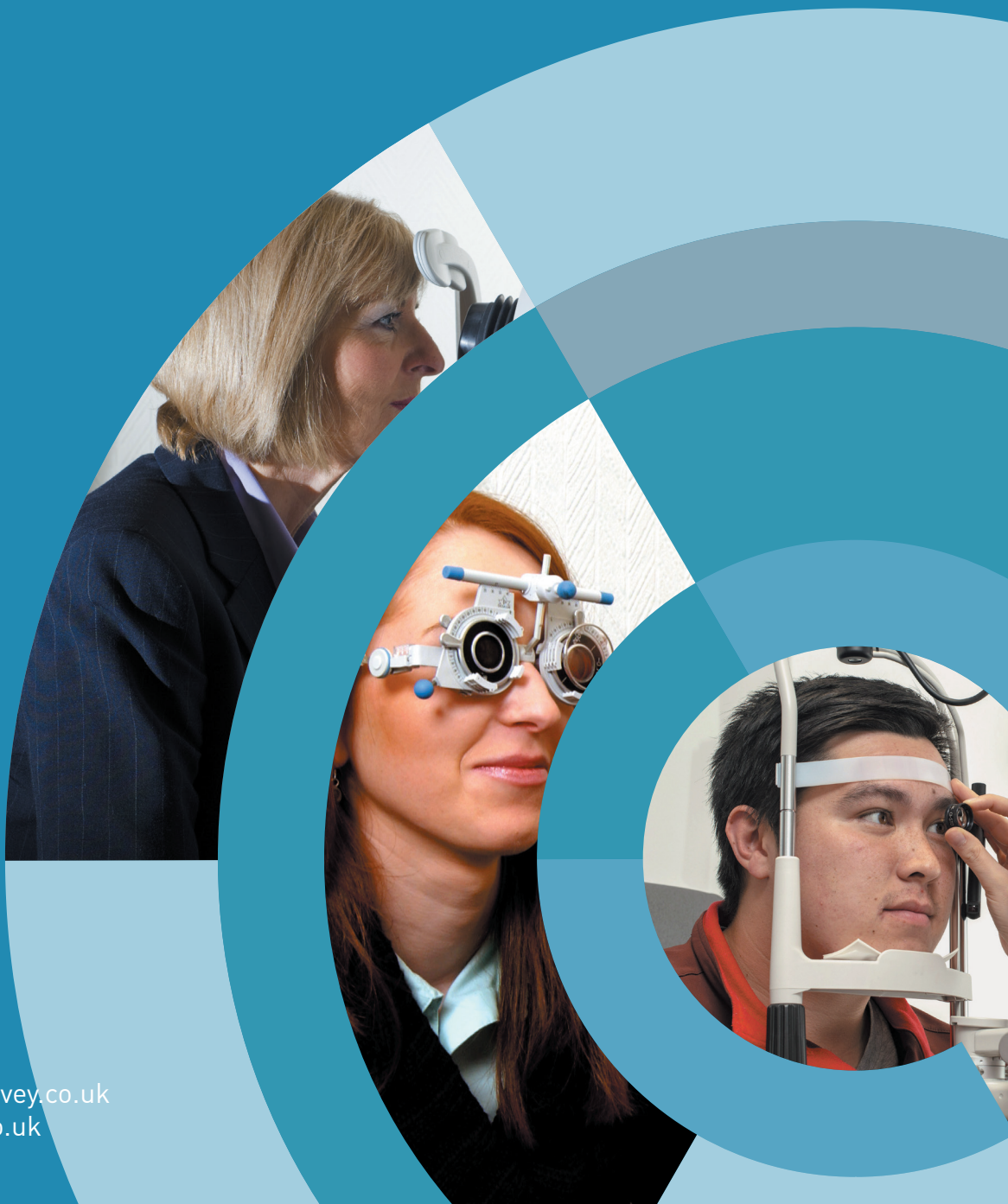
G.T. HARVEY & PARTNERS

OPTOMETRISTS

Your Vision, Our Focus

New Guide to Vision and Learning



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Testimonial

Andrea (Mum to Charlie)

"It became obvious that my 9-year-old son had a problem with glare from white paper while reading and writing and dyslexia was a theory. I was recommended by a friend to visit G T Harvey and Partners in Newcastle. Immediately the Optometrist found a problem with his eye muscles. They do not work together and were weak. (We have visited high street Opticians for 4 years; this was never detected). He was given a thorough eye examination and had other tests carried out. It was decided we would try a coloured overlay, to stop the glare, to do daily eye exercises to help strengthen the muscles and to help them work together.

