding

toolkit from Atlas.ti to code and analyze the interview data. The raw data of each participant's experiences of instructional practices were used for the qualitative analysis. The coding software allowed me to develop a coding scheme by categorizing the responses of the participants from the interview. The data were analyzed using the data-driven open coding process. Open coding allowed me to develop themes based on the review of the transcripts using words or phrases that are meaningful and relevant to the research (Braun & Clarke, 2013).

Specific data were reviewed, selected, and evaluated using Braun and Clarke's (2013) six-phase process. The first phase was to become familiar with the data. The recordings and transcripts were reviewed carefully, and keywords/phrases were highlighted. After familiarizing myself with the data, Phase 2 is when I highlighted and generated initial codes determining which were most relevant to answer the RQ questions. Next, I categorized codes into subthemes, which are generated into Phase 3 themes. In Phase 4, I conducted a recursive review of potential themes by addressing the following: theme or code, theme quality, theme boundaries, meaningfulness (thick or thin), is a lack of coherence. After subthemes were developed, the theme was then generated. Phase 5 allowed me to define and name the themes as it was relevant to the UDL framework. Lastly, Phase 6 includes reporting the findings after the final inspection of the data was written (Bryne, 56, 2022).

Results

After collecting and transcribing the data from the interview, I coded it into categories on Atlasti for analysis. The data analysis resulted in specific interviews special

education teachers use to assist students with visual or visual motor deficits such as CI in notetaking. The two RQs addressed in the study were as follows:

1: What instructional strategies do special education teachers use to assist students who have CI with visual-motor deficits?

2: How do instructional practices for visual deficits assist students with notetaking as perceived by special education teachers?

To answer RQ1 and RQ2, 11 interview questions were presented to participants and answered in the following sections.

Research Question 1

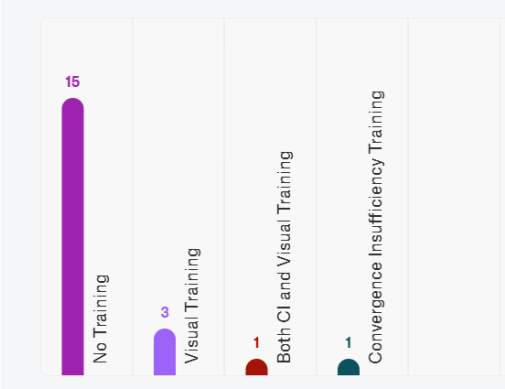
Data collection from participants answered Interview Questions 1 through 7 for RQ 1. Three themes were used: knowledge of visual deficits, interventions, and resources.

Theme 1: Knowledge on Visual Deficits

Interview Questions 1 and 2 were asked to determine how knowledgeable teachers about visual deficits were. Theme 1 had four categories: CI training, visual deficits training, both CI and visual deficit training, and no training (see Figure 5).

Figure 5

Training for Visual (Motor) Deficits



In Interview Question 1, the participants were asked, “Have you received any training or professional development in teacher students with convergence insufficiency?” and “How often/How long ago?” Two participants stated they had received training. Participant 12 received training more than 20 years ago from a different state, and Participant 1 received training in a different country. The remaining 18 participants (90%) needed to learn what convergence insufficiency was.

Interview Question 2 asked the participants, “Have you received any visual or visual-motor deficits training?” and “How often/How long ago?” Four of the 20 participants (20%) reported having received training in visual or visual-motor deficits. Participant 2 received training more than 5 years ago, Participant 12 more than 20 years ago, Participant 15 received limited training more than eight years ago, and Participant 18 received very little training more than ten years ago. Participants that received training believed “a refresher of information would be beneficial”. The remaining 16 participants (80%) reported not to have received any training on visual or visual-motor deficits. See Table 1 for participants’ CI and visual training responses.

Table 1

Participants Responses to CI and Visual-Motor Training

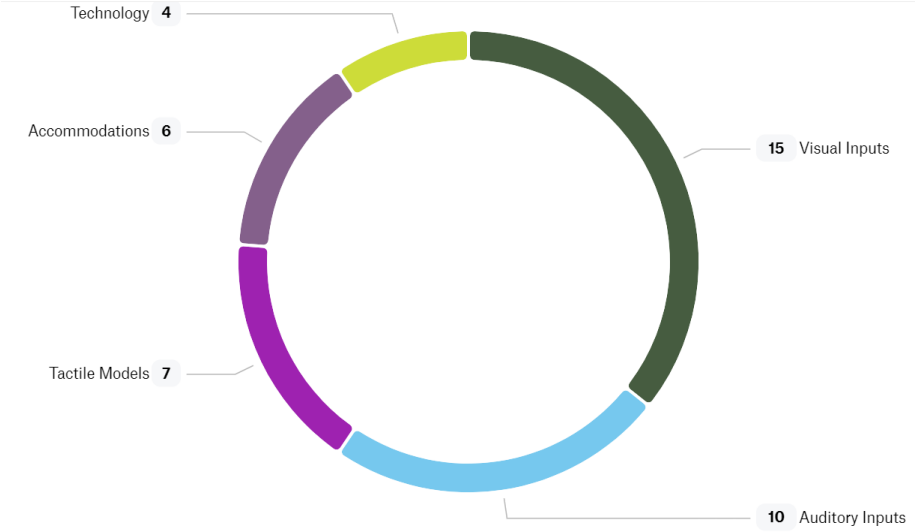
Participant	Yes, Some Training	No Training Obtained	If yes, How long ago, How often?
Teachers with CI Training	2	0	"I received CI and visual training more than 20 years ago when living" in a different state. In another country, "I received about 3 to 4 trainings"
Teachers with Visual Training	3	0	"5 years ago, working in" another country. "Limited trainings more than 8 years ago"
Teachers with No Training	0	15	"Not any formal training. However, there are certain things to help out with students to have visual issues" "No, I have not received any type of training, no formal training of helping students with conversion insufficiency" "No, I have not received any type of training"

Theme 2: Interventions

Interview Questions 3 and 4 were asked to determine teachers' interventions to assist students with a visual deficit, such as CI. Interventions were labeled the second theme, with three categories: learning styles (coding: tactile/kinesthetic models, auditory inputs, visual inputs); educational technology (coding: computer-based programs, technology, and multimedia technology learning); and other (coding: cooperative learning, expressive learning, and accommodations; see Figure 6). In Interview Question 3, the participants were asked, "What are the main interventions you used the most (or would use) to accommodate students with visual/visual motor challenges?"

Figure 6

Interventions to Accommodate Visual or Visual-Motor Deficits



Visual inputs are the interventions that were mainly used or would be used by participants for a student with a visual deficit. The data show that 75% of participants used or would use visual inputs (i.e., large print, color-coded words, guided notes, zoom, closed caption, and a 20-inch monitor). Large print was the primary method that participants reported using, would use, and be the most helpful because it allowed students to read the information themselves. Auditory inputs were also commonly used with more than 50% of the participants (i.e., text-to-speech, speech-to-text, read-aloud, audio playback, line reader/digital line reader). Tactile models (i.e., textured/bumpy paper, sticky notes, highlighter usage, and braille) were shown to be used or would be used by 35% of the participants. Accommodations (i.e., lighting, preferential seating, glasses, extra time, repetition, reteaching, and recommended checklist) were used or would be used by 30% of the participants. Participants were least likely to use technology

(i.e., computers to type, computer programs used to teach, and using graphics and annotations).

As a follow-up question to Interview Question 3, participants were asked, "What methods, if any, did not work and why?" Though most participants did not note any interventions, seven of the 20 participants stated their concerns about interventions that may not work to accommodate a student with a visual or visual-motor deficit. Participant 4 stated, "getting a bigger monitor does not necessarily benefit a student with visual/visual motor challenges. Having a bigger screen or zooming in to focus on one thing creates confusion for the students." In reference to interventions that did not work, Participant 5 suggested that

> Too many standards in the curriculum makes it difficult to apply and insert all the necessary interventions and methods for them to grasp the information. Students may not be able to grasp concepts to comprehend the information in a short amount of time.

In response to what intervention that did not work and why, Participant 10 noted,

> Always using technology does not work. Because technology internet can be gone in a minute. I would prefer to have a hardcopy. Students can refer back to a hardcopy, and teachers can give them feedback. It will also eliminate students from looking up all the answers which can hinder their learning.

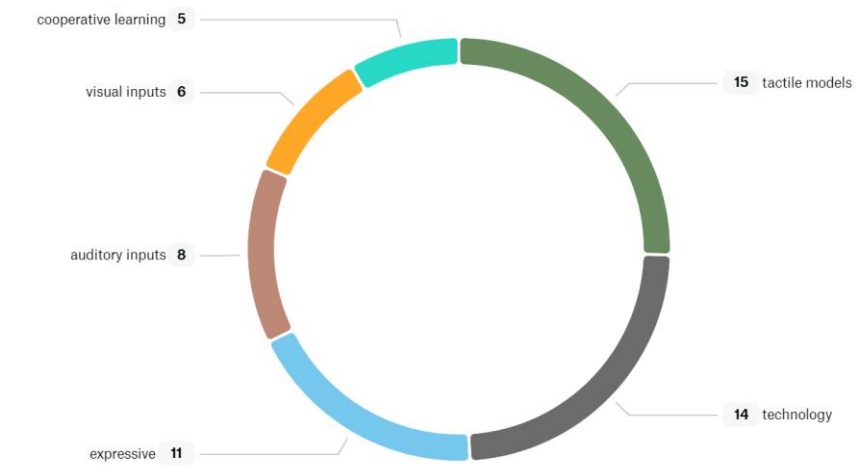
Participant 12 stated magnifying sheets were interventions that did not work well: "Magnifying sheets, especially when coordination isn't there. Technology is a better alternative as it improves." Participant 13's response to interventions that did not work

were guided notes: “Giving notes to students didn’t work. It’s more helpful when they write it themselves. They can retain more of the information rather than them just taking a look at notes given to them and placing it aside.” Participant 16 stated, “The old traditional way to read and answer questions will not work because it takes some students longer to process information and some process it differently than others. Some people have difficulty understanding what they’ve read.” In response to interventions that may not work, Participant 18 initially noted, “none that I can think of” and made a follow-up statement that “braille only helps with those that are severely visually impaired.”

In Interview Question 4, the participants were asked “During instruction, what methods or materials do you use aside from traditional pencil/paper task for student to show their understanding of concepts?” The data showed that aside from the traditional use of paper and pencil, the tactile/kinesthetic model was the most helpful method to assist students with concepts. Participants believed tactile/kinesthetic models to be more helpful because the students can perform a task using hands-on activities, which promotes learning and greater retention than just seeing or hearing about it alone (see Figure 7).

Figure 7

Methods Used Aside from Traditional Techniques



The Tactile/Kinesthetic Model was used by 75% of participants, which includes "acting it out", by create comic strips, using concept maps, creating flipbooks, gameboards, posters, using highlighters, inputting text data, manipulatives, notecards, sticky notes, rattles, touch task, and drawing pictures. Technology was used by 70% of participants, which includes laptop/iPad usage, as well as programs such as Book Creator, Flipgrid, creating videos, Canvas, Nearpod, Storyboard, and computer-based assignments that incorporate a combination of text, videos, graphics, visual or audio inputs. The expressive Model was used by 55% of participants, which includes creating comic strips and caricatures, choice boards, non-symbolic representations, active panels, creating PowerPoint, and learning games. Auditory Inputs were used by 40% of participants, which includes audio clips, verbal expressions, interviews, and oral activities/presentations. Visual Inputs were used by 30% of participants, which includes

large print, resources to review in Canvas, thumbs-up/down, flashcards, and zooming-in/magnifying. Finally, Cooperative Learning was used by 25% of participants, which includes 1-on-1 learning, grouping, small group, peer tutoring, think-pair-share activities, and Nearpod.

Based on the responses to questions 3 and 4, Learning Styles were the most useful interventions used in the classroom. When asked why the preferred methods, the consensus was that the learning style tools help students understand the information quicker, putting less stress on the students while giving them time to process the concepts; students can build on their prior knowledge by using tactile tools as their strengths. Visual aids allow them to make sense of what they see, and auditory aids provide a clear understanding of the information.

Theme 3: Resources

Interview Questions 5-7 were asked to determine the awareness of assistive technology, how to access it, and what teachers want to know to teach students with a visual deficit successfully. Theme 3, Resources, used two categories to answer this question: 1. Learning Styles (coding: visual tools, auditory tools, and tactile tools), 2. Educational Technology (coding: computer programs, multimedia technology, and technology), 3. Other (alternative resources and resources unknown).

