

APPLYING MULTISENSORY APPROACHES FOR STUDENTS WITH DYSLEXIA

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ABSTRACT:

Dyslexia, a neurobiologically-based specific learning disability characterized by difficulties in accurate word recognition, spelling, and decoding, presents significant challenges in reading, writing, phonological awareness, and student self-esteem. Traditional, predominantly visual or auditory instructional methods often prove ineffective for these learners. This paper examines the application of multisensory approaches as a critical intervention strategy. Rooted in the Orton-Gillingham (OG) method and supported by neuroscience, multisensory learning integrates visual, auditory, kinesthetic, and tactile modalities to engage multiple neural pathways simultaneously. This approach addresses the core phonological processing deficits in dyslexia by leveraging individual learning strengths, enhancing information processing, memory retention, and motivation. The paper details specific multisensory techniques within each modality (visual aids, auditory tools, kinesthetic activities, tactile manipulatives) and discusses their efficacy in improving literacy skills. Successful implementation requires teacher training, appropriate resources, and collaborative support systems. While research confirms the effectiveness of multisensory strategies, the paper concludes by highlighting the need for further investigation into long-term outcomes, integration across subjects and age groups, and the role of emerging technologies. Multisensory approaches offer a transformative, inclusive framework for empowering students with dyslexia to overcome learning barriers and achieve their academic potential.

Keywords: *Dyslexia, Multisensory Learning, Specific Learning Disabilities (SLD), Reading Difficulties, Inclusive Education*

Introduction

The definition of specific learning disabilities has caused controversy and controversy among the scientific community (Sandravelis, 2015), especially in the fields of school psychology and neuropsychology (Decker et al., 2013). Thus, it is observed that depending on the scientific point of view, the definition differs significantly, while variations of the definition are found even within the same scientific field. Many researchers use the terms specific learning disabilities and dyslexia as identical. Furthermore, it has been observed that the terms learning disabilities and specific learning disabilities, depending on the geographical and communication context in which they are used, sometimes end up with the same or very different things. In the United Kingdom, the term learning disabilities refers to cognitive or intellectual disorders, while in Australia and

America, the term learning disabilities is synonymous with specific learning disorders (McDowell, 2018). Moreover, sometimes the term “dyslexia” is overused in an attempt to find an appropriate word to describe any difficulty in the process of learning and producing written speech. It has been empirically observed that all students who face difficulties in their studies, especially when they do not have interdisciplinary consultations, are often labeled as students with learning difficulties, regardless of the specific type of difficulty.

It is often observed that students with learning disabilities often face challenges in more than one cognitive subject. Specifically, according to research by Moll et al. (2019) and Willcutt et al. (2019), learning difficulties in reading often coexist with learning difficulties in mathematics, but the underlying cause of this comorbidity is not clearly defined (Viesel-Nordmeyer, 2023)

The term learning disabilities is general and defines cognitive difficulties, and more specifically difficulties in the acquisition of listening, speaking, reading, writing and reasoning or mathematical abilities (Darvis, 2001) that an individual faces throughout school life. This term refers to a heterogeneous set of problems related to the functioning of learning and comprehension of speech, reading comprehension, and mathematics (NRCLD, 2007). The causes of generalized learning disabilities are secondary symptoms of another difficulty or disorder. There is a potential coexistence of learning disabilities with problems with self-control behavior, social perception, and social interaction, but this does not imply that such problems in themselves constitute learning disabilities.

Dyslexia and the importance of a multisensory approach in children

The question “What is dyslexia?” although simple and simplified, is complex and complicated to answer and there is no single, definitive diagnosis or definition for it (Neil, 2017).

The word “dyslexia” - in Greek δυσλεξία - etymologically comes from the Greek words [$\{\delta\upsilon\varsigma\}$ + $\{\lambda\acute{\epsilon}\xi\eta\}$]. The preposition “dys” has a negative meaning and indicates either a bad attribute, for example, δυσ-οσμία (unpleasant smell), or a difficulty δυσκαμψία (inflexibility) (Babinotis, 2004). Thus, looking back to the Greek language, we find that the word dyslexia can be literally understood as a difficulty in words. The above literal translation, which aims at semantic completeness, could be enriched as follows: difficulty in using, recording and reading words. According to Stein (2018), the term dyslexia was first used in 1887 by Rudolf Berlin, a German ophthalmologist, who coined the term “dyslexia” to apply to stroke patients who selectively lost the ability to read without losing basic vision or hearing and retaining most other cognitive skills. However, Pringles Morgan managed to associate his name with the term because he gave it human characteristics. Dyslexia was originally described as word blindness, and the reason was Morgan’s patient who, although not cognitively impaired, nevertheless learned to write and read at the age of 14 with systematic training. However, he seemed unable to hold any visual structure and/or representation of words. Over the course of the century, the term blindness was replaced by the term dyslexia as it became clear that visual acuity was not responsible for the difficulties and