While using the overlay my son's reading became 30% quicker! After 6 weeks we returned for a follow up appointment. His eye muscles had improved enormously, his reading age at school had improved dramatically as had his writing assessment.

We are of course delighted. Not only with the improvements but with the fantastic service we have received from the practice. I would certainly recommend this Opticians to anyone experiencing similar problems.

We are ongoing in our journey, but am certain we will have a positive outcome. 5-star service.

Thank you".

An Introduction to the role eyes can play in reading, writing and spelling problems.

Our aim is to remove the visual disadvantage and ensure that the eyes or visual system are not preventing your child from fulfilling their full academic potential.

Miss J L Henderson B. Sc (Hons), MC Optom
BABO member and lead Specific Learning Difficulties (SLD) Optometrist.

Mr S. A. Henderson, B.Sc. (Hons)., MC Optom.
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Introduction

The aim of this document is to give those with an interest in reading or specific learning difficulties (SLD) an insight into some of the ways in which Optometry may be able to alleviate associated visual problems. In addition, I hope it will provide an explanation as to how we assess and manage both adults and children with reading difficulties.

There are certain areas in the role of vision and learning which are well understood, with many research papers being written on the subject. However other areas, particularly aspects of behavioural optometry and "Vision Therapy" are more controversial and less well researched. The information provided in this document represents our views as a practice. These are based on papers we have studied on the subject of reading difficulties as well as lectures and seminars we have attended. However, the most important influence is our own experience with an ever-increasing number of patients who have been diagnosed with either dyslexia, reading difficulties or some other form of specific learning difficulty.

To this end our examination routine is a four-stage procedure:

Stage 1 - The initial and preliminary assessment.
Stage 2 - A full binocular vision and visual perception assessment.
Stage 3 - An assessment using coloured overlays.
Stage 4 - An investigation using an Intuitive Colorimeter.

I hope during the following pages you will come to understand both why such an approach is adopted and the correlations between eyes (vision) and reading/spelling difficulties.

Please feel free to contact me if you have any questions about what you have read. I will endeavour to answer them, or at least give you references where you can pursue your interest further.

Jenny Henderson

How do we read?

Reading is a complex, cognitive process of decoding symbols to derive meaning. The process is not a natural innate process, it must be learnt and practiced to improve. It involves the passage of images via the visual system to the brain where the images are decoded and given meaning.

Visual process

The visual processes involved in reading are very complex and include several skills and stages These are:

- Focusing of the eyes (accommodation).
- Binocular co-ordination (binocular vision; the two eyes working together).
- Visual perception skills.
- Intelligence.
- Experience.
- Memory.

The eyes play a key role in the visual process.

The eyes must focus on the words. The two eyes must co-ordinate together to focus on the page and also converge to the plane of the page.
The eyes must move along the line of text in a smooth accurate manner and then move accurately to the start of the next line.

Any inaccuracies or misfunction of any of these actions, will cause difficulties in reading.

Five stages of reading development.

Reading is not something which just happens.
You don't wake up being able to read, nor do you learn to read in the same way you learn to walk. It is not intuited from the environment nor is it simply a matter of physical maturation. Learning to read requires instruction and practice and occurs at defined stages.

Stage 1

"The emerging pre-reader" - typically between 6 months and 6 years.

This is the process whereby a child is "read to" by a parent or older sibling. This exposes the child to multiple sounds, words, concepts, images and stories. By the end of this stage the child pretends to read or tells a story when looking at a book. They ask questions when read to, recognize individual letters and can print their own name.

Stage 2

"The novice reader" - typically, between 6 and 7 years.

In this stage the child is learning the relationship between letters and sounds and between printed and spoken words. The child starts to read simple text containing high frequency words and phonetically regular words and uses emerging skills and insights to sound out new syllable words (phonics).