In Interview Question 5, participants were asked, What resources are accessible, if any, to assist students with visual or visual-motor challenges? For interview question 5, participants responded to the question to determine what resources they were aware of to assist students with visual(motor) deficits (see Figure 8). Forty percent of participants

knew of auditory tools, particularly text-to-speech/speech-to-text, but 2 out of the 8 participants did not know how to access them. Thirty percent of the participants did not know of any resources at all, nor where they can be accessed.

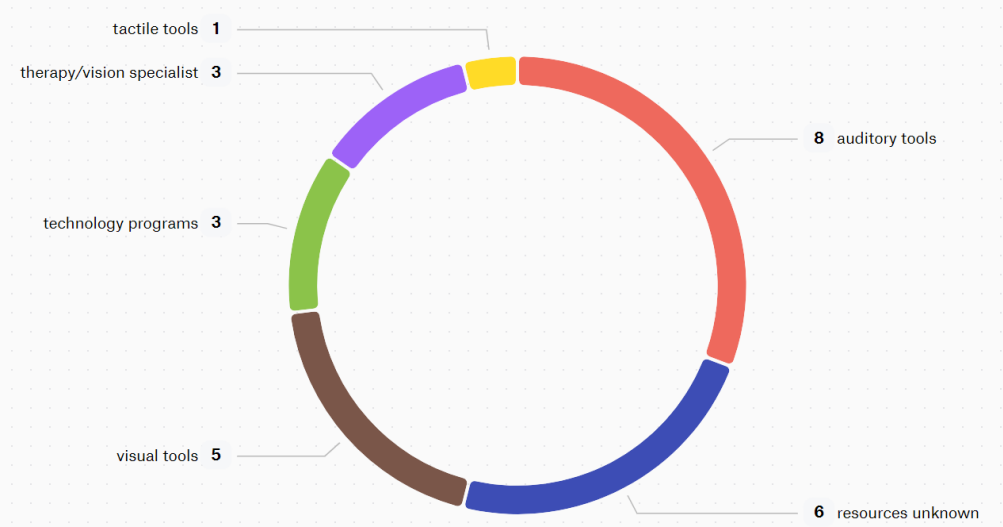
Participant 1 included

> working in a different location, "We had hearing practicals to help students with visual and motor challenges. We had codes for visuals."

Twenty-five percent of participants were aware of visual tools to assist students with visual(motor) deficits, particularly large print, but 1 participant was "unaware of how to perform the operation." Twenty-five percent of the participants explained occupational, physical, and vision therapy as resources, but 2 out of the 3 participants were unaware of the referral process. Five percent of participants knew how to obtain access to tactile resources. Learning styles were the most common resources the participants were aware of, followed by the category Other for resources unknown.

Figure 8

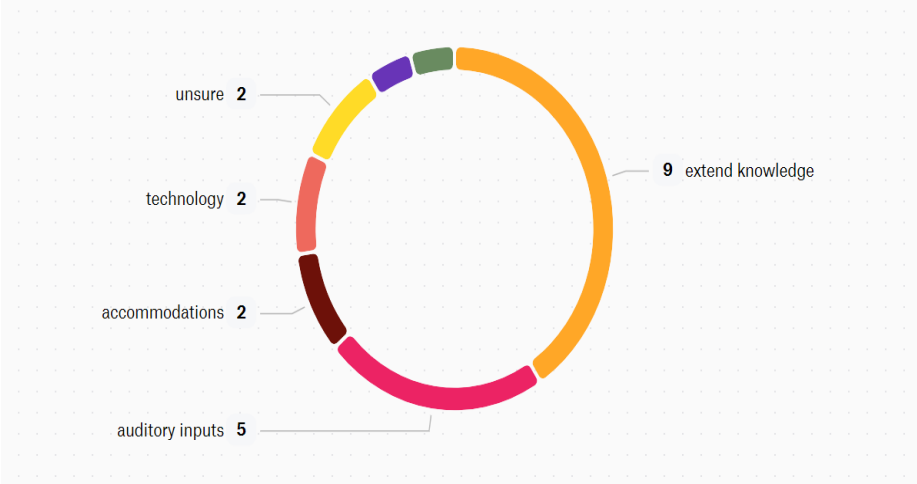
Accessibility of Resources



In Interview Question 6, participants were asked, “What techniques do you wish other special education teachers knew about visual or visual-motor challenges?” For interview question 6, data showed the category Other as the technique most participants wished for (see Figure 9). Listed under the category Other, Alternative Resources was coded, which included 45% of participants suggesting extended knowledge or professional development needed for all teachers, 10% of participants wishing teachers were more knowledgeable about IEP accommodations, and 5% of participants recommending outside resources such as vision therapy. Additionally coded in the *Other* category was Resources Unknown, with 10% of participants unsure of any techniques they would want others to use. Altogether, the *Other* category had more than 65% of participants that either noted more insight with alternative resources such as professional development or adherence to accommodations and those that were unsure what techniques teachers should be aware of.

Figure 9

Wanting to Know More About



Following the *Other* category is Learning Styles, with 30% of participants wishing they knew more about auditory or visual techniques to teach students with visual or visual motor deficits. Lastly, the Educational Technology category was coded at 10% on the participant's wish list for what teachers wanted to know regarding visual or visual/motor deficits. Overall, the results showed that participants wished for professional development, having more time to perform in small groups and give student feedback, and having a checklist on hand (connecting accommodations to deficits) to assist students with visual(motor) deficits. See Table 2 for participants' perspectives on what they wished for teachers to do about visual deficits.

Table 2

Participants' Responses to Techniques they Wish to Know

Participant	Participant's Response
Participant 1	"Know of assistive technology devices. Teachers are unaware of different techniques that can help a child"
Participant 2	"Auditory books, they should know how to increase font size for students to see and read for themselves"
Participant 3	"The same program that allows students to use line readers, read aloud and talk-to-text. It accommodates students and teachers should be aware of it"
Participant 4	"None right now because I don't know of any to use"
Participant 5	"Extend knowledge to the classroom for all teachers (special ed and general ed) for students to be successful"
Participant 7	"I have not seen anyone using visual aids. I would like to see a checklist for teachers to help students. More checklist"
Participant 9	"This is not only the responsibility of the teachers to know, because it should come from the authority, like our department chairs. They should give awareness about what's going on, even what could exist in our classroom, and provide any professional development on that. awareness programs and trainings, and resources, and how to recognize or identify those students in your classroom would be helpful"
Participant 10	"More hands-on training for both students and the teachers"
Participant 12	"We have to be creative in our approaches. People need to ask questions and trying to make do and they don't have to reinvent the wheel. Tap into someone with experience in that area and they may be able to provide suggestions"
Participant 13	"Text-to-speak because I don't really know how to access it. And larger print text online"
Participant 14	"Having training on dyslexia or anything about visual would be helpful"
Participant 15	"Technology has grown significantly making things easier; training on what new enhancements are can maybe increase visual skills for students"
Participant 16	"How to be able to translate information from not just being paper and pencil, but something that being more auditory. Learning how to implement different platforms to be able to convert information that we would normally use this paper and pencil and make it more auditory or make it so we can be kind of more closed captioning that they can hear and see it this way, versus paper and pencil. With it being auditory, they can record it, stop it, go back, rewind it, versus when you're reading something is most kids get frustrated, they got to keep going back and reading again"
Participant 17	"More things to implement in the class to help students. More training is needed on this"
Participant 18	"How to better teach them and what strategies other than large print that can be used"
Participant 19	"There are manuals from the state department that help people identify and provide support for different exceptionalities. Teachers should go through that list of what the state department suggest.

In Interview Question 7, participants were asked "What stories of success can you share?" For interview question 7, participants were asked about any techniques they used for students with visual(motor) deficits and had student success. As shown in Table 3, 40% of the participants did not have any success stories to share, 15% made sure students wore glasses and saw success, and about 5% of the participants stated that parental communication was used to receive students' success with visual(motor) deficits. Despite 60% of participants falling in the unconventional techniques categorized as Other, nearly 35% of participants used Learning Strategies, and approximately 15% of the interviewees used Educational Technology and saw a difference in academic learning with students.

Table 3

Techniques Used for Success

Strategies	Number of Participants	Strategy Type
Learning Strategies	6	Auditory – 1 %; Tactile – 2%; Visual (large print) – 4%
Educational Technology	3	Computer – 0%; Multimedia Technology – 1%; Technology – 2%
Other Supports	12	Glasses – 3%; No Stories of Success – 8%; Parent Communication – 1%

Summary for Research Question 1

In summary, Research Question 1 focused on special education teachers' instructional strategies to assist students with CI with visual-motor deficits. Seventy-five percent of the participants received no formal training to assist students with CI, visual, or visual-motor deficits. The remaining 25% of participants who received some training

shared that the training received was of a different geographic location, being a different state or country. Despite the lack of awareness of best practices to assist students with such a disability, teachers explained their commonly used techniques to assist students with visual or visual-motor deficits. Of the various methods, visual inputs (particularly large print) were used the most by participants to assist students with such a deficit as visual or visual-motor challenges. However, tactile/kinesthetic models were used the most for students to develop an understanding of content. Of all techniques, programs, and resources available, 55% of participants were aware of one or more types of assistive technology, 30% did not know of any resources, and 15% suggested alternative services outside of the school. The generally known resource was the text-to-speech/speech-to-text tool, but only 30% of participants that suggested the tool knew how to access it. Due to a lack of knowledge, most participants needed success stories to share or included unconventional methods (such as having students wear glasses and developing a rapport with parents). Because of this, more than 50% percent of special education teachers believed that training or professional development is necessary to successfully assist students with CI, visual, or visual-motor deficits.

Research Question 2

Research Question 2 asks, “How do instructional practices for visual deficits assist students with notetaking as perceived by special education teachers?”. Data collection from participants answered RQ2 with Interview Questions 8 through 11. I asked participants Interview Questions 8 through 11 to determine the supports teachers utilize to assist students with their visual-motor integration to read, write, and take

adequate notes. Three themes were used: Engaging Practices, Assistance, and Visual-Motor Integration Techniques.

Theme 1: Engaging Practices

In Interview Question 8, participants were asked, "What options do you provide, if any, for learners that need support engaging with reading while writing?". To explore the pedagogy practices of the participants, Theme 1 used three categories (Accommodations, Interactive Learning, and Learning Styles) to code the methods that participants used to support learners with reading while writing. All participants used many techniques coded as follows: 1. Accommodation (coding Assistive Technology, Grouping, and Other). 2. Interactive Learning (coding Graphic Organizers, Real World Concepts, and Interactive Writing). 3. Learning Styles (coding Audio Inputs, Tactile Models, and Visual Inputs; see Table 4). The data showed that 37% of the participants use Learning Styles (specifically Visual Inputs) as the optimal option for teachers to support learners with reading engagement while writing. Visual inputs coded were Copy of Notes/Taking Pictures 13.7% and Making Videos/PPT 9.8%. For the Tactile Model, only 2% of participants used this method to support students, and 11.8% used Audio Inputs (i.e., voice recording, read-aloud, Dictaphone, and audio playbacks).

Table 4

Engaging Practices

Strategies	Number of Participants	Strategy Type
Learning Strategies	19	Auditory – 6% Tactile – 1% Visual – 12%
Interactive Learning	15	Graphic Organizers – 11% Real World Concepts – 3%

		Interactive Writing – 1%
Other Supports /Accommodations	17	Assistive Technology – 4% Grouping – 5% Other – 8%

Although the category Learning Style had the greater percentage of usage, it is significant to note that many participants additionally used techniques within the Accommodations and Interactive Learning categories (see Tables 5 and 6). The Interactive Learning category coded 29% of techniques used included the following: Graphic Organizers (such as portfolios, fill-in-the-blank questions, guided/closed notes), Real World Concepts (such as scenarios/inferences, real-life/interactive questions), and Interactive Writing. The Accommodations category results revealed approximately 33% of participants using the following: 1. Assistive Technology (text-to-speech, magnifying notes, type answers), 2. Grouping (1-on-1, peer collaboration, small group), 3. Other (such as scaffolding, modeling, read-aloud, chunking, progress monitoring, and preferential seating).

Table 5

Student Supports for Engagement

Strategies	Number of Participants	Descriptions
Learning Styles	19	Different styles of learning are used –visual, kinesthetic, reading/writing, and auditory—to account for individual differences in learning for students.
Interactive Learning	15	Actively engaging students in the learning process by including real-world instructional practices, more hands-on materials, and may encompass technology.
Accommodations	17	Assistive technology, accessible seating, alternative format text, alternative instructions to classroom instruction to students.

