The relationship between visual problems and learning difficulties - The role of vision therapy

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ABSTRACT

This literature study of existing bibliography focuses on the relationship between visual dysfunctions and learning difficulties in school aged children. In addition, the effectiveness of vision therapy in such conditions, according to the results obtained by studies in the field will be examined. The results of twenty studies were examined in order to prove that only learning difficulties are in some cases related to visual dysfunctions, and that vision therapy is effective in certain cases. The types of learning disabilities and the role of vision in learning are extensively analyzed in this literature review and it is proved that vision therapy can be beneficial for students with learning difficulties, but not a treatment for learning disabilities.

Keywords: *visual deficits, learning difficulties, vision therapy, visual problems, children, reading problems, learning disabilities.*

INTRODUCTION

Vision is doubtless our primary sense. Without its correct function our perception for the world around us can be dramatically different. For the correct understanding of *what we see* it is significant that not only the eyes function correctly, but also our brain, and most importantly the collaboration between them. Vision problems can be caused, among many others, by dysfunctions in the optical pathways from eyes to brain or in the nerves and the muscles involved in all the visual procedure (Gates, 2011).

Vision, as well as other senses, is directly related with the learning process. If vision is not functioning properly, our ability to learn and understand is highly affected. It is not uncommon for students with learning disorders that problems related to vision appear. That is the reason why vision is assessed, among other aspects, before a student is diagnosed with a learning problem. By the term *vision* we are not necessarily referring to problems of low visual acuity, since many of the deficits that are affecting the learning process have nothing to do with that. This is actually the reason why in many cases the problem is not evident until the child goes to school. However, even after that age, such deficits are not diagnosed and the bad school performance of the student is incorrectly attributed to other factors. As a result, many children are misdiagnosed with learning disabilities (Hinkley et al., 2011). Even when we are sure about the existence of a learning disability, we must ensure that the visuoperceptual skills are functioning correctly, as in many cases those two may co-exist (Lazarus, 2022). However, it is important to distinguish a child's problem between learning disability and learning difficulty (Vidyadharan & Tharayil, 2019). When we speak of learning disabilities, such as dyslexia, we exclude the problems related to vision deficits, while by using the term learning difficulty, vision problems may be involved (Malik, 2022).

Learning disabilities are affecting about 15 out of 100 children (Boyd, 2022). However, many of these cases may be misdiagnosed as a learning disability, and it can actually be just a learning difficulty, due to a perceptual deficit (Quercia et al., 2013). There are several studies supporting the case that vision therapy can be very effective in the improvement of these conditions and the results have shown a significant change in the learning process, and as a result a better performance at school, in students that followed a vision therapy treatment plan (Swanson, 1972;Seiderman, 1980;Srinithya, 2017;Hussaindeen et al., 2017). However, the issue is still raising a controversy with some studies shown no improvement in such patients after vision therapy(Metzer & Werner, 1984, Beauchamp &Kosmorsky, 1987), and some representatives of other specialties contraindicating vision therapy in students with learning disabilities (Wang et al., 2022).

Learning disabilities or disorders is a sum of terms that describes a wide variety of learning problems. They affect the ability of a person to understand or use spoken or written language, calculating, coordinate his/her body movements and direct his/her attention to something specific (Lerner, 2000). Learning disabilities may occur since birth, but usually they are not noticed until the child reaches school age.

In medical terms, a learning disability is considered a pattern of neurological dysfunction in sufferers brain, affecting the ability of correctly receiving, processing or responding to information, and as a result the capacity of learning (AOA, n.d.). If after a careful optometric evaluation, is concluded that a learning difficulty is associated with a visual dysfunction; a correctly designed vision therapy plan can be extremely helpful and effective to improve the school performance of a student Kavale, K. 1982).

Vision therapy is a long-term, progressive procedure, performed by an optometrist by which visual skills and abilities of the patient are improved, developed and strengthened. With vision therapy we achieve a comfortable and clear vision, by changing visual processing and understanding correctly the visual information received from the environment (Starr, 2000). Vision therapy programs focus on the correct function and voluntary brain control of the eyes and the improvement of the visual comfort (Committee on Children with Disabilities, American Academy of Pediatrics and American Academy of Ophthalmology, American Association for Paediatric Ophthalmology and Strabismus, 1998).