deficiencies in these individuals (Stein, 2018). Later, in the 1950s, with the introduction of Noam Chomsky's revolutionary concepts of general grammaticality and repetitive genetic phonology (1955), dyslexia was fully perceived as a problem with the acquisition of phonological skills. Many years later, in the 20th century, with the introduction of functional magnetic resonance imaging, it was realized that readers with poor skills have clear differences in the activity of their cerebral cortex and especially in the left hemisphere, which is particularly important for language (Shaywitz, 1997). As already mentioned, there are many different views and definitions of specific learning difficulties and it seems that the opinions of scientists do not converge. Regarding the difficulty inherent in specific learning difficulties, the International Dyslexia Association (IDA, 2023) characterizes a neurobiological disorder that manifests itself with deficits in language perception and expression and other processes involved in the acquisition of knowledge. On the other hand, there is no term for dyslexia per se and the emphasis is given to the type of learning disorder of individuals. Despite the different views of scientists on the definition of dyslexia, there is a common denominator everywhere: intelligence can be up to 70 ± 5 , that is, at lower or even 151 borderline levels of normal mental functioning. This happens because if students with lower intelligence could be placed under the umbrella of dyslexia, then their difficulties could only be attributed to their cognitive impairment, and not necessarily to the presence of a disorder.

According to the International Dyslexia Association (2002), dyslexia is a specific learning disability that has a neurobiological origin and is characterized by difficulties in correct and/or fluent word recognition, problems in spelling and problems with decoding abilities (Karovska, 2018). The problems in children with dyslexia arise from difficulties in processing sounds within words and establishing connections between sounds and written symbols - letters as well as patterns of letter combinations - which represent sounds in words. The term learning problems or learning disability is an umbrella term that describes specific problems with information processing and learning skills. Dyslexia is one of the disabilities that is included in the order of learning disabilities. Dyslexia is the most common learning disability (Rief, 2010). According to Critchley and Critchley (1978) dyslexia occurs in varying degrees: Severe – when the student has a high IQ and excellent verbal abilities, but has serious reading problems.

Sometimes the difficulties manifest themselves with problems in organization and sequencing. Turner (2004) created a dyslexia index with a description of the gradation in terms of the severity of dyslexia and, based on the results of standardized tests, distinguishes five degrees of dyslexia: no signs of dyslexia; a small number of signs of dyslexia; moderate form of dyslexia; severe form of dyslexia; very severe form of dyslexia. The dyslexia index also provides an assessment of phonological ability, which includes an assessment of phonemic awareness, phonemic memory and phonological knowledge (Karovska Ristovska, 2018).

The impact of dyslexia on learning can be significant and manifest itself in different ways. Most often, students with dyslexia have difficulties in: 1. **Reading:** Reading difficulties are the most characteristic of dyslexia. Students may have problems decoding words, meaning they have

difficulty matching letters to their corresponding sounds. This can lead to slow and inaccurate reading, as well as difficulty understanding what they read (Shaywitz, 2003); 2. **Writing and Spelling:** Due to difficulties in language processing, students with dyslexia often have problems with writing and spelling. They may have difficulty remembering the visual patterns of words, resulting in frequent spelling errors (Berninger, 2009); 3. **Phonological Awareness:** As mentioned, dyslexia is often accompanied by poor phonological awareness, meaning students have difficulty identifying, distinguishing, and manipulating the sounds in words. This can affect their ability to learn new words and use phonetic reading strategies (Snowling, 2000); 4. **Self-esteem and motivation:** Due to persistent difficulties and failures in school, students with dyslexia often experience low self-esteem and reduced motivation to learn. This can lead to avoidance of reading and writing tasks, which further increases academic gaps (Riddick, 2010). However, it is important to emphasize that dyslexia is not an indicator of low intelligence or lack of diligence. Students with dyslexia often have unique strengths, such as creative thinking, visual-spatial skills, and problem-solving abilities ((IDA), 2020). The key to success lies in recognizing their specific needs and applying appropriate learning strategies, such as multisensory approaches, which activate different senses to facilitate the learning process (Eide, 2011). The theoretical framework and importance of the multisensory approach.