Table 6

Types of Supports

Strategies	Number of Participants	Strategy Type
Learning Strategies	37.3%	Audio Inputs audio playback- 11.8% Tactile Models sensory motor/touch- 2% Visual Inputs copy of notes/taking pictures- 13.7% making videos/PPT- 9.8%
Interactive Learning	29.4%	Graphic Organizers graphic organizers/portfolios 21.6% Real World Concepts scenarios, interactive questions, inferences- 5.8% Interactive writing collaborative writing- 2%
Other Supports /Accommodations	33.3%	Assistive Technology text-to-speech 7.8% Grouping small group, peer grouping- 5.9% 1-on-1 learning- 3.9% Other Read aloud, scaffolding, chunking, modeling, preferential seating, progress monitoring- 15.7%

The data indicated Visual Inputs as the most used supportive strategy by interviewees. Visual Input is a differentiation strategy used to assist students with their sense of sight and making connections from what they have observed. The Visual Inputs coded by the participants were Copies of Notes, Taking Pictures, Making Videos, and PowerPoint Presentations. While visual inputs are used most often in the classroom by the participants, 13.6% stated that interactive Vocabulary in the lesson worked best for

students, as shown in Table 7. Moreover, 10% of participants noted that students would prefer teachers to include active collaboration, 10% would like teachers to apply real-world applications, 10% want teachers to use auditory playback, and 10% prefer videos in the classroom.

Table 7

Preferred Strategies

Strategies	Teachers Preferred Strategies	Student Preferred Strategies
Learning Strategies (Audio, Tactile, and Visual Inputs)	12	8
Interactive Learning (Graphic Organizers, Real world Concepts, Interactive Writing)	4	8
Other Supports /Accommodations (Assistive Technology, Grouping, Other)	6	4

Theme 2: Assistance

Interview Question 9, "How do you assist students with notetaking challenges?". To explore the notetaking practices of the participants, Theme 2 used three categories to code: (Accommodations, Interactive Learning, and Learning Styles). All participants used many techniques coded as follows: 1. Accommodation (coding Assistive Technology, Grouping, and Other). 2. Interactive Learning (coding Graphic Organizers, Multimodal Tasks, and Organizing Concepts). 3. Learning Styles (coding Audio Inputs, Tactile Models, and Visual Inputs).

The results revealed that the use of Organizing Concepts and Visual Inputs was used most by participants (see Table 8). Organizing Concepts included guided notes, fill-

in-the-blank questions focusing on vocabulary, Cornell notes, chunking concepts, and utilizing a notebook/binder. Participants also used visual inputs often to assist students with notetaking. Visual inputs included giving students a copy of teachers' notes, large print, and color coding.

Table 8

Notetaking Assistance

Strategies	Number of Participants	Strategy Type
Learning Strategies	19	Auditory – 3 % (Recordings, probing questions) Tactile – 9% (Highlighting, drawing) Visual – 12% (Copies, large print, color coding)
Interactive Learning	15	Organizing Concepts – 12% (Chunking, guided notes, graphic organizers) Multimodal Task – 1% (Interactive notebook) Technology – 2% (Online resources)
Other Supports /Accommodations	17	Assistive Technology – 2% (Text-to-talk, typing) Grouping – 1% (Small group, one-on-one) Other – 1% (Incentives)

Although the data showed both organizing concepts and visual inputs being the most selected choice to use by 27% of participants each, giving students a copy of the teacher's notes were generally noted the most. Nine of the 20 participants (or Forty-five percent of the interviewees) explained giving students a copy of teachers' notes as a tool to assist with notetaking challenges. However, in a follow-up question, "How well do these supports work," participants that provided students a copy of their notes generally

explained that it works well for some students because they can focus more on the lesson; however, when the notes are provided for students, they tend to retain less information, and many do not review the copy to study. When asked the method they would use if a student had a severe notetaking deficit, 60% would use large print. While many participants explained that they found the large print to be the most effective for a severe deficit, it is significant to note that the interviewees discussed more than one method. Following large print, 50% of the participants would use audio as a tool to assist a student with a severe notetaking challenge.

Theme 3: Visual-Motor Integration Techniques

Interview Question 10, "What techniques have you (or would you) use if you noticed a student's writing from the board is different from his/her paper?". Theme 3 categories were coded: (Accommodations, Interactive Learning, and Learning Styles)to explore the visual-motor integration techniques of the participants. All participants used many techniques coded as follows: 1. Accommodation (coding Assistive Technology, Grouping, and Other). 2. Interactive Learning (coding Graphic Organizers, Multimodal Tasks, and Organizing Concepts). 3. Learning Styles (coding Audio Inputs, Tactile Models, and Visual Inputs). The formula to calculate the percentages of this table is the number/number of participants.

The results revealed Visual Inputs in the category of Learning Styles to be the technique participants use most often (see Table 9). Of the 20 participants, 80% used Visual Inputs, including larger font sizes and a copy of teachers' notes. In addition to Learning Styles, 15% of participants used Audio Inputs (i.e., read-aloud and voice

recordings), and 15% used Tactile Models (i.e., identifying errors, bumpy paper/close pins, highlighters, or sticky notes). In the Interactive Learning category, 15% of participants used Graphic Organizers (guided notes), 5% used Multimodal Tasks (differentiated instruction), and 10% incorporated technology to assist with visual-motor deficits. In the Accommodations category, 5% of participants used assistive technology (text-to-talk tool), 5% used grouping (small group), and 45% used other methods, which included proximity, assisting with writing, double checking work, referring students for a checkup, work at a slower pace, and preferential seating.

Table 9

Visual-Motor Connections

Strategies	Number of Participants	Strategy Type
Learning Strategies	22	Audio Inputs – 3 % Tactile Models – 3% Visual Inputs – 16%
Interactive Learning	6	Organizing Concepts – 3% Multimodal Task – 1% Technology – 2%
Other Supports /Accommodations	11	Assistive Technology – 1% Grouping – 1% Other – 9%

All participants were asked follow-up questions for IQs 10 and asked to share any stories of success they may have in assisting students with notetaking. Participants were asked, “What techniques, if any, did not work?”, “What techniques did you find useful and why?”, and “What stories of success can you share?” Participant 1 could not think of any techniques that do not work for students when their writing on paper is different than what on a whiteboard. However, the participant stated that assistive technologies such as

computer programs, technology, and text-to-speech or speech-to-text would be helpful because students are given different opportunities to input their work if their writing isn't the best. There were no stories of success to share for notetaking at this time.

Participant 2 said that all techniques they have tried were helpful. The techniques used were visual prompts, cross checks, self-evaluations, and preferential setting. However, "visual prompts are the most useful for students with a visual impairment". Visual prompts allow the students to stay engaged with the instruction. This participant had twins that always made writing mistakes: "Tapping on the board showed them where they made mistakes, and they would correct. After 12 weeks of training, I gradually stopped tapping and they were able to do the writings, less and less without mistakes".

Participant 3 responded that for students writing being different from the board, giving the student a copy of notes is the most useful. It helps them focus on the work rather than to see if the writing is correct. This participant could "not think of any success stories to share at the moment."

When asked what techniques, if any, did not work and which were found to be useful, Participant 4 stated, "none!" This participant did not have experience working with students with visual impairments and could not comment on which would or would not work best.

During the interview with Participant 5 noted that, "Just talking doesn't work. People learn differently, just listening to it is not enough." In terms of techniques that would be useful if a student's writing is different than what's on the board, the participant stated that "Highlighting information and displaying information is the most useful. They

tend to keep up with where you are because it's highlighted or pointed out." As a story of success, the participant shared that "Chunking the information and highlighting it helps them draw out key words and points that are necessary for us to study. It helps them become better notetakers in the process."

When asked what techniques found not to be useful when writing on the board is different from writing on paper, Participant 6 said, "too much information at one time." The student could go into academic overload and become less motivated, engaged, and if they have problems writing, too much information would cause them to miss something. The technique that was found to be useful was "Cornell notes as it allows students to organize concepts and is easy to understand and read when reviewing. I typically use Cornell notes in my classes which organize the student's way of studying. The generally do well on test when they can go back and find the information they need to review."

Participant 7 said, "Writing with small font" is the technique that does not work for students having difficulty writing what's on the board. They could have difficulty seeing the text. "Enlarging font" is the most helpful. When asked if there is a story of success to share, the participant noted "Just helping students with notes to make sure they can be successful."

Participant 8 did not know of any techniques that did not work for students if writing on the board was different than their paper. However, believed that

> Reading aloud to students and then check for understanding is useful. Read aloud gives students the information in another way and asking them questions checks their understanding. If their writing is different, checking for understanding makes

sure they got the information.

A story of success would be when

> a student had trouble writing down notes with rest of students so allowing him to take a picture of it and then made the student come back and show him that they had the notes help him prepare for assessments.

In interview with Participant 9, when asked what techniques did not work, the response was "none," and the techniques found to be useful was followed by "I really haven't come across any student like that, and I don't have any stories of success."

Participant 10 stated that

> small print is a technique that does not work because the students cannot write what they do not see. … Large print, sitting closer to the computer, and even if you're watching a movie, preferential seating is useful when students have difficulty writing what's on the board. A combination of all those things helped a student I had be successful.

When asked if there are techniques that did not work when students writing on paper is different than the whiteboard, Participant 11 stated that "There are not any that I can think of that don't work, but Small works better and is useful."

> Small groups can give you time to hone-in on what's going on with the student to help them better. I have a student that needed more time writing in the classroom. I would modify the instruction for her motor skills, and it would help her be successful in the classroom.

Participant 12 stated many techniques may not work when students writing on

paper is different than the board. “Rulers can become sword fights, paper of a child with Cerebral Palsy can crumble unless they have card stock. Pencils can even be a distraction depending on the kid. Knowing the kid and their exceptionality is key.” However, “All tools can be useful it just depends on the student.” As a story of success:

> a student with ADHD had several other undiagnosed exceptionalities, had fallen through the crack. Encouragement for him was helpful to build confidence and trying out several different tools interventions to see what worked. He is now an orthopedic doctor and he said that everyone gave up on him, but you didn’t.
>
> The technique that does not work is the teacher’s notes.

Participant 13 noted,

> Giving notes does not help them understand information. They tend to be less engaged and when they do not use several senses (seeing, writing, and doing), they are less likely to retain the information. But if their writing is different, I do give the students a copy so they will not struggle. They can build on learning from their strengths rather than their weaknesses.

A story of success would be “Seeing a student use the materials given to him as he learned to read braille was nice. Encouragement is a must.”

Participant 14’s response to techniques that do not work when students writing is different than the board is “Giving them the notes doesn’t necessarily help with growth in notetaking. I don’t have any stories of success but feel that Frequent checks to see what they are understanding and are missing can be useful.”

Participant 15 said,

Letting them read their own notes to study, they are less likely to get good results on assessments when their notes from the board is translated different from their paper.… What I find to be useful is when "They need adequate notes to study with vs what they think they see, so they can refer to, to get good results when assessed. As for a story of success, highlight notes, circling key words, making important key words stand out in their memory, kids to well with these concepts. They also do well with original notes, and they can refer to study if they don't feel their notes are good for them to review.

Participant 16 stated,

"don't know of any techniques that does not work for students whose writing is different but did find small groups and read aloud to the students" to be useful. For many students I provide small groups, reading the notes, making sure that they are assured that they are writing what you're saying, for what you're reading on the actual board, that's one of the test strategies. Also being able to print out notes. For many students, it's efficient. this just came to my mind, giving them highlighters; highlighting information as well, when they get the notes that are printed, highlighting the important things, so they won't be reading everything, when they're most important things that are stuff that you require them to highlight. They get so frustrated when they see that this that is a huge task, versus if I have them highlighting it, like it's more chunking with the huge tag that he has a day of looking at all these notes. So, I will say, those different strategies I just said, it helps with formative assessments, and summative test that the students

have to be able to take.

I would like to add that this may be a new endeavor that we would have us especially as the education teachers are going to have to embark on with students that come into my class. I'm always for like new strategies. In any type of may get some strategy that can be able to utilize, they will be grateful and helpful. I'm sure now that it is bought to my attention, I will see more students struggling with these deficiencies in years to come. You can apply what's in the IEP, but sometimes, accommodations that can assist a student aren't there, especially if its undiagnosed. I think it's shocking and I'm intrigued on how the perception of a person can be deceived as what they are seeing can be different than what they write down. It throws me off a little, but I'm more intrigued and want to go hard in doing my job better for these students. But to do so, we have to become more knowledgeable, concise and proficient in our craft.