Vision therapy programs are more complicated than simple eye exercises, as they aim to improve the brain-eye communication and the effective operating of the visual system. As a procedure, it is not intended to strengthen the eye muscles, but to train the brain to process and understand correctly the visual information received from the environment. Every treatment plan is personalized according to the patient's visual needs and it may consist not only by the exercises performed in the practice, but also exercises at home can be added, when the patient is capable of performing them alone, always under the conduction of the optometrist, and the results and progress are closely monitored. (College of Optometrists in Vision Development, n.d).

More specifically, when the program is aimed at children of scholar age, the goal is to teach them how to apply the visual skills that they have developed during the treatment plan, to improve their performance in reading and writing, as well as in keeping their attention and concentration to the desired stimuli. In general, the child's visual system is trained from the beginning to focus with better accuracy, efficacy and comfort throughout all the learning process and not be distracted by external stimuli (Institute for Clinical Systems Improvement 2003).

METHOD

Aim of the study

The present research aims to investigate the relationship of vision and learning difficulties and effectiveness of vision therapy as a form of treatment for children with learning difficulties. The aim of this literature review is to assess and explain how visual dysfunctions can be related with learning problems on children of school age and examine if vision therapy can have an effect in the improvement of school performance. Through the comparison of

the results of the different relevant studies, a better understanding of this effect is accomplished.

Inclusion criteria

All relevant studies up to this day were included.

Exclusion criteria

Exclusion criteria were languages other than English, Greek and Spanish and studies before 1970.

Procedure

For this literature review, a systematic and thorough literature research has been conducted using searching machines of Google Scholar and PubMed, as well as the websites *https://schools.shrewsburyma.gov*, *www.aao.org*, *https://www.optometrists.org*, *https://www.chop.edu*, *https://childmind.org*, *https://ldaamerica.org*, *https://aapos.org*, *https://speechify.com* and *https://www.covd.org*. The following keywords were used: vision therapy for learning disabilities, vision training, vision therapy, learning disabilities, vision and learning problems, learning difficulties, visual dysfunction, vision and reading, vision and dyslexia, vision therapy for children. Results of twenty studies about the effectiveness of vision therapy in children with learning difficulties were examined. The results were analyzed extensively and both sides were studied, while the amount of the sources that were studied was over seventy five. APA formatting rules have been applied for the construction of this literature review.

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RESULTS

Visual deficits and learning disabilities

Many studies have been done, especially the recent years, trying to find a relation of visual deficits and learning disabilities. A study of Sherman (1973) in 50 children of 6-13 years old, who had been diagnosed with learning disabilities, show that 76-96% of them also had mechanical vision problems and 72-80% of them also presented visual perceptual-motor difficulties. However, only the 2-16% of them presented low visual acuity or refractive errors (Iles et al., 2000). Considering this survey, we understand that is crucial, before a student is diagnosed as *"learning disabled*" to have a full optometric examination and not only examine his/her visual acuity and refraction. Another, more recent study also highlights "the importance of a full assessment of binocular visual status in order to detect and remedy these deficits in order to prevent the visual problems continuing to impact upon educational development."*(*Dusek et al., 2010)

In the past, other studies have examined the incidence of visual deficits in students with and without learning disabilities. The results have shown that the incidence is higher in children with such disabilities (Hoffman, 1980). Another study shows an incidence of 14-65% (Erin & Koenig, 1997). However, we should be cautious before taking into account those results, as many of these children may be misdiagnosed and their problem is actually due to a visual difficulty.

Nowadays, even though the issue is still controversial, more studies are done in the

field trying to enrich our knowledge and empower the evidence for a more clear distinction and a more accurate and early detection of those problems. As for the approach and treatment, if possible, an even more controversial discussion has opened, especially in the optometric field with the appearance of vision therapy techniques, which are gaining field every day.