The child is being read to at a level above their own independent reading level, to develop more advanced language patterns, vocabulary and concepts.

In late stage 2 most children can understand up to 4,000 or more words when heard, but can only read about 600.

Stage 3

"The decoding reader" - typically between 7 to 9 years.

In this stage the child is reading simple familiar stories with increasing fluency. This is done by consolidating the basic decoding elements, sight vocabulary and meaning in the reading of familiar stories.

There is direct instruction from teachers in advanced decoding skills as well as encouraging the child to read a wide selection of interesting material.

The child is still being read to at levels above their own independent reading level to develop language, vocabulary and concepts.

In late stage 3, above 3,000 words can be read and understood and about 5,000 are known when heard. Listening is still more effective than reading.

Stage 4

"The fluent comprehending reader" - typically between 9 and 15 years.

At this stage reading is used to learn new ideas in order to gain new knowledge, to experience new feelings, to learn new attitudes and explore issues from one or more perspectives.

Reading includes the study of text books, reference books, newspapers and magazines that will contain new ideas and values as well as unfamiliar vocabulary and syntax. There is a systematic study of word meaning and learners are guided to react to text through discussions, answering questions, generating questions as well as writing.

At the beginning of stage 4 listening comprehension is still more effective than reading comprehension of the same text.

By the end of stage 4 reading and listening are about equal for those who read very well and reading in some cases may be more efficient.

Stage 5

"The expert reader" - typically from 16 years onwards.

At this stage the learner is reading widely from a broad range of complex materials both expository and narrative with a variety of viewpoints.

Leaners are reading widely across disciplines including physical, biological and social sciences as well as humanities, politics and current affairs.

Reading comprehension is better than listening comprehension, of text of difficult content and readability.

The end of reading development doesn't exist.

The unending story of reading, moves forward always stimulating the reader to develop knowledge.

Definition: What is Dyslexia?

The Official World Federation of Neurology definition of dyslexia is "a disorder manifested by difficulty in learning to read despite conventional instruction, adequate intelligence and social, cultural opportunity. It is dependent upon fundamental cognitive disabilities which are frequently of constitutional origin."

This somewhat long-winded definition, I feel is best translated to the following:
"Specific learning difficulties or dyslexia is an unexpected problem in learning to read in children who seem otherwise capable and intelligent."

I feel it is appropriate at this stage to perhaps outline some of the terminology used.

Terminology

The phrase specific learning difficulties (SLD) is normally used as a generic term for those children who have specific difficulties in certain academic activities (i.e., their performance in these areas is not commensurate with their intelligence). Specific reading difficulty (dyslexia) is the most common type of specific learning difficulty. Specific spelling difficulty is also invariably associated with specific reading difficulty.

The criterion often adopted to diagnose dyslexia is that a child should be behind in reading by 18 months or more. Less intelligent children would generally not be expected to read as well as the more intelligent. Hence any qualification of reading difficulty usually takes account of a child's I.Q. or of some other measure of performance, such as listening comprehension.

Although this method of diagnosing dyslexia as a discrepancy between aptitude and achievement has been questioned, there is still considerable evidence supporting this method and it is still used widely in a clinical field. It should be stressed that children do not need to have a high I.Q. to be dyslexic; they simply need to be worse at reading than one would expect from their general performance of tasks which are independent of reading skill.

Prevalence Of Dyslexia

Depending upon which papers you read on the subject the prevalence of dyslexia seems to vary. A general estimate is somewhere between 4% and 10% of all children having dyslexia, although other researchers have actually given the incidences to be up to 30% of all children.

If you take the lower value of 4% this means that in an average class of 30 children, you would expect 1-2 children to be dyslexic. However, the higher value of 30% would indicate that 9 children in every class of 30 would have the condition. It can be seen therefore that it is not an uncommon problem. The estimates of a visual component of dyslexia vary enormously from zero to anything up to 85%.

Correlates Of Dyslexia

It has been known for some time that there are factors or problems that are more likely to be present in the dyslexic population than in non-dyslexics. In other words these factors are correlates of dyslexia. This does not imply that they will always be present in dyslexic children and it does not mean that these factors are a cause of reading difficulties