Participant 17 suggested that technology does not always work:

Having students to type doesn't allow them to practice writing and I don't think allowing students to write when they don't know what they are writing is effective either. At this time, I am not sure what techniques would be useful and don't have any success stories to share.

Participant 18 found,

closed notes to be useful in assisting students whose writing is different than what's on the board: "Closed notes allow them to be accountable and pay attention to the lesson. As a story of success, using closed notes have helped take

stress and anxiety off students." There are not any techniques this participant believed did not work.

Participant 19 noted that the techniques found to be less effective for students whose writing on paper is different than writing on paper is computer programs such as Nearpod because students can request the notes. If they aren't actively notetaking, it's not beneficial, they may not pay attention to the information. They are less likely to retain the information if it's given to them. Actively taking notes is the most useful tool. As a bonus, those that take notes do well especially if I allow them to use them on the test. Those who don't take notes, or good notes, do not do well and are not as successful.

Participant 20 indicated that various methods would be useful to assist students with notetaking:

Scaffolding because it breaks the information down into manageable parts, a highlighter or tracing because they use those tactile and motor skills that will enhance memory, side notes because they can refer back to it. I cannot think of any that don't work but do have a story of success. I had a student, and he couldn't copy anything. He flipped his numbers and his letters and had difficulty understanding 12 in the calculator. I would tell him to input the numbers 1 and then 2 in the calculator. With the use of these strategies, he can now talk about numbers and use numbers. He still has challenges with writing, but we write everyday as practice. We had to really break it down for him and he copies what's on the board a lot better now. He would be a story of success.

Summary for Research Question 2

In summary, RQ 2 focused on instructional practices for visual deficits that assist students with notetaking as perceived by special education teachers. Teachers use several options to provide learnings that need support engaging with reading while writing; visual Inputs and Graphic Organizers were used most often. Visual Inputs fall under the Learning Styles category, which includes visual, kinesthetic, and auditory inputs into learning and instruction. The Visual Inputs that teachers typically use are making copies of notes, allowing students to take pictures, and making videos/PPTs to support students with reading while writing. The preferred strategy of the teachers was the use of vocabulary words. The data showed the preferred strategy of the students to be videos, auditory instruction, real-world concepts, and active collaboration. According to the results, Organizing Concepts such as fill-in-the-blank or guided notes and Visual Inputs such as large print and a copy of the teacher's notes were the most selected choice used by participants to assist students in notetaking. While giving students a copy of the notes was the most selected choice, the participants also explained that students tend to retain less information. Enlarge print was used more for students with a severe deficit. Like engaging practices and assistance with notetaking, visual-motor integrative techniques that the participants used to support the students is mainly Visual Inputs. A copy of the teacher's notes was selected as the most used. However, 20% of the participants believed that giving students a copy of the notes is not beneficial, as read in Interviewee Excerpts 13, 14, 18, and 19. Participants contend that copies of notes do not allow students to excel in their writing skills, they could become less engaged with the lesson and less

accountable for their work, and they are less likely to retain the information than those that use multiple senses to learn such as hearing, seeing, and doing the assignment.

Evidence of Trustworthiness

Triangulation was used to increase the trustworthiness of the study. An audit trail, interview transcriptions, and member checks were the data sources used to enhance trust in the validity of the conclusions. The audit trail is the roadmap that shows the steps I took throughout the exploration of the study. Member checks validated the data, and the transcripts were detailed accounts that began building trust.

Credibility

Data triangulation from multiple resources was used to increase credibility. The triangulation method I used included an audit trail, gathering data from interviews, and member checks. To establish credibility, I utilized an audit trail throughout the study to provide a record of the steps taken during the study as a comprehensive view. In addition to the audit trail, I used the transcriptions I coded from the interviewee to categorize the concepts into themes. Using transcriptions from the interview allowed me to organize and deduce the data to answer the research questions better. Lastly, I used member checks to enhance credibility by checking for the validity of responses. Rechecking the information of the participants and using an audit trail increases the study's credibility (Ramsook, 2018).

Transferability

This study can be generalized across participants. For this study, I used special education teachers as participants; however, this does not account for the general

education teachers' attitudes or the administrative personnel whose focus is visual deficits. There could also be a situational focus that can be changed, such as notetaking or changing the visual deficit to another to evaluate desired findings. An audit trail was used, which provided concise steps to how the data was collected and analyzed, which allowed the study to be replicated (Ramsook, 2018).

Dependability

Dependability requires stability within the research and maintaining alignment (Ramsook, 2018). Alignment was maintained throughout the study to increase dependability. The research problem, purpose, theoretical framework, research questions, methods, and design were all aligned to determine what instructional methods special education teachers use to assist students with visual deficits on one accord. Triangulation utilizing the audit trail, transcripts, and member checks also increased dependability because more sources that validated the information made it more trustworthy and reliable.

Confirmability

Audio recordings were scripted and returned to participants before coding the data to increase confirmability. Once the participants validated the transcripts for accuracy, I coded them using Atlasti.com software. I remained objective throughout the study to eliminate biases allowing the data to remain neutral. The audit trail also confirmed that the research was accurate (Suter, 2012).

Audit Trail

The audit consisted of the following steps:

1) A pilot study was conducted, and no changes were needed to the questions.
2) After emails were sent to prospective interviewees and accepted, the letter of candidacy, RQ questions, time, and date were sent to participants.
3) A recording device and Zoom voice recording was present for every interview. Five interviews were conducted per week for the 20 participants.
    a. Two of the 20 participants' voice recordings via Dictaphone did not work. However, the Zoom voice recording worked well. All other participants were double-recorded via Dictaphone and Zoom.
4) I transcribed the data.
    a. During the transcription phase, I ran into a challenge with Express Scribe. Otter was used in place of Express Scribe for transcription. Zoom voice downloads of the interview were used in Otter.
    b. Transcriptions were copied and pasted onto a Word document.
    c. To verify that the transcripts were accurate, I crossed matched the transcripts with the Dictaphone. Due to the dialect of four speakers, minimal and necessary changes were made to the transcripts.
    d. Transcriptions were sent to the participants for verification of accuracy. Interviewee 12 made a minimal change. All transcripts were verified as accurate. For confidentiality, participants were listed with numbers rather than names.
5) I coded the data.
    a. During the coding phase, there was a challenge with the initial planned

CAT coding tool. Atlas.ti was used on a trial basis, purchased, and shown to be an efficient tool.

b. Using Atlas.ti, I coded data. To code, I reviewed the transcripts more than a dozen additional times to familiarize myself with the data. Sub-codes were generated using the raw data. A 6-phase process we used to code is shown in Table 10. Themes were then categorized and coded into Atlas.ti.

c. Pictures of the graph were taken using the Snip-it tool.

Table 10

Coding of Raw Interview Data Using Inductive Themes

Coding Tree 2				
Phase 1: Familiarizing data	**Phase 2: Generating initial codes (59 codes generated into 9 sub themes)**	**Phase 3: Developing Themes**	**Phase 4: Reviewing Themes Phase 5: Defining Themes**	**Phase 6: Producing the report**
Raw Interview Data	***Tactile*** (sticky note, bumpy paper, gameboard, acting, highlighters, sticky notes) ***Auditory Input*** (audio clips, oral activities, interviews) ***Visual Input*** (Zoom, flashcards, large print, thumbs-up, review of text)	Learning Styles	29- Involve seeing, hearing, or doing	Representation and Actions of Learning
	Computer-Based Programs (Canvas, Flipgrid, Book Creator, Storyboard, Nearpod) ***Technology*** (computer, IPad, video) ***Multimedia learning*** (PPT, tech+audio/visual)	Educational Technology	14- Involve use of tech or multi skills	
	Cooperative Learning (peer tutoring, small gp, 1-on-1, Nearpod) ***Expressive Learning*** (PPT, comic books, active panel, learning games) ***Additional Accommodations*** (ext. time, lighting, glasses, preferential seating, reteach)	Other	16- Involve areas that do not go into another category	

Summary of Results

The findings of the results were presented in the data collected from the transcripts and tables. Common themes were provided through the analysis of the participants' interviews. The major findings are as follows.

Research Question 1

What instructional strategies do special education teachers use to assist students with CI with visual-motor deficits? The findings for this research question are presented below:

1. 95% of the participants have yet to receive training for CI.
2. 85% of the participants have yet to receive visual training.
3. 75% of the participants have yet to receive any training at all.
4. 75% of participants used Visual inputs, particularly large print, as the main intervention to accommodate students with visual/visual motor challenges.
5. 75% of participants used Tactile models as a great method aside from traditional pencil/paper tasks for students to show their understanding of concepts. Following this model is the use of technology.
6. 40% of participants knew of auditory tools, particularly text-to-speech, as an accessible resource to assist students with visual/visual motor challenges. However, it is important to note that 30% of participants did not know any resources to assist students with visual deficits.
7. At least 45% of participants wished they had extended knowledge or professional development to assist students with visual/visual motor deficits.
8. 40% of participants could not share any stories of success—however, 20% described enlarged print in their success story.

Research Question 2

How do instructional practices for visual deficits assist students with notetaking

as perceived by special education teachers? The findings for this research question are presented below:

1. 55% of participants used Learning Styles, particularly visual inputs, by giving students a copy of notes as a support to engage students with reading while writing.
2. Rather than a copy of notes, teachers preferred to use vocabulary with students.
3. Visual input (a copy of the teachers' notes) and Organizing Concepts (guided notes) are the main methods the participants used to assist students with notetaking challenges.
4. Visual input (teachers' notes) was mostly used by participants when students' writing from the board was different from their papers. However, 25% of the those who chose visual inputs believe that while giving students a copy of notes is helpful, students can become less engaged and accountable, and less likely to retain the content.

Summary

The purpose of this study was to determine if professional development is needed to assist students with visual or visual-motor deficits such as CI. The aim was to explore instructional strategies that inclusive special education teachers use to assist students with visual deficits and determine what is typically used and why. Twenty special education high school teachers were purposefully invited and selected to participate in the study. A phenomenological approach was used via Zoom and tape recording to interview their

responses. Data analysis used Otter.ai to transcribe the data and Atlas.ti to code the raw data. To answer the RQ1 and RQ2, 11 interview questions were asked, and the responses were as follows: Most of the participants have yet to receive training for CI. Large print was the main intervention used to accommodate students with visual impairments. Tactile techniques were significantly used to replace paper/pencil tasks. Text-to-speech was the accessible resource that many of the participants were aware of; however, many participants were unaware of resources to assist with visual deficits. Most of the participants wished they had professional development on visual deficits. Giving students a copy of notes and using guided notes greatly assisted students with notetaking challenges and writing when it is different from writing on the board. While Chapter 4 answers the interview process and data, Chapter 5 interprets the study's results, limitations, recommendations, and implications.

Chapter 5: Discussion, Conclusions, and Recommendations

The purpose of this qualitative study was to explore special education teachers' perceptions of the instructional strategies used in an inclusive high school setting to assist with notetaking for students with CI. My study sought to explore general interventions that are set in place in the public school system to prevent visual-motor deficit students from systemically falling behind academically each year. The aim was to explore teachers' instructional practices to determine if professional development is necessary. Semistructured interviews were conducted with 20 special education teachers. The interview data was transcribed and sent back to the interviewee for accuracy. Afterward, the transcriptions were coded, and the results were reported. Chapter 5 interprets the data and explains the data's limitations, recommendations, and implications to conclude the study.

Interpretation of the Findings

The findings showed a need for more professional training to assist students with CI or visual deficits. When teaching students with a visual deficit, teachers typically use large print to accommodate the student. If paper and pencil are not being used, many teachers indicated that hands-on tactile activities were beneficial. Though a significant number of teachers did not know any resources to assist students with visual deficits, many participants knew of text-to-speech as an accessible resource and wanted extended knowledge on how to help their students with visual problems. The findings also revealed that teachers typically support their students by giving them a copy of their notes to engage students during the instruction so focus would not be on notetaking challenges.

Although this method was used by most of the teachers, some participants believed that giving students notes can hinder the growth of their learning.

The UDL was the framework used to explore flexible learning tools to address the challenges students face with visual deficits to meet the students where they are and achieve increased learning outcomes programs (Carrie-Rubin, 2015). Under the three principles of UDL in the study, teachers developed proactive lessons to eliminate barriers for visual deficit learners explaining the *why* of learning and engagement. Teachers could use various techniques based on their experiences to address problematic situations. An example within the study was teachers using visual inputs to stimulate interest or tactile tools for motivation of students.