Vision therapy in children with learning difficulties

The effectiveness of vision therapy in students with learning difficulties is a controversial issue, and through the years more and more specialists of vision have conducted studies about it. From ophthalmologists and optometrists, to paediatricians and neuropsychologists, they all have shown a great curiosity and interest about that relatively new science and trying to find out if the results are as promising as they are said to be (John et al., 2005).

Over the years, vision therapy has been proposed as a treatment plan to reading disabled students, many studies had been conducted with the aim of examining its suitability and effectiveness in learning disabilities treatment. The first major research (Keogh, 1974) concluded that the existing evidence was too limited to prove whether the program is effective or not. The results lead her to conduct a similar study again in 1985, where it was noticed that it was almost impossible to conclude about the effectiveness of vision therapy because of the great variation of the procedures (Keogh &Pelland, 1985). The researchers also mention that it is paradoxical that vision therapy was recommended for a broad range of problems, but yet the relationship between vision and learning disabilities was not clearly defined by any optometrist performing vision therapy.

At the same time, a study by Metzer and Werner has shown that there was no significant difference in refractive or ocular motor abnormalities and perceptual capability between reading-disabled and not children. In addition, no further improvement in reading was noticed after visual-motor-perceptual training programs (Metzer & Werner, 1984). Later, in 1987 a study about the relation between the visual system and learning disabilities concluded that eye movements are not the controlling factor in learning disabilities and dyslexia specifically, but that they are secondary to comprehension difficulties. As a result, visual-perceptual training is ineffective and researchers underlined that the evidence of its efficacy was contradictory and too little (Beauchamp & Kosmorsky, 1987).

There are older studies supporting the hypothesis that vision therapy is beneficial for students with learning difficulties (Seiderman, 1980). The case in Seiderman's study was supported by test results and actual observation of the student's reading level in the classroom. Another study for optometric vision therapy, presented the cases of 100 patients with learning difficulties. Two of the most interesting findings in this cases analysis were that there was a significant improvement in the learning ability of 90% of the patients and that the Snellen chart is not the most appropriate chart for examining the vision of such patients (Swanson, 1972).

In 2001, the American Academy of Ophthalmology published a report about the effectiveness of vision therapy for learning disabilities. The report mentioned that there is no scientific evidence proving that

behavioural and orthoptic vision therapy or colored overlays are effective treatment plans for learning disabilities (AAO, 2001). Again, in 2003 a report from the Institute for Clinical Systems Improvement comes to the same result. In both cases, the authors raise the need for more adequate and controlled trials. Some years later, Rawstron et al. (2005) supported the use of eye exercises for convergence insufficiency, but reported that there was not clear scientific evidence for their effectiveness in dyslexia and learning disabilities in general. The same year, Sampson et al. (2005) conducted a clinical trial in 96 children with visual information-processing delay, but normal auditory and verbal language development. They divided them in two groups. The experimental group underwent a typical vision therapy program and the control group a placebo program of equal amount of time and attention required. All children were evaluated for both their visual information processing and educational performance before, right after and six months after the completion of the program. All children had a significant improvement in almost all tests after the program, but there was not a significant difference in the performance between the two groups. This led the researchers to the conclusion that placebo effect is responsible for the improvement in the children's performance after the program.

A recent study in 30 children with learning disabilities showed that "*vision therapy together with occupational therapy has significant effect on improving visuo-motor integration skills in children with learning disabilities*". (Srinithya, 2017)

In addition, Hussaindeen et al. (2017) in a study about the efficacy of vision therapy in children with learning disabilities and associated binocular vision anomalies, conclude that "*vision therapy plays an important role in the improvement of binocular vision parameters*". More specifically, 94 children diagnosed with specific learning disability participated in the study and their binocular vision parameters were examined before and after vision therapy programs. All parameters, except negative fusional vergence, were significantly improved after vision therapy.