Multisensory literally means more than one sense. In other words, using more than one of the five senses at the same time. We learn through information received through our senses, not just sight, hearing, smell, taste, and touch. A multisensory approach to learning integrates more than one sense throughout the teaching process in order to improve the learning process of students. By adopting this approach, the inclusion of multiple senses in the learning process leads to increased learning abilities in students and increased efficiency in retaining acquired knowledge. However, it is noted that in reality, most teaching in schools is still mainly based on the use of visual or auditory methods (Syahputri, 2019).

As previously noted, the multisensory teaching approach refers to an educational strategy in which students engage all of their human sensory abilities - including hearing, smell, touch, sight, sensation, and taste - in educational settings (Suryaratri, et al., 2019). These interactive methods embody a natural approach, mirroring the innate learning process observed in infants and young children as they explore the world through tactile experiences and taste exploration (Sarudin, 2019). The multisensory educational approach seeks to enhance children's learning by simultaneously engaging multiple senses. This approach effectively addresses potential challenges that arise from processing information through a single sense (such as hearing or vision). By enabling the simultaneous engagement of different senses (such as touch, movement, hearing, and vision), it provides a comprehensive solution to the learning process. Through this approach, children can cultivate different types of memories - tactile, visual, auditory, or kinesthetic. This empowers each child to utilize their unique strengths for optimal learning outcomes (Loizou, 2016).

The names of neuropsychiatrist Orton and educational psychologist Gillingham have become synonymous with the multisensory approach to teaching. As early as 1925, Samuel T. Orton postulated that while dyslexia has biological origins, its cure is fundamentally educational in nature (Henry, 1998). Subsequently, based on this hypothesis, it was believed that dyslexic children could benefit significantly from personalized instruction, specifically focusing on systematic phonics-focused reading instruction. The revolutionary OrtonGillingham (OG) method, originally conceived by Orton and then developed into a comprehensive curriculum by Anna Gillingham and Bessie Stillman (Gillingham, 1956), has laid the foundation for numerous multisensory programs since its inception (Ring, 2017). The OG approach involves a structured, sequential, and multisensory framework, emphasizing synthesis and phonics-based techniques for effective reading instruction (Ritchey, 2006). The Orton-Gillingham method activates three sensory inputs, namely visual, auditory, and kinesthetic, which is known by the acronym (VAK) (Hardiana, 2018). Other multisensory methods also use the tactile factor (Chither, 2020), while others consider the kinesthetic factor to include the tactile factor.

More specifically, neuroscience, using functional neuroimaging methods (providing images of brain activity during the performance of an activity, such as phonological processing for example), has confirmed that areas of the brain (parietal and fusiform cortex) are responsible for decoding letters (orthography) to language sounds (phonology) in children with reading difficulties (Shaywitz, 2020).

These children may show deficits in one or more of the basic sensory modalities required for reading and spelling: visual perception (through visual adaptation), auditory reception (understanding sound), verbal expression and perception of movement (related to speech), as well as the execution of hand movements and the feeling of such movements (related to writing). The effectiveness of multisensory approaches is rooted in their ability to enable children to nurture and utilize all four sensory modalities simultaneously (Walker, 2000). The adoption of multisensory techniques aligns with the natural functioning of the brain, which involves processing sensory input from multiple senses. This is due to the brain's fundamental role in integrating and processing information originating from different sensory channels (Farrell, 2011).

Numerous reports of multisensory interactions in various perceptual tasks and contexts suggest that these interactive elements are pervasive rather than exceptional in the processing of sensory information by the human brain (Shimojo, 2001).

Multisensory approaches are important because: 1. **Individualizing learning:** Each student has a unique way of learning. Some are visual learners, others are auditory learners, and some learn best through physical activities. Multisensory approaches take these differences into account and allow students to capitalize on their strengths while working to improve areas in which they are weaker (Tomlinson, 2014); 2. **Supporting students with specific learning disabilities:** For students with dyslexia, traditional teaching methods are often ineffective. Multisensory approaches, which include the use of images, sounds, movement, and touch, help these students overcome

their difficulties and develop reading, writing, and spelling skills (Birsh, 2011); 3. **Increased engagement and motivation:** When learning is interactive and involves multiple senses, students are more engaged and motivated. This is especially important for students who have had negative experiences with traditional learning and who may feel demoralized by their difficulties (Fredricks, 2004); 4. **Deeper processing of information:** When information is presented through multiple senses, the brain makes more associations, which facilitates memory and understanding. For example, when a student learns a new word through a visual image, auditory sound, and physical movement, the likelihood that he or she will remember and understand the word is much greater (Paivio, 1986).