Using the UDL, however flexible, many teachers' methods are limited as it is based on teachers' knowledge and experience. Despite teachers' lack of knowledge on visual deficits, many teachers were able to be resourceful in the presentation of the instruction, expressing multiple ways for a student with a visual deficit to learn the content. Teachers' resourcefulness from their experience constitutes the *what* of learning, principle two of the UDL. An example is differentiation of tools using visual, auditory, and tactile methods during instruction to promote student learning. It is important to note that the more established teachers had a plethora of tools to represent instruction in comparison to the newer teachers.

Lastly is principle three, the *how* of learning using action and expression. Teachers used differentiated ways for students to express what they know such as the use of tactile models to represent their work or allowing students to orally explain concepts.

Most teachers needed a success story to show progressive learning from any of the methods they used. Using the *how* of learning also informed teachers of strategies that did not or only partially worked to assist students with visual deficits.

In contrast to success stories, several of the teachers noted that methods such as giving students a copy of the notes would not be beneficial to the students learning progress. Additionally, though large print assists with reading, it does not assist with other areas such as student writing. Tactile activities (i.e., highlighter or hands-on activities such as drawings) were the stories of success that explained how students could express their learning through assessments. However, tactile practices were not used by all of the teachers. All other methods (visual, auditory, technology, and additional accommodations) were independently argued by teachers that multi-modal methods using technology alongside sensory techniques could be effective such as a video, but only if the student went home to playback information for homework. Giving students a copy of notes and using audio tools was also argued as having pros and cons towards student learning. Although all methods appeared to have helped students with a visual deficit in some way, all methods did not explain how a student can express their learning of the content while inside the classroom and show improvement.

Compared to the literature review, the findings confirmed a need for more professional development for teachers to accommodate students with visual deficits in the public school systems. According to the literature, more than implementing techniques or tools is required for students to be successful (CAST Professional Learning, 2015). Implementing coordinated training and performance assessments provides the school

systems with the infrastructure needed for teachers and students to succeed, and all stakeholders should be involved in practicing and regulating set conducive programs (Carrie-Rubin, 2015). The results also confirmed that teachers were typically unaware of binocular vision problems such as CI (see Migrants et al., 2019), and did not associate reading disability, reading comprehension, writing, or dyslexia as a binocular anomaly (Raghuram et al., 2019) without prompting. Many educators initially confused visual deficits with visual impairments written under the IDEA as partial sight or blindness. Additionally, the findings confirmed that tactile material and large print are frequent tools used by teachers to assist students with visual deficits in the public school system as with the private school study (see Koehler & Wild, 2019). This study also confirmed that differentiation plays a major role in meeting students where they are with visual deficits.

To extend knowledge, including audio inputs into the lesson has additionally shown to be a helpful tool for students with visual processing disorders such as CI by allowing students absorb and retain concepts in a different way (see National Center for Learning Disabilities, n.d.). Although many of the techniques used in the private school sector were seen in the findings for the public school, the results did not show consistent methods or teaching tactics that teachers could use to assist students with a visual deficit with one accord appropriately.

Limitations of the Study

This study had the following limitations. One of the study's limitations was the number of participants. A small sample size can affect the trustworthiness of the data (Patel et al., 2018). Another limitation was the focus on techniques used by high school

public special education teachers. With this study, the focus was on special educators, but general educators also support students with disabilities and could provide valuable information. Additionally, the results may not apply to grade schools as the techniques used could differ because there is a greater shift in rigor as students' progress. But this study's focus on high school inclusive special education teachers' methods allowed a basis for potential transferability. Another limitation was that the techniques used to assist students with visual-motor deficits may differ in other geographic regions. Though there is a lack of training and understanding of visual deficits within the area of research, this could vary for other regions resulting in different techniques being used.

Recommendations

From the findings, I presented evidence that professional development is needed for teachers to assist student learning more effectively and efficiently for visual deficits. Considering that at least two to three students per classroom may have a visual deficit, subsequent trials should take place to determine which methods improve student performance. Therefore, it is recommended that an experimental design be used to determine which methods best support students with visual deficits. Lastly, teachers should use methods with a systematic infusion of the three UDL principles. Stakeholders should not just develop an action plan developing any number of strategies but rather test solutions using the UDL implementation process to support all learners.

Implications

This study contributes to positive social change by identifying and conceptualizing ways for teachers to manage the impact of visually impaired students

being overlooked and falling between the educational gaps. Closing achievement gaps by providing adequate support can decrease the dropout rate, incarcerations, and increase the likelihood of extending education. More significantly, the earnings of a high school dropout are approximately $240,000 less compared to a graduate, a dropout's health is expected to be worse, and their life expectancy is 9.2 years shorter (Shelia, 2018). From an economic viewpoint, not meaningfully utilizing human potential costs the United States trillions of dollars (Auguste et al., 2009). Therefore, closing achievement gaps academically and economically provides a positive social impact.

Conclusion

Learning stems from visual pathways which includes reading to build language skills, and writing to build visual perceptions, comprehension, and fine motor skills. Difficulties with vision can cause major challenges with a student's school life. Although teachers may be unaware of visual difficulties, they are expected to accommodate students and identify challenges students may have. The phenomenon is for teachers to be equipped with the tools needed to aid in the learning of their students despite them not having the adequate set of tools to do so. This research highlighted what public inclusive special education teachers do to determine they types of techniques that are being used to assist students with visual deficits and hopes to provide understanding on how to accommodate students with such a disability. Having knowledge of interventions may reduce teachers having to improvise instruction which can prolong the learning process. With the statistical account of students who have such a disorder, more training could be provided for better awareness.

This study revealed the autonomy of instructional practices used by practitioners to assist students with visual or visual-motor deficits such as CI. To assist students, perplexed methods were used based solely on experience rather than informed resources. Visual inputs and tactile models have been shown to be the commonly used practices by teachers to assist with visual deficits and notetaking skills. The study showed that many methods to assist students with visual deficits may engage in learning, but little evidence supported growth in improving skills such as notetaking. Tactile tools were most preferred to escape pencil/paper tasks and explained using all three principles of the ULD, while visual inputs were used most to assist with reading. The study revealed that teachers were not on one accord with implementation of techniques to support students with visual deficits, and systematic coordinated training or coaching would be beneficial for teachers and students to progress in the learning process.

References

Abraham, N. G., Srinivasan, K., & Thomas, J. (2015). Normative data for near convergence, accommodation, and phoria. *Oman J. Ophthalmology*, 8(1), 14–18. https://pubmed.ncbi.nlm.nih.gov/25709268/

Ahmad, F. (2021). *Real time analysis of eye movements using computer aided software* [Master's thesis, New Jersey Institute of Technology]. https://digitalcommons.njit.edu/cgi/viewcontent.cgi?article=2846&context=theses

Ahn, S. (2021). Combined effects of virtual reality and computer game-based cognitive therapy on the development of visual-motor integration in children with intellectual disabilities: A pilot study. *Occupational Therapy International*, 1–8. https://pubmed.ncbi.nlm.nih.gov/34316294/

Aletaha, M., Daneshvar, F., Mosallaei, M., Bagheri, A., & Khalili, M. R. (2018). Comparison of three vision therapy approaches for convergence insufficiency. *Journal of Ophthalmic & Vision Research, 13*(3), 307–314. https://pubmed.ncbi.nlm.nih.gov/30090188/

Allen, M. (2017). *Debriefing of participants*. In The SAGE Encyclopedia of Communication Research Methods. https://dx.doi.org/10.4135/9781483381411.n133

Almekhlafi, A. G., Ismail, S. A., & Hassan, A. A. (2020) Teachers reported use of Marzano's instructional strategies in United Arab Emirates k-12 schools. *International Journal of Instruction, 13*(1), 325–340. https://eric.ed.gov/?id=EJ1239291

Alvarez, T. L., Scheiman, M., Santos, E. M., Morales, C., Yaramothu, C., d'Antonio-Bertagnolli, J. V., Gohel, S., Biswal, B. B., & Li, X. (2019). Clinical and functional imagining changes induced from vision therapy in patients with convergence insufficiency. *IEEE Engineering in Medicine and Biology Society*, 104–109. https://pubmed.ncbi.nlm.nih.gov/31945855/

American Association for Pediatric Ophthalmology and Strabismus (n.d.-a). *Convergence insufficiency*. In the American Association for Pediatric Ophthalmology and Strabismus Glossary. https://aapos.org/glossary/convergence-insufficiency

American Association for Pediatric Ophthalmology and Strabismus. (n.d.-b). *Exotropia*. In the American Association for Pediatric Ophthalmology and Strabismus Glossary. https://aapos.org/glossary/exotropia

American Association for Pediatric Ophthalmology & Strabismus. (n.d.-c). *Strabismus surgery.* In the American Association for Pediatric Ophthalmology and Strabismus Glossary. https://aapos.org/glossary/strabismus-surgery

American Optometric Association. (n.d.). *School-aged vision: 6-18 years of age*. https://www.aoa.org/healthy-eyes/eye-health-for-life/school-aged-vision?sso=y

American Psychology Association. (2017). *Ethical Principles of Psychologists and Code of Conduct*. https://www.apa.org/ethics/code

Arvind, A. (2014). Study of prevalence of convergence insufficiency (CI) among 9th and 10th group students in Gwalior, India. *American Academy of Optometry*. https://www.aaopt.org/detail/knowledge-base-article/study-prevalence-

convergence-insufficiencyci-among-9th-and-10th-grade-students-gwalior-india

Austin, Z. (2014). Qualitative research: Getting started. *Canadian Journal of Hospital Pharmacy*, *67*(6), 436–440. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4275140/

Auguste, B. G., Handcock, B., & Laboissiere, M. (2009). The economic cost of the US education gap. *The McKinsey Quarterly*. https://www.mckinsey.com/~/media/McKinsey/Industries/Social%20Sector/Our%20Insights/The%20economic%20cost%20of%20the%20US%20education%20gap/The%20economic%20cost%20of%20the%20US%20education%20gap.pdf

Bakker, R, (2017) *Transcription Tools and Software*. Works of the FIU Libraries, 62. https://digitalcommons.fiu.edu/glworks/62

Blanchard, S., Chang, W., Heronema, A. M., Ramcharan, D. D., Stanton, K. L., & Stollberg, J. E. (2016). Common occupational therapy vision rehabilitation interventions for impaired and low vision associated with brain injury. *Optometry & Visual Performance*, 4(5), 265–274. https://www.ovpjournal.org/uploads/2/3/8/9/23898265/blanchard.pdf

Blandul, V., & Bradea, A. (2017) Developing psychopedagogical and methodical competences in special/inclusive education teachers. *Problems of Education in the 21st Century, 75*(4), 335–344. https://doi.org/10.33225/pec/17.75.335

Blanton, L. P., Pugach, M. C., & Florian, L. (2011). Preparing general education teaches to improve outcomes for students with disabilities. *American Association of Colleges for Teacher Education: National Center for Learning Disabilities.*

https://www.ncld.org/wp-content/uploads/2014/11/aacte_ncld_recommendation.pdf

Borsting, E., Rouse, M., & Chu, R. (2005). Measuring ADHD behaviors in children with symptomatic accommodative dysfuction or convergence insufficiency: A preliminary study. *Optometry Journal of the American Optometric Association*, 76(10), 588-592. https://doi.org/10.1016/j.optm.2005.07.007

Borsting, E., Mitchell, G. L, Scheiman, M. M., Chase, C., Kulp, M. T., and Cotter, S. A. (2016) Behavioral and Emotional Problems Associated with Convergence Insufficiency. *Journal of Attention Disorders*, 20(10), 836-844. https://pubmed.ncbi.nlm.nih.gov/24271946/

Bower, V. (2020). *Debates in Primary Education: The purpose of primary education*. (1st ed.) Routledge. ISBN: 9781003091028. https://doi.org/10.4324/9781003091028

Bradbury, J. A., & Doran, R. M. (1993). Secondary exotropia: A retrospective analysis of matched cases. *Pediatr Ophthalmol Strabismus*, 30(3), 163-166. PMID: 8350225. https://pubmed.ncbi.nlm.nih.gov/8350225/

Braun, V., & Clarke, V. (2013). *Successful Qualitative Research: A practical guide for beginners.* Thousand Oaks, CA: Sage. file:///C:/Users/lambert.jennifer/Downloads/SQR%20Chap%201%20Research%20Repository.pdf

Busetto, L., Wick, W., & Gumbinger, C. (2020 How to use and assess qualitative research method. *Neurological Research and Practice*, 2(14).

https://doi.org/10.1186/s42466-020-00059-z

Bush, S., Hinkley, S., Jenerou, A., Damari, D., Buckingham, R., Geneva, C., and Reger, M. (2019). The impact of binocular vision and tracking intervention on academic performance: An in-school vision therapy pilot program. *Optometry & Visual Performance*, 7(1). http://ovpjournal.net/issue7-1_webfiles/OVP7-1_article_Bush_web.pdf