Other studies highlight the importance of the acceptance of visuoperceptual skills' contribution to the learning process (Garje et al., 2015). A hundred children diagnosed with a specific learning disability participated in the study and proved that poor visual perception affects directly the academic performance of the patient. As a remediation, the study supports the case that vision and occupational therapy should be incorporated in developmental therapies, as studies have undisputedly shown the effectiveness they have in the performance of patients.

Finally, Gibson et al. (2015), in a study about the effectiveness of a specific cognitive training program indicated that, among other cognitive therapies, vision therapy can be helpful for children with learning difficulties, having or not a learning disability. Sixty one students were included in the study and the treatment group was consisted of 31 students, with 21 of them diagnosed with a learning disability. All of them completed 120 hours of cognitive training with the program, which include the training of several cognitive functions, which are attention, processing speed, working memory, long-term memory and auditory and visual

processing. However, the study mentions that in the spatial relations test, which measures visual processing, the difference between the treatment and control groups was the only one that was not significant, referring that most of the exercises were focused more in the rest of the cognitive skills trained. Nevertheless, the investigators are highlighting the need for further investigation, as they mention that more studies in the field should take place in the future.

On the other hand, there are also recent studies that support the fact that vision therapy is not a suitable approach for children with learning disabilities. A literature study of Rucker implied that there is not enough evidence that vision therapy is a recommended treatment for conditions of learning disabilities, impaired reading, dyslexia, or ADHD, although convergence exercise relief patients with convergence insufficiency and ocular motor deficits (Rucker et al., 2017). This enhances the statement that visual deficits are not necessarily related to learning disabilities, but to learning difficulties. In the same direction, the study of Barrett has come to similar conclusion that the statement that vision therapy is effective in the treatment of a variety of conditions is not scientifically evident and further investigation should be done (Barrett, 2009). There are studies that even recommend against the use of vision therapy in students with learning disabilities (Wang et al., 2022). In this study, it is also mentioned that if such patients already undergo vision therapy, a paediatric ophthalmologist should monitor the condition or interfere if no improvement is noticed after a few months.

Causes and types of learning disorders

The causes of learning disorders are due to differences in neurological functioning of the person's brain. The factors responsible for those differences can be of various types and may occur in different stages of a person's lifetime. First of all, genes can make a person more predisposed to developing a learning disability, as well as certain health conditions often involving some extent of learning disability, such as Down's syndrome or cerebral palsy (Vogler et al., 1985). Moreover, in the embryonic stage, a maternal illness during pregnancy, or birth complications, which may block oxygen's flow to the baby's brain, can be considered as a cause, according to some authors. Finally, injuries or illnesses, such as meningitis, in early childhood can be the reason for the existence of a learning disability (Kohli et al., 2018).

There are several types of learning disabilities and the distinction is not always clear. One of the most common classifications is the following:

Dyscalculia

Dyscalculia is a disability related to mathematical calculations and also known as "*math or number dyslexia*". Persons with dyscalculia are facing difficulties understanding mathematical concepts, numbers and reasoning. In their daily life, they may struggle with counting money, solving mental math, reading clocks, identifying patterns and remembering math facts. Dyscalculia often coexists with dyslexia, as about half of the children with dyscalculia also have dyslexia (Morsanyiet al., 2018).

Dysgraphia

For individuals with dysgraphia it is difficult to convert their thoughts into written language or drawing. This difficulty may be manifested as incorrect spelling, grammatical and vocabulary mistakes, lack of critical thinking and poor memory. Sufferers may experience problems with letter spacing and size, thinking and writing simultaneously, motor planning and spatial awareness. Poor handwriting is characteristic in this condition (Handler&Fierson, 2011).

Dyslexia

Dyslexia is probably the most commonly diagnosed form of learning disabilities, as it often affects reading comprehension, grammar and many other language skills (Bosse et al., 2007). The most common symptoms and signs of dyslexia are the difficulty in decoding words and identifying individual sounds within words (phonemic awareness). Dyslexia is defined as a cognitive dysfunction secondary to a neurobiological dysfunction (Eden et al., 1996). More recent studies define it as a phonological deficit (Goswami, 2003); however, it can be secondary to auditory temporal processing or speech perception deficits. In addition, it is considered one of the most frequently learning disability related to visual dysfunctions (Grigorenko, 2001).