Types of multisensory approaches

Multisensory approaches are versatile and flexible methods that involve most of the senses to enhance the learning process. These approaches are particularly useful for students with specific learning disabilities, such as dyslexia, as they allow them to overcome their difficulties by activating different sensory pathways.

Visual Multisensory Approaches

Visual multisensory approaches are one of the most effective ways to enhance learning, especially for students who are visually oriented. These approaches involve the use of pictures, diagrams, graphs, videos, maps, charts, and other visual elements that help students process and remember information better. Visual stimuli are particularly useful for creating mental associations, which facilitate understanding and long-term memorization of materials.

Examples of visual multisensory approaches: **Infographics and diagrams:** They present complex information in a simpler and more understandable format. For example, a timeline of historical events can be presented in a diagram, making it easy for students to follow and understand the events (Mayer, 2001); **Mind maps:** These maps help students organize their thoughts and connect different concepts. For example, when learning a new word, a student can create a mind map that includes a definition, synonyms, antonyms, and examples of usage (Paivio, 1986). Dual Coding Theory explains how visual and verbal information are processed separately but are linked in memory, making visual learning effective; **Video materials:** Videos are a powerful learning tool because they engage both the visual and auditory senses. For example, science experiments or historical events can be presented in videos, making learning more interactive and interesting (Clark, 2010); **Illustrations and pictures:** These are especially useful for learning new words or concepts. For example, when studying animals, pictures of animals can help students remember their names and characteristics more easily (Fadel, 2008). Visual multisensory approaches facilitate better understanding and help students visualize abstract concepts, which makes learning more understandable. Students are more engaged when learning includes visual elements because they

make the process more interesting. Research shows that information that is presented visually is better remembered than information that is presented only verbally.

Auditory Multisensory Approaches

Auditory multisensory approaches focus on the use of sound and hearing as primary channels for learning. These approaches are particularly useful for students who are auditory learners, that is, those who learn best through listening and verbal communication. Auditory methods include the use of speech, music, sounds, discussions, audio recordings, and other forms of auditory stimuli that engage students' auditory senses.

Examples of auditory multisensory approaches: **Audio recordings and podcasts:** These are useful for presenting information through speech or music. For example, audio books are a great way for students to listen to literary works, which is especially helpful for those who have difficulty reading (Mayer, 2001); **Discussions and debates:** Learning through discussions allows students to express their opinions and hear different perspectives. This stimulates critical thinking and active learning (Baddeley, 1992); **Music and Songs:** Music can be used to enhance the retention of information. For example, songs with educational content (such as songs about the multiplication table or grammar rules) are effective for learning and memorization (Gardner, 1983); **Sound Effects and Audio Visuals:** Sound effects can be used to enhance the understanding of concepts. For example, when studying nature, the sounds of animals or nature can make learning more realistic and interesting (Rauscher, 1993). Auditory multisensory approaches allow for better understanding among auditory learners. Auditory stimuli can increase concentration and attention, especially for students who have difficulty focusing. Information presented through sound is often better remembered because sound creates an emotional and memory connection. Auditory approaches are particularly useful for students with dyslexia or reading difficulties, as they allow them to overcome obstacles through listening.

Kinesthetic Multisensory Approaches

Kinesthetic multisensory approaches focus on incorporating physical activities and movements into the learning process. These approaches are particularly useful for students who are kinesthetic learners, that is, those who learn best through hands-on activities, movement, and physical engagement. Kinesthetic methods include the use of gestures, physical manipulations, experiments, games, and other forms of activity that engage students' bodily senses.

Examples of kinesthetic multisensory approaches: **Physical Manipulations:** The use of objects such as blocks, figures, or other tools for physical manipulation helps students understand abstract concepts. For example, when learning mathematics, students can use blocks to visualize and solve mathematical problems (Jensen, 2000); **Role-playing and Simulations:** These activities allow students to experience concepts through role-playing and simulations. For example, when learning about history, students can role-play historical figures and reenact events (Ratey, 2008);

Experiments and hands-on activities: Science experiments and hands-on activities are a great way to learn through experience. For example, when learning about chemistry, students can conduct experiments to understand chemical reactions (Ratey, 2008); **Movement and gestures:** The use of movement and gestures can support the learning of new concepts. For example, when learning new words, students can use gestures to connect words to their meanings (Tomlinson, 2014). Kinesthetic multisensory approaches allow for better understanding. Students who learn best through physical activities benefit more from kinesthetic methods. Physical activities make lessons more interactive and interesting, which increases student engagement. Information that is associated with physical activities is better remembered because it creates memory connections through movement and experience. Kinesthetic approaches are especially useful for students with dyslexia or other concentration difficulties, as they allow them to release their energies and focus on learning.