Byrd, D. R. & Alexander, M. (2020). Investigating special education teachers' knowledge and skills: Preparing general teacher preparation for professional development. *Journal of Pedagogical Research*, 4(2). DOI: https://doi.org/10.33902/JPR.2020059790

Byrne, D. (2022). A worked example of Braun and Clarke's approach to reflexive thematic analysis. *Qual Quant* **56**, 1391–1412. https://doi.org/10.1007/s11135-021-01182-y

Capp, M. J. (2017). The effectiveness of universal design for learning: a meta-analysis of literature between 2013 and 2016. *International Journal of Inclusive Education*, 21(8). https://doi.org/10.1080/13603116.2017.1325074

Carlson, J. A. (2010). Avoiding traps in member checking. *Qualitative Report*, 15(5), 1102-1113. https://doi.org/10.46743/2160-3715/2010.1332

Cascio, M. A., Lee, E., Vaudrin, N., & Freedman, D. A. (2019). A team-based approach to open coding: Considerations for creating intercoder consensus. *Field Methods*, 31(2). https://doi.org/10.1177/1525822X19838237

Castillo-Montoya, M. (2016). Preparing for interview research: The interview protocol

refinement framework. *The Qualitative Report*, 21(5), 811-831. DOI: https://doi.org/10.46743/2160-3715/2016.2337

Cedars Sinai (2021). *Convergence Insufficiency*. Health Library. https://www.cedars-sinai.org/health-library/diseases-and-conditions/c/convergence-insufficiency.html

Changwong, K., Changwong, A., & Sisan, B. (2018). Critical thinking skills development: Analysis of a new learning management model for Thai high schools. *Journal of International Studies*, 11(2), 37-48. https://www.jois.eu/?420,en_critical-thinking-skill-development-analysis-of-a-new-learning-management-model-for-thai-high-schools

CITT-RS Study Group, Scheiman, M., Chase, C., Cotter, S. A., Mitchell, G. L., & Kulp, M. T. (2018). Effect of treatment of symptomatic convergence insufficiency on reading in children: A pilot study. *Clinical & Experimental Optometry*; 101(4), 585-593. https://pubmed.ncbi.nlm.nih.gov/29577409/

Choi, J., Chang, J. W., Kim, S. J., & Yu, Y. S. (2011). The long-term survival analysis of bilateral lateral rectus recession versus unilateral recession-resection for intermittent exotropia. *American Journal of Ophthalmology*, 153(2), 343-351. https://doi.org/10.1016/j.ajo.2011.06.024

Chougule, P., & Kekunnay, R. (2019). Surgical management of intermittent exotropia: Do we have an answer for all? *BMJ Open Ophthalmology*, 4(1). DOI: http://dx.doi.org/10.1136/bmjophth-2018-000243

Cooper, J., & Jamal, N. (2012). Convergence insufficiency—a major review. *Optometry Review*, 83(4), 137-158. https://pubmed.ncbi.nlm.nih.gov/23231437/

Creswell, J. W. (2016). *Qualitative inquiry & research design: Choosing among the five approaches (4th ed.).* Thousand Oaks, CA: SAGE.

Currie-Rubin, R. (2015). *The data inquiry- UDL cycle*. CAST Professional Learning. https://www.cast.org/binaries/content/assets/cast/downloads/data-inquiry-and-universal-design-for-learning_edits211.pdf

Davidsen, A. S. (2013). Phenomenological approaches in psychology and health sciences. *Qualitative Research in Psychology*, 10(3); 318-339. https://pubmed.ncbi.nlm.nih.gov/23606810/

Das, V. E. (2016). Strabismus and the oculomotor system: Insights from macaque models. *Annu Rev Vis Sci*, 2, 37-59. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5443124/

Devarajan, P. & Maheshgowri, R. (2020). Visual acuity of school age children in selected schools of pimpri chinchwad metropolitan corporation: A cross sectional study. *Journal of Dental Research and Review*, 7(5). https://journals.lww.com/jdrr/Fulltext/2020/07001/Visual_Acuity_of_School_Age_Children_in_Selected.16.aspx

Dick W. (2020) *A History of Instructional Design and Its Impact on Educational Psychology.* In: Glover J.A., Ronning R.R. (eds) Historical Foundations of Educational Psychology. Perspectives on Individual Differences. Springer, Boston, MA. https://doi.org/10.1007/978-1-4899-3620-2_10

Ding, J., & Levi, D. M. (2021). A unified model for binocular fusion and depth perception. *Vision Research*, 180, 11-36.

https://doi.org/10.1016/j.visres.2020.11.009

Elliott, V. (2018). Thinking about the coding process in qualitative data analysis. *The Qualitative Report*, 23(11), 2850-2861.

Eyes on Learning. (2021). *Why Children's Vision Matters*. http://eyesonlearning.org/why-childrens-vision-matters/

Fusco, N., Germano, G. D., & Capellini, A. (2015). Efficacy of a perceptual and visual-motor skill intervention program for students with dyslexia. *CoDAS*, 27(2). https://doi.org/10.1590/2317-1782/20152014013

Gammelgaard, B. (2017), Editorial: The qualitative case study, *The International Journal of Logistics Management*, Vol. 28 No. 4, pp. 910-913. https://doi.org/10.1108/IJLM-09-2017-0231

Ganesh, A., Pirouznia, S., Ganguly, S. S., Fagerholm, P., & Lithander, J. (2011). Consecutive exotropia after surgical treatment of childhood esotropia: A 40-year follow-up study. *Acta Ophthalmologica*, 89(7), 691-695. https://doi.org/10.1111/j.1755-3768.2009.01791.x

Gavish, B. (2017). Special education trainee teachers' perceptions of their professional world: Motives, roles, and expectations from teacher training. *Teachers and Teaching*; 23(2), 153-170. https://doi.org/10.1080/13540602.2016.1204285

Ge, Q., Chen, Z., Liu, Z., Pan, J. S., Wen, Y., Li, J., Feng, L., Yuan, J., Deng, D., & Yu, M. (2020). Quantifying nasotemporal asymmetry of interocular suppression in alternating strabismus after correction. *Investigative Ophthalmology & Visual Science*, 62(6). https://doi.org/10.1167/iovs.61.8.6

Ghadban, R., Martinez, J. M., Diehl, N. N., & Mohney, B. G. (2015). The incidence and clinical characteristics of adult-onset convergence insufficiency. *Ophthalmology*, 122(5), 1056-1059. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4414695/

Ghosh, A., Padhy, S. K., Gupta, G., & Goyal, M. K. (2014). Functional convergence spasm. *Indian Journal of Psychological Medicine*, 26(3), 332-334. https://journals.sagepub.com/doi/pdf/10.4103/0253-7176.135394

Goering, M., Drennan, K. B., & Moshirfar, M. (2020). Convergence Insufficiency. *National Center for Biotechnology Information.* PMID: 32119277. https://www.ncbi.nlm.nih.gov/books/NBK554390/

Gray, L. M., Wong-Wylie, G., Rempel, G. R., & Cook, K. (2020). Expanding qualitative research interviewing strategies: Zoom video communications. *The Qualitative Report*, 25(5), 1291-1301.

Harris, A. R. & Gilbert, F. (2022). Visualising the risks of clinical trials for fair treatment and appropriate informed consent of participants. *Graefe's Archive for Clinical and Experimental Ophthalmology*. 260, 2775–2776. https://doi.org/10.1007/s00417-022-05558-0

Hassan, Z. A., Schattner, P., & Mazza, D. (2006). Doing a pilot study: Why is it essential? Malaysian Family Physician, 1(2-3), 70-73. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4453116/#:~:text=A%20pilot%20study%20can%20be,to%20identify%20potential%20problem%20areas

Healthline Medical Network. (2018). *Superior Rectus.* Human body- Muscular System. https://www.healthline.com/human-body-maps/medial-rectus-muscle#1

Hilton, C., Miellet, S., Slattery, T. J., & Wiener, J. (2019). Are age-related deficits in route learning related to control of visual attention? *Psychological Research*, 84(6), 1473-1484. https://pubmed.ncbi.nlm.nih.gov/30850875/

Holden, S. K., van Dok, E., & Pelak, V. S. (2019). Co-occurrence of convergence insufficiency and cognitive impairment in Parkinsonian disorders: A Pilot Study. *Front Neurology*, 10(864). https://pubmed.ncbi.nlm.nih.gov/31447772/

Holland, K. (2012) *Special Educational Needs: A Guide for Inclusive Practice*. SAGE Publications Ltd. ISBN: 9780857021632

Hong, J., Fu, J., Wang, Y., Zhao, B., & Li, L. (2020). Prevalence of heterophoria in a population of school children in central China: The Anyang childhood eye study. *Int J Ophthalmol*, 13(5), 801-805. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7201350/

Huston, P. A., & Hoover, D. L. (2014). Treatment of symptomatic convergence insufficiency with home-based computerized vergence system therapy in children. *Journal of American Association for Pediatric Ophthalmology and Strabismus*, 19(5), 417-421. https://doi.org/10.1016/j.jaapos.2015.06.004

Iliescu, D. A., Timaru, C. M., Alexe, N., Gosav, E., Simone, A. D., Batras, M., & Stefan, C. (2017). Management of diplopia. *Romanian Journal of Ophthalmology*, 61(3), 166-170. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5710033/

Irving, E., Chriqui, E., Law, C., Kergoat, M., Leclerc, B., Panisset, M., Postuma, R., & Kergoat, H. (2017) Prevalence of convergence insufficiency in Parkinson's disease. *Mov Diso Clin Pract*, 4(3), 424-429.

https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6174402/

Irving, E., Machan, C. Chriqui, E., Law, C., Alhassan, M., Almeida, Q. J., Hovis, J. K., & Kergoat, H. (2018). Changing Vergence Function in Persons with Parkinson's Disease and Convergence Insufficiency. *Investigative Ophthalmology & Visual Science*, 59(9). https://pubmed.ncbi.nlm.nih.gov/32234684/

Jain, C., Kushwaha, V., Bhumbla, S., Malik, K. P. S., Malik, V. K., & Bowry, R. (2017). Comparative study of unilateral recession resection versus bilateral recession in intermittent exotropia. *Delhi Journal of Ophthalmology*. 27(4), 259-262. https://journals.lww.com/djo/Abstract/2017/27040/Comparative_Study_of_Unilateral_Recession.6.aspx

Javid, F. Z., Brenton, J., Guo, L., & Cordeiro, M. F. (2016). Visual and ocular manifestations of Alzheimer's disease and their use as biomarkers for diagnosis and progression. *Front Neurology*, 7(55). https://pubmed.ncbi.nlm.nih.gov/27148157/

Jenn, N. C. (2006). Common ethical issues in research and publication. *Malaysian Family Physican*, 1(2-3), 74-76. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC4453117/

Josefson, D. (2002) Eye drops are better for amblyopia than patches, says study. *BMJ*, 324(7339), 698. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC1172103/

Jung, E. H., & Kim, S. (2018). Surgical results and factors affecting outcome in adult patients with sensory exotropia. *Eye*, 32, 1851-1857. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6292891/

Kallio, H. Pietial, A., Johnson, M., & Docent, M. (2016). Systematic methodological review: Developing a framework for a qualitative semi-structured interview guide. *Journal of Advanced Nursing*. https://pubmed.ncbi.nlm.nih.gov/27221824/

Keohler, K. E., & Wild, T. A. (2019). Students with visual impairments' access and participation in the science curriculum: Views of teachers of students with visual impairments. *Journal of Science Education for Students with Disabilities*; 22(1), 1-17. https://files.eric.ed.gov/fulltext/EJ1225218.pdf

Kim, E. H., Granger-Donetti, B., Vicci, V. R., & Alvarez, T. L. (2010). The relationship between phoria and the ratio of convergence peak velocity to divergence peak velocity. *Investigative Ophthamology & Visual Science*, 51, 4017-4027. https://doi.org/10.1167/iovs.09-4560

Kniestedt, C., & Stamper, R. L. (2003). Visual acuity and its measurement. *Ophthalmology Clinics of North America*, 16(3), 155-170. https://pubmed.ncbi.nlm.nih.gov/12809155/

Knobbe, C. A. (2019). *Strabismus Surgery*. All about vision. https://www.allaboutvision.com/conditions/strabismus-surgery.htm

Knudsen, E. I. (2020). Evolution of neural processing for visual perception in vertebrates. *The Journal of Comparative Neurology*, 528(17), 2888-2901. https://doi.org/10.1002/cne.24871