Non-verbal learning disabilities (NVLD)

Non-verbal learning disabilities are referring to problems with motor, visual-spatial and social skills. They are not language-based difficulties like most of other learning disabilities, and actually their diagnosis is yet not official. People with NVLD are having trouble understanding body language, facial expressions, voice tones and in general every aspect of non-verbal communication, making social interaction very hard for them. In many cases, there might be a physical aspect, as individuals are often having coordination problems (Hammill et al., 1981).

Oral/Written language disorder and specific reading comprehension deficit

Other disorders related to learning disabilities are auditory processing disorder (APD) in which there is a difficulty in sound processing (Miller, 2023) and language processing disorder (LPD) in which sufferers are having trouble processing spoken language (Frye, 2021). In addition, more associated disorders are, attention deficit hyperactivity disorder (ADHD), which in approximately 20-30% of the sufferers coexists with another learning disability (Foy&Earls, 2005), dyspraxia, characterized by difficulty of the patient to control his/her muscles (Hurst et al., 2006) and also executive functioning, which is a disorder in the cognitive management systems of the brain. The last one is not considered a learning disability, but different patterns are almost always present in individuals with learning disabilities.

Learning disorders have been a constant growing issue in recent years, as more and more students seem to be dealing with some sort of difficulty attributed to them. However, a large number of these students have been misdiagnosed with learning disabilities, while the learning problem they are facing is actually due to other factors, creating symptoms similar to those found in conditions such as dyslexia, dysgraphia, etc. Such factors are among others, like visual,

hearing, verbal or motor handicaps, intellectual disability, emotional disturbances, as well as environmental, economic or cultural disadvantages.

Concerning the visual handicaps, their incorrect detection and diagnosis can lead to irreversible visual problems, which in a different case could have been treated, without having such an intense impact on their everyday activities and giving the sufferers the possibility to improve their school performance, as well as their daily life. In order to make this possible, it is important that the optometric evaluation starts at a young age and is done at regular intervals, especially at young ages, during which the optical system is malleable and has greater reserves of adaptation and accommodation (Learning Disabilities Association of America, n.d).

Vision problems and learning

Visual perceptual and motor deficits

Visual perceptual and motor deficits are also known as visual processing disorders and they are related with the inability of the sufferer's brain to interpret and process visual information (Verma, 2001). This incapability affects reading, drawing and coping and it often leads to short attention span. Despite their impact in learning process they are not considered as learning disabilities and they are often mistaken for dyspraxia, dysgraphia, ADHD and dyslexia (Stein, 2014). Also, they differ from visual impairment since the visual acuity and all test results might be excellent, there is no blindness or issue with the functioning of the eyes, but still the individual may be unable to judge distances, distinguish between two objects or assess size and orientation (Kiely et al., 2001).

Visual perceptual skills are the essential skills processing the information received from the environment. It is actually depends on the way that the eyes move, how they converge and diverge. If they don't move correctly, the person is not capable to understand the sensory data they receive. That is the reason that these skills are directly linked with the learning process and their inefficiency has a huge effect in that. Visual perceptual skills are responsible for accurate eye movements and the correct function of visuospatial skills, which are distinguished between laterality and directionality skills. Furthermore, visual analysis is also an important function of visual perceptual skills and its main features are visual discrimination, visual sequential memory, figure-ground discrimination and visual closure (Sanghavi & Kelkar 2005).

Patients with visual perceptual deficits are having trouble with performing basic functional motor movements, essential especially for the process of reading. The movements that occur while reading are fixation, saccadic and tracking movements. Without their correct function, the individuals are facing many difficulties while reading, they often lose track of the sentences and lines, they have a reading speed lower than the average for their age and they may even avoid reading, causing low performance at school.