Tactile Multisensory Approaches

Tactile multisensory approaches focus on incorporating touch and physical interaction into the learning process. These approaches are particularly useful for students who learn best through physical contact and manipulation of objects. Tactile methods involve the use of a variety of materials, textures, and tools that engage the sense of touch, allowing students to experience concepts through physical engagement.

Examples of tactile multisensory approaches: **Manipulative materials:** The use of objects such as clay, sand, fabric, or other textures helps students understand concepts through touch. For example, when learning about geometric shapes, students can create shapes from clay or touch three-dimensional models (Gardner, 1983); **Tactile books and resources:** Books with different textures or relief illustrations are an excellent way to incorporate touch into learning. These resources are especially useful for students with visual impairments or those who learn best through touch (Hannaford, 1995); **Tactile Games:** Games that involve touch, such as sorting objects by texture or shape, can support tactile learners. For example, students can sort different types of grains or rocks by their texture (Montessori, 1912); **Texture Experiments:** Students can explore different textures and materials through hands-on activities. For example, in nature study, students can touch different types of leaves, tree bark, or minerals (Jensen, 2000). Tactile multisensory approaches allow students who learn best through touch to benefit more from tactile methods. Physical activities and manipulatives make lessons more interactive and interesting, which increases student engagement. Information that is associated with physical activities and touch is better remembered because it creates memory connections through experience. Tactile approaches are particularly useful for students with visual or auditory difficulties, as they allow them to overcome obstacles through touch.

Conclusion

Multisensory approaches represent a revolutionary and inclusive approach to education, especially for students with dyslexia. These methods, which integrate the visual, auditory, kinesthetic and tactile senses, offer opportunities for deeper and more effective learning, enabling students to overcome their difficulties and develop their potential. Through an analysis of the different types of multisensory approaches, their application and the results of research, it becomes clear that these methods are of crucial importance in creating an effective and accessible educational environment. Multisensory approaches take into account the different learning styles and needs of each student. For students with dyslexia, who often face difficulties in traditional teaching, these methods offer alternative paths to successful learning. By activating different sensory modalities, multisensory approaches overcome the limitations of traditional methods and enable students to learn in a way that is most suitable for them. Research has shown that multisensory approaches significantly improve reading, writing, and phonological awareness skills in students with dyslexia. These methods not only facilitate the learning process, but also increase students' self-esteem and motivation, which is crucial for their academic and emotional development. Multisensory approaches offer flexibility and creativity in teaching, allowing teachers to adapt their methods to the needs of each student. This is especially important in classrooms with different levels of ability and learning styles.

Dyslexia is associated with neurological differences in the processing of language and visual information. Multisensory approaches activate alternative pathways in the brain, allowing students to overcome their difficulties and achieve success. Although there are numerous studies that confirm the effectiveness of multisensory approaches, further research is still needed to determine the best practices and strategies. It is particularly important to investigate: The long-term effects of multisensory approaches on academic and socio-emotional outcomes for students with dyslexia; The ways in which multisensory methods can be integrated into different subjects and age groups; The impact of technology (such as virtual and augmented reality) on the effectiveness of multisensory approaches.

For the successful implementation of multisensory approaches, it is necessary to provide appropriate training for teachers. This includes: Training in the different types of multisensory methods and their application in the classroom; Strategies for individualizing teaching according to the needs of each student; Creating an inclusive and supportive learning environment.

Schools should invest in the development of resources and materials that support multisensory approaches. This includes: Tactile tools (such as sand or plastic letters); Visual tools (such as diagrams, maps, and pictures); Technological solutions (such as apps and programs for multisensory learning).

To ensure the success of multisensory approaches, collaboration between schools and families is essential. Parents need to be informed about the benefits of these methods and be involved in the learning process of their children. Multisensory approaches represent a powerful

tool for transforming education, especially for students with dyslexia. With their ability to activate different senses and support different learning styles, these methods offer the opportunity to create a more inclusive, effective and inspiring educational environment. Although there are challenges in their implementation, with appropriate support, training and research, multisensory approaches can become a key element in the education of the future. Through a continued commitment to research, innovation and collaboration, we can ensure that all students, including those with dyslexia, have access to the education they deserve and that allows them to develop their potential to the fullest.

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