Kommerell, G., Kromeier, M., Scharff, F., & Bach, M. (2015). Asthenopia, associated phoria, and self-selected prism. *Informa Healthcare*, 23(2), 51-65. https://pubmed.ncbi.nlm.nih.gov/26158471/

Kremmyda, O., Frenzel, C., Hufner, K., Goldschagg, N., Brem, C., Linn, J., & Strupp, M. (2020). Acute binocular diplopia: Peripheral or central? *Journal of Neurology*, 267, 136-142. https://doi.org/10.1007/s00415-020-10088-y

Kurokami, T., Koeda, T., Migita, O., Hata, K. (2019). Reading disability due to an ocular motor disorder: A case of an adolescent girl with a previous diagnosis of dyslexia. *Brain & Development*; 41(2), 187-190. http://dx.doi.org.ezp.waldenulibrary.org/10.1016/j.braindev.2018.09.003

Lajmi, H., Yakhlef, A. B, Bouazzeoui, E. O. A., & Fekih, L. E. (2020) Outcomes of surgery in patients with sensory exotropia. *Journal Francqis d'Ophtalmologie*, 43(2), 128-132. https://doi.org/10.1016/j.jfo.2019.07.007

Lavrich, J. B., Warner, N. J. K., Hauschild, A. J., Thau, A., Wasserman, B. N., DeBenedictis, C., Schnall, B., Manley, D., Gunton, K. B., Padidam, S., & Landy, J. E. (2019). Inconsistent diagnostic criteria for convergence insufficiency. *Journal of American Association for Pediatric Ophthalmology and Strabismus*, 23(1). https://doi.org/10.1016/j.jaapos.2018.09.008

Law, C., Chriqui, E., Kergoat, M., Leclerc, B, Panisset, M., Irving, E. L., Postuma, R. B., Chouinard, S., & Kergoat, H. (2017). Prevalence of convergence insufficiency-type symptomatology in Parkinson's disease. *Canadian Journal of Neurological Sciences*, 44(5), 562-566. https://pubmed.ncbi.nlm.nih.gov/28862105/

Lazarus, R. (2020). *Can Glasses or Eye Patches Treat Convergence Insufficiency?* https://www.optometrists.org/vision-therapy/vision-therapy-for-children/convergence-insufficiency-2/convergence-insufficiency-treatment-

trial/can-glasses-or-eye-patches-treat-convergence-insufficiency/

Lazarus, R. (2020). *Do Pencil Push-Ups Work?* Optometrists Network. https://www.optometrists.org/vision-therapy-for-children/convergence-insufficiency-2/do-pencil-push-ups-work/

Lazarus, R. (2020). *Vision and Learning Difficulties*. Optometrists Network. https://www.optometrists.org/vision-therapy/guide-vision-and-learning-difficulties/vision-and-learning-difficulties/

Lee, H. J., Kim, S. J., & Yu, Y. S. (2019). Long-term outcomes of bilateral lateral rectus recession versus unilateral lateral rectus recession-medical rectus plication in children with basic type intermittent exotropia. *Eye*, 33, 1402-1410. https://www.nature.com/articles/s41433-019-0422-2

Lew, W. H., Stevenson, S. B., & Coates, D. R. (2021). Stimulus dependence of interocular suppression. *Scientific Reports*, 11(1), 1-12. https://pubmed.ncbi.nlm.nih.gov/33927294/

Luan YN, Wang LH. Advances in surgery procedures for convergence insufficiency-type intermittent exotropia. *World J Ophthalmol* 2014; 4(3): 71-74. https://www.wjgnet.com/2218-6239/abstract/v4/i3/71.htm

Mah Tjun Lyn, J., Loh Sau, C., Rosli, N. A. (2020) Mainstream versus special needs educators: Comparisons of knowledge levels towards their roles and responsibilities in supporting inclusive education. *Malaysian Journal of Education*; 45(1), 30-40. http://journalarticle.ukm.my/15244/1/39081-129354-1-PB.pdf

Makgaba, N. T. (2006). A retrospective analysis of heterophoria values in a clinical population aged 18 to 30 years. *African Vision and Eye Health*, 65(4), 150-156. https://doi.org/10.4102/aveh.v65i4.270

Martino, F., Castro-Torre, J. J., Casares-Lopez, M., Ortiz-Peregrina, S., Ortiz, C., & Anera, R. G. (2021). Deterioration of binocular vision after alcohol intake influences driving performance. *Scientific Reports*, 11(1), 1-13. https://www.nature.com/articles/s41598-021-88435-w

McGregor, M. L. (2014). Convergence insufficiency and vision therapy. *Pediatric Ophthalmology*, 61(3), 628-639. http://dx.doi.org/10.1016/j.pcl.2014.03.013

Migrants, T., Kiyokawa, J. M., & Island, H. (2019). The relationship between attention, dyslexia, and convergence insufficiency. *International Journal of Undergraduate Research and Creative Activities*, 11(1), 1-11. https://pdfs.semanticscholar.org/4b34/d8d38e22874d8e81c0cf0f51a18b50524cb2.pdf

Milewski, P. (2017), "Historicizing health and education: Investigations of the eyesight of school children in the early nineteenth century", *History of Education Review*, Vol. 46 No. 2, pp. 125-135. https://doi.org/10.1108/HER-03-2016-0018

Molloy, C. S., Battista, A. M., Burnett, A., Lee, K. J., Roberts, G., Gheong, J. L., Anderson, P. J., & Doyle, L. W. (2015). The contribution of visual processing to academic achievement in adolescents born extremely preterm or extremely low birth weight. *Child Neuropsychology: A Journal on Normal and Abnormal Development in Childhood Adolescence*, 23(3).

https://doi.org/10.1080/09297049.2015.1118024

Momeni-Moghaddam, H., Kundart, J., Azimi, A., & Hassanyani, F. (2015). The effectiveness of home-based pencil push-up therapy versus office-based therapy for treatment of symptomatic convergence insufficiency in young adults. *Middle East African Journal of Ophthalmology*; 22(1); 97-102. https://pubmed.ncbi.nlm.nih.gov/25624682/

Moran, T. P., & Carroll, J. M. (1996). *Design Rationale: Concepts, Techniques, and Use*. CRC Press: Taylor and Frances Group. 1-504. ISBN 9780805815672

Moser, A. & Korstjens, I. (2018). Series: Practical guidance to qualitative research. Part 3: Sampling, data collection and analysis. *European Journal of General Practice*, 24(1), 9-18. https://pubmed.ncbi.nlm.nih.gov/29199486/

Nair, A. G., Patil-Chhablani, P., Venkatramani, D. V., & Gandhi, R. A. (2014). Ocular myasthenia gravis: A review. *Indian J Ophthalmol*, 62(10), 985-991. https://pubmed.ncbi.nlm.nih.gov/35157811/

National Association of Special Education Teachers. (2021). *PDP- Professional Development Courses*. https://www.naset.org/career-center/professional-development-program-pdp/pdp-menu/pdp-professional-development-courses

National Center for Learning Disabilities (NCLD). (n.d.). *Visual and Auditory Processing Disorders*. http://www.ldonline.org/article/6390/

Neal. (2020). Phenomenon of interest, framework, or theory? Building better explanations in community psychology. *Global Journal of Community Psychology Practice.* https://www.gjcpp.org/en/article.php?issue=22&article=132

Nijhawan, L. P., Janodia, M. D., Muddukrishna, B. S., Bhat, K. M., Bairy, K. L., Udupa, N., & Musmade, P. B. (2013). Informed consent: Issue and challenges. *Journal of Advanced Pharmaceutical Technology & Research*, 4(3), 134-140. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC3777303/

Nunes, A. F., Monteiro, P. L., & Nunes, A. S. (2020) Factor structure of the convergence insufficiency symptom survey questionnaire. *PLoS One*; 15(2), 1-9. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7039507/

OCALI (n.d.). History of UDL: *A Brief Overview*. https://www.ocali.org/project/learn_about_udl/page/udl_history

Oliva, O., & Morgando, A. (2018). Bilateral lateral rectus recession versus unilateral recession/resection for basic intermittent exotropia. *Medwave*, 18(6). https://www.medwave.cl/link.cgi/English/Updates/Epistemonikos/7318

Optometry.osu.edu. (2005). *Chapter 8: Office-Based Vision Therapy (VT/Orthoptics)*. https://optometry.osu.edu/sites/default/files/PDFs/Research/CITT/MOP_Chapter08.pdf

Parkinson, J., & Maxner, C. (2005). Eye movement abnormalities in Alzheimer disease: Case presentation and literature review. *Am Orthopt. J*, 55, 90-96. https://pubmed.ncbi.nlm.nih.gov/21149116/

Patel, M. X., Doku, V., & Tennakoon, L. (2018). Challenges in recruitment of research participants. Cambridge University Press. *Advances in Psychiatric Treatment*, 9(3), 229-238. https://doi.org/10.1192/apt.9.3.229

Patino, C. M. & Ferreira, J. C. Inclusion and exclusion criteria in research studies:

Definitions and why they matter. *J Bras Pneumol*, 44(2), 84. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6044655/

Poope, R. (2014). Poor eyesight and educational outcomes in Ethiopia. Poor eyesight and educational outcomes in Ethiopia. *The Review of Black Political Economy*, 41(2), 205. https://doi.org/10.1007/s12114-014-9177-y

Posey, A. (2021). *Universal Design for Learning (UDL): A Teacher's Guide*. CAST, Inc. https://www.understood.org/en/school-learning/for-educators/universal-design-for-learning/understanding-universal-design-for-learning

Provalis Research (2021). QDA Miner Lite- Free Qualitative Data Analysis Software. https://provalisresearch.com/products/qualitative-data-analysis-software/freeware/

Raghuram, A., Hunter, D. G., Gowrisankaran, S., & Waber, D. P. (2019). Self-reported visual symptoms in children with developmental dyslexia. *Vision Research*, 155, 11-16. https://doi.org/10.1016/j.visres.2018.11.007

Ramsook, L. (2018). A methodological approach to hermeneutic phenomenology. *International Journal of Humanities and Social Sciences*, 10(1), 12-24.

Ratan, S. K., Anand, T., & Ratan, J. (2019). Formulation of research question—Stepwise approach. *Journal of Indian Association of Pediatric Surgeons*, 24(1), 15-20. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6322175/

Reiter, S., Stewart, G., & Bruce, C. (2011). A strategy for delayed research method selection: Deciding between grounded theory and phenomenology. *Electronic Journal of Business Research Methods*, 9(1), 35-46. https://academic-publishing.org/index.php/ejbrm/article/view/1266/1229

Rudman, D. L., Pollard, N., Craig, C., Kantartzis, S., Piskur, B., Simo, S. A., van Bruggen, H., & Sample, K. L., Hagtvedt, H., & Brasel, A. S. (2020). Components of visual perception in marketing contexts: A conceptual framework and review. *Journal of the Academy of Marking Science*, 48, 405-421. https://doi.org/10.1007/s11747-019-00684-4

Rumman, A. A. A. & Alheet, A. F. (2019). The role of researcher competencies in delivering successful research. *Information and Knowledge Management*, 9(1). https://www.iiste.org/Journals/index.php/IKM/article/viewFile/45969/47849

Saunders, B., Sim, J., Kingstone, T., Baker, S., Waterfield, J., Bartlam, B., Burroughs, H., & Jinks, C. (2018). Saturation in qualitative research: Exploring its conceptualization and operationalization. *Qual Quant*, 52(4), 1893-1907. https://pubmed.ncbi.nlm.nih.gov/29937585/

Scheiman, M. (2011). *Understanding and Managing Vision Deficits: A Guide for Occupational Therapists.* (3rd ed). SLACK Incorporated. Philadelphia, PA. ISBN: 978-1-55642-937-8

Scheiman, M., Chase, C., Borsting, E., Mitchell, G. L., Kulp, M. T., & Cotter, S. A. (2018). Effect of treatment of symptomatic convergence insufficiency on reading in children: A pilot study. *Clinical and Experimental Optometry*, 101(4), 585-593. https://pubmed.ncbi.nlm.nih.gov/29577409/

Scheiman, M., Kulp, M. T., Cotter, S. A., Lawrenson, J. G., Wang, L., & Li, T. (2020). Interventions for convergence insufficiency: A network meta-analysis. *The Cochrane Database of Systematic Review*; 12.

https://pubmed.ncbi.nlm.nih.gov/33263359/

Schiller, S. (2018). Contributing to social transformation through occupation: Experiences from a think tank. *Journal of Occupational Science*, 26(2), 316-322. https://doi.org/10.1080/14427591.2018.1538898