In addition, patients with visuospatial dysfunctions are struggle processing the location of objects and symbols in relation to each other. It has a great effect in the ability of reading and also in mathematics. Symptoms usually are related to

directionality difficulties, such as confusing and revising letters and numbers of similar shape and lack of the ability to judge the size, shape, movement, and orientation of objects in any amount of space (Dhingra et al., 2010)

Finally, for a patient with a dysfunction in visual analysis process, it is difficult to correctly identify a familiar objective he/she only sees a part of it and he/she is facing comprehension issues and confusion. Another problem for this patient might be the creation of a mental image for use in mnemonics. The behaviour of children with a dysfunction of visual analysis is similar to ADHD patients. They are easily distracted, they have difficulties in focusing, they are unable to keep attention in an activity for a long time and they can become hyperactive or impulsive.

As visuomotor integration skills, we consider all the complex skills such as visual perception, motor control and eye-hand coordination. This refers to the ability to translate a visual image into an accurate motor action. A child with difficulties in the visuomotor integration presents problems in the writing process. It usually manifests as poor hand-eye coordination and directly affects writing and sports performance in students (Franceschini et al., 2022). The most common signs and symptoms of these patients are bad posture while writing and very close working distance, bad handwriting, excessive corrections or erases in the writing, inadequate pressure of the pencil, unusual paper or notebook angles when writing and incapability of recognizing errors committed during writing (Beery, 1989).

Visual-auditory integration skills are those that are used to match visual stimuli with auditory stimuli. These skills are especially important for reading and in direct connection with the vision. The symptoms and signs that a child with difficulties of visual-auditory integration presents are difficulty to spell, inability to learn phonetically new information and having troubles relating symbols and sounds (Weitzman, 2022).

Signs and symptoms of visual perception motor deficits

The symptoms of bad perceptual motor activities appear at different ages, but usually they become evident when a child starts reading and writing, meaning at scholar age. There are some typical behaviours and habits that students with this kind of disability adapt, which are considered as warning signs. Those signs are related to poor word comprehension, lack of focus during the lesson, information retaining and difficulties while taking notes from the board, due to impaired sensory processing.

More specifically, some of the most common symptoms and signs are the inability of accurate copying of information, turning of the head when reading or holding of books and papers at unusual angles, poor organization on the page, reversal of superficially similar letters and symbols, closing one eye when reading and the often loss of place while reading (Peters et al., 2011).

The role of vision therapy

Materials and techniques

In vision therapy programs, a variety of special tools designed for specific and

personalized activities are used. Some of the materials that are used for the diagnosis and evaluation of a patient's condition are among many others occluders, prisms retinoscopes, ophthalmoscopes, sciascopy bars, colored filters and a great variety of optometric tests. Those may include stereopsis tests, DEM test and Worth light test (Gardner, 1996). Some of the diagnostic material can find application in the treatment plan procedures as well. In addition to those, for the vision therapy exercises are also used Marsden balls, notebooks for eye tracking exercises, Hart charts or any board game of varying size, tangram, Brock string, lifesaver cards and more recently tablets and computer programs or applications for vision therapy (Shrewsbury Public Schools, n.d).

In recent years, advanced technologies and new computer-based therapies are used in addition to traditional vision therapy exercises or as a variation of them in many cases. Those technological advantages, on the one hand have provided a great improvement and facilitation for the practitioners and on the other hand a better motivation and entertainment for the patients. Interactive activities and even a kind of computer games have been introduced in the field making treatment plans more fun and attractive, especially when working with children.

Every vision therapy treatment plan does not have the same duration or frequency of visits. All those depend on the severity and the nature of the patient's problem, as well as the patient's personal needs and abilities. In most cases, apart from the exercises performed during the visits, some exercises are given to the patient for practicing at home. It is important for the evolution of the treatment plan to work in regular basis and not to skip appointments or levels of the exercises. However, it takes time for the patient to see improvement and the results of the therapy to become evident, so it must be clarified from the start that patience and persistence is required. The first improvement signs might be noticeable after some weeks to six months, depending on the patient and the severity of the problem. During all that time, the optometrist will observe and assess the improvement in the visual skills that are trained (Hernández-Rodríguez, & Piñero, 2020).

Until recently, it was believed that vision therapy was only effective in young children. However, more recent studies both in neuro-ophthalmology and in developmental optometry have shown that vision therapy can be effective in adults as well (Ciuffreda, 2002).

Conditions treated by vision therapy

The most common dysfunctions in which vision therapy finds application are amblyopia, strabismus, double vision, eye coordination and eye tracking problems, focusing difficulties, visual fatigue, depth perception and three-dimensional vision difficulties, poor hand-eye coordination, as well as visual perception and processing issues. However, the only condition that is scientifically proved and widely accepted that vision therapy is efficient for is, without a doubt, convergence insufficiency (Aletaha et al., 2018; Alvarez et al., 2010; Scheiman et al. 2005; Scheiman, et al. 2010), which as a condition is in many cases related with slow reading and inability to concentrate in near vision tasks, or even avoidance of such tasks. For the rest of the

conditions mentioned before, although vision therapists and patients shown very good results, there is still not enough scientific evidence, as the number of studies is very low. Nevertheless, there is also not enough evidence proving the opposite, so more research must be done in the field to have sufficient proof, in order to support the hypothesis.

DISCUSSION

Vision therapy is for sure a valuable tool for developmental optometrists and can offer a better quality of vision in patients with a variety of visual deficits. According to the studies examined in this literature review, it appears to have a positive impact in some cases, but still there is not enough evidence to support the hypothesis. It is a fact that it can be beneficial for patients with convergence and divergence problems, amblyopic situations, even rehabilitation after brain injury, but its contribution to learning difficulties is not yet clearly defined, although there is evidence that it has a great effect in children with bad school performance.

It is crucial that both optometrists and other specialists do not fight each other and must always be open to discussion and further investigation in depth of a patient´s issue, in order to give the correct diagnosis, examining every possibility for their situation and giving them all available solutions. In many cases, more than one treatment plan should be applied to a patient, in different fields to provide them the best results. Considering that, if a patient follows a vision therapy plan, it does not necessarily mean that they cannot be treated at the same time by another specialist in another field. The only condition is that the two or more specialists that treat a patient must be in communication so that they do not interfere and influence each other´s work.

In addition, vision therapy is not yet firmly established as an option among professionals of eye care and child development. Even in the field of optometry, not all of them are well informed about the options and the benefits that vision therapy can provide. All specialties involved in the diagnosis and evaluation of a developmental, learning or visual problem should be aware, in order to refer the patient in a specialized vision therapist, if needed.

On the other hand, there are studies indicating that vision therapy has no effect in children with learning difficulties (Metzer & Werner, 1984; Beauchamp &Kosmorsky, 1987). However, it must be clear that vision therapy is not a cure for learning disabilities, such as dyslexia and optometrists are not to replace other specialists in the diagnosis and treatment. Vision therapy is recommended to relief symptoms that do not always imply such disabilities, but may be due to a visual deficit. In any case, optometrists should collaborate with other specialists like neuropsychologists or paediatricians in order to offer to the patients the best solution for their problems and to improve and facilitate their daily activities, as well as to come to an accurate diagnosis and be sure that a vision therapy treatment is suitable for each case and can truly benefit the patient.

Further investigation should be done in the field of vision therapy related to learning difficulties and its effectiveness. At the

moment, there are studies supporting both sides and the issue is still controversial. Until then, vision therapy should not be excluded as a way of relief and improvement of a patient struggling with such issues but, on the other hand, it cannot be applied as an isolated solution, nor be considered as a treatment for learning disabilities in any case. However, vision therapy should be more wide-spread among eye care professionals and specialists dealing with school performance problems, and patients should be informed about it as an option and evaluated, if needed by a trained optometrist.

CONCLUSION

Vision therapy can be beneficial for students with learning difficulties when related to visual deficits, but it is not clear yet if it can be helpful for students with learning disorders as well. Studies have shown improvement in students with low school performance, after they have undergone vision therapy, but in the case of learning disabilities it was only in the degree that vision was involved.

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