Searle, A., & Rowe, F. J. (2016). Vergence neural pathways: A systematic narrative literature review. *Neuroophthalmology*, 40(5), 209-218. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5122972/

Sehgal, S., Rebello, R., Wolmarans. L., & Elston, M. (2017). Hickam's dictum: Myasthenia Gravis presenting concurrently with Graves' disease. *BMJ case reports*, 2017. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5589050/

Shainberg, M. J. (2017). Vision therapy and orthoptics. *American Orthoptic Journal*, 60(1). https://doi.org/10.3368/aoj.60.1.28

Sheila (2018). *Impact of low-literacy*. https://www.literacyconnections.org/impact-of-low-literacy/

Singman, E. L., Matta, N. S., & Silbert, D. (2017). Convergence insufficiency associated with migraine: a case series. *American Orthoptic Journal*, 64(1). https://doi.org/10.3368/aoj.64.1.112

Sivasubramaniam, S., Dlabolová, D.H., Kralikova, V., & Khan, Z. R. (2021). Assisting you to advance with ethics in research: an introduction to ethical governance and application procedures. *Int J Educ Integr* 17, 14. https://edintegrity.biomedcentral.com/articles/10.1007/s40979-021-00078-6

Spierer, O., & Spierer, A. (2021). Unilateral lateral rectus recession is an effective

surgery for intermittent exotropia in young children. *BMC Ophthalmology*, 21(10). https://bmcophthalmol.biomedcentral.com/articles/10.1186/s12886-020-01778-2

Suleiman, A., Lithgow, B. J., Anssari, N., Ashiri, M., Moussavi, Z., & Mansouri, B. (2019). Correlation between ocular and vestibular abnormalities and convergence insufficiency in post-concussion syndrome. *Neuro-Ophthalmology*, 44(3), 157-167. https://doi.org/10.1080/01658107.2019.1653325

Suter, W. N. (2012). *Chapter 12: Qualitative Data, Analysis, and Design*. (2nd ed.). Sage. https://dx.doi.org/10.4135/9781483384443.n12

Teacher College, Columbia University. (2022). The Academic Achievement Gap: Facts & Figures. https://www.tc.columbia.edu/articles/2005/june/the-academic-achievement-gap-facts--figures/

The Children's Defense Fund. (2022). The State of America's Children: Education. https://www.childrensdefense.org/state-of-americas-children/soac-2021-education/

Thelwall, M. & Nevill, T. (2021). Is research with qualitative data more prevalent and impactful now? Interviews, case studies, focus groups and ethnographies. *Library & Information Science Research,* 43(2). https://doi.org/10.1016/j.lisr.2021.101094

Trieu, L. H., & Lavrich, J. B. (2018) Current concepts in convergence insufficiency. *Current Opinion in Opthalmology*, 29(5), 401-406. https://pubmed.ncbi.nlm.nih.gov/29994854/

Triantafilou, D. M., Welder, J. D., & Longmuir, S. Q. (2014). Convergence Insufficiency.

Ophthalmology and Visual Science. https://webeye.ophth.uiowa.edu/eyeforum/cases/198-convergence-insuffic.htm

Van Garderen, D., Scheuermann, A., Poch, A., & Murray, M. M. (2016). Visual representation in mathematics: Special education teachers' knowledge and emphasis for instruction. *The Journal of the Teacher Education Division of the Council for Exceptional Children*, 41(1). https://doi.org/10.1177/0888406416665448

Vasileiou, K., Barnette, J., Thorpe, S., & Young, T. (2018). Characterizing and justifying sample size sufficiency in interview-based studies: systematic analysis of qualitative health research over a 15-year period. *BMC Medical Research Methodology*, 18(148). https://doi.org/10.1186/s12874-018-0594-7

Von Noorden, G. K., & Campos, E. C. (2002). *Binocular Vision and Ocular Motility: Theory and Management of Strabismus.* (6th ed.). Mosby- A Harcout Health Science Company, 1-657. https://www.aao.org/assets/0c711d7f-503f-4cd9-b4ac-92d6ec31a718/636343503854270000/strabismus-binocular-vision-and-ocular-motility-vnoorden-pdf?inline=1

Wang, X., Zhang, W., Chen, B., Liao, M., & Liu, L. (2019). Comparison of bilateral medial rectus plication and resection for the treatment of convergence insufficiency-type intermittent exotropia. *Acta Ophthalologica* (1755375X), 97(3), 448-453. https://pubmed.ncbi.nlm.nih.gov/30740923/

Weston, C. & Cranton, P. A. (2016). Selecting instructional strategies. *The Journal of Higher Education*, 57(3), 259-288.

https://doi.org/10.1080/00221546.1986.11778771

Willings, C. (n.d.). Convergence Insufficiency. Teaching Students with Visual Impairments. https://www.teachingvisuallyimpaired.com/convergence-insufficiency-ci.html

Wood, J. M., Black, A. A., Hopkins, S., & White, S. L. J. (2018). Vision and academic performance in primary school children. *Journal of the College of Optometrists*. https://doi.org/10.1111/opo.12582

Xia, Y., & He, S. (2021). New progress in the study of convergence insufficiency. (2021). *International Journal of Ophthalmology & Visual Science*, 6(1), 41-45. https://www.sciencepublishinggroup.com/journal/paperinfo?journalid=230&doi=10.11648/j.ijovs.20210601.16

Appendix A: Invitation Letter

Dear Name,

Hello, my name is Jennifer Lambert, an educator in the Southeast district in Georgia. I am in the Walden University PhD program, and as part of my coursework, I have developed a research study to explore instructional strategies of secondary special education teachers for students with visual or visual-motor deficits with aim to close educational gaps. I am seeking secondary special education teachers to participate in the study. Interviews will be conducted via virtual conference call (Zoom) during regular school hours (such as planning), and could be before or after school if you prefer. Would you be interested in assisting with this mission? Interviews should not take nor more than 20 minutes. The research will be ongoing for approximately 3 months. Please let me know if you would like to participate by clicking the link below to view and sign the Informed Consent document. The course has deadlines, so we will need to begin the process by ____ (date), and will finish by ____ (date). You can contact me by telephone at XXX-XXX-XXXX if you have any questions.

**Please click the link below to Consent to the study:

Sincerely,

Jennifer Lambert
Walden University Doctoral Student

Appendix B: Notification of Selection Letter

Dear Name,

Congratulations on your selection as a participant in the exploration of instructional strategies to assist students with visual-motor deficits study. Many excellent candidates were considered. Your selection was based on your background and experience, and meeting the required qualifications for the study. You are invited to take part in an interview for a research study I am conducting as part of my doctoral program. The purpose of the interview is to explore instructional strategies secondary special education teachers of an inclusive setting use to assist students who struggle with notetaking due to visual or visual-motor deficits known or unknown as convergence insufficiency. This research is intended to provide understanding on how one can assist students with aims to close educational gaps, whether identified or not, for visual-motor impairments.

Interview Procedures: I am requesting that you permit me to conduct an audio-recorded interview for about 15-20 minutes. Transcriptions of interviews will be analyzed as part of my course. You will have the opportunity to see your responses in a written format to make sure all the information is accurate. Copies of your interview recording and transcript are available from me upon request.

Voluntary Nature of the Interview: This interview is voluntary. If you decide to take part now, you can still change your mind later.

Risks and Benefits of Being Interviewed: Being in this interview would not pose any risks beyond those of typical daily life. There is no benefit to you.

Privacy: Interview recordings and full transcripts will be shared with each interviewee, upon request. Transcripts with identifiers redacted will be shared with my university faculty along with my analysis. The interview recording and transcript will be held for 5 years after the completion of my course under lock and key in a private area.

Contacts and Questions: If you want to talk privately about your rights as an interviewee, you can contact me, or Walden University's Research Participant Advocate. They are Walden University representative who can discuss this with you. The email address for the contact is IRB@mail.waldenu.edu. Please share any questions or concerns you might have at this time. You can contact me by phone at XXX-XXX-XXX, or reply to this email if you have any questions.

Sincerely,
Jennifer Lambert
Walden University Doctoral Student

Appendix C: Non-Selection Letter to Potential Participants

Dear Name,

Thank you for your interest to participate in the exploration of instructional strategies to assist students with visual-motor deficits study. Unfortunately, you were not selected as a participant.

The task of selecting participants for the study was not an easy decision. However, we have reached a sufficient number of qualified participants for the study. We appreciate the time and energy that go into reviewing and responding to the recruitment for the study. Thank you for investing the time.

We wish you success in your future endeavors.

Sincerely,

Jennifer Lambert

Walden University Doctoral Student

Appendix D: Research and Interview Questions

Research Question 1: **What instructional strategies do special education teachers use to assist students who have CI with visual-motor deficits?**

Interview Questions:

- Have you received any trainings or professional development in teaching students with convergence insufficiency?
    - Follow-up question: Can you recall how long ago that was and how often you received training?
- Have you received any trainings for visual or visual-motor deficits?
    - Follow-up question: Can you recall how long ago that was and how often you received training?
- What are the main interventions you use the most (or would use) to accommodate students with visual/visual motor challenges?
    - Follow-up questions: Which do you find to be the most helpful and why? What methods, if any, did not work and why?
- During instruction, what methods or materials do you use aside from traditional pencil/paper task for students to show their understanding of concepts?
- What resources are accessible, if any that you are aware of, to assist students with visual or visual-motor challenges?
- What techniques do you wish other special education teachers knew as it pertains to visual or visual-motor challenges?
- What stories of success can you share?

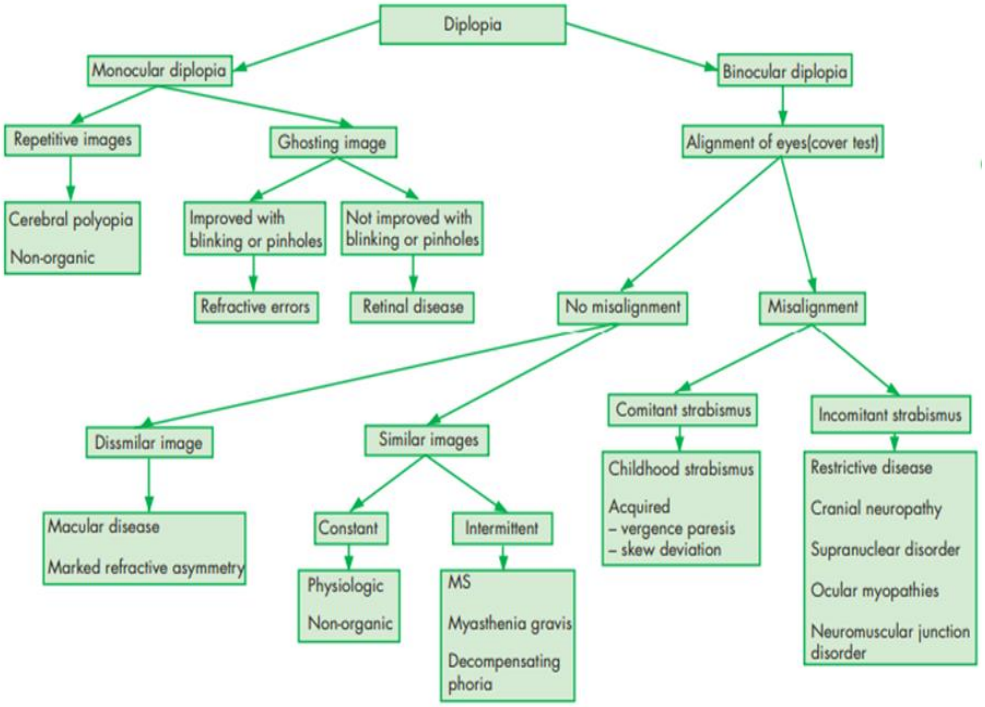
Research Question 2: **How do instructional practices for visual deficits assist students with notetaking as perceived by special education teachers?**

Interview Questions:

- What options do you provide, if any, for learners that need support engaging with reading while writing?
    - Follow-up question: Which option work the best? Which method do students typically prefer?
- How do you assist students with notetaking challenges?
    - Follow-up question: How well do these supports work?
    - Follow-up question: What methods do you use for students with a severe deficit? (i.e. large print, voice recording)
- What techniques have you (or would you) use if you noticed a student writing from the board is different from his/her paper?
    - Follow-up questions: What techniques, if any, did not work? What techniques did you find to be useful and why?
- What stories of success can you share?

Appendix E: Diplopia Diagram

General Approach to Diplopia Diagram



(Danchaivijitr, 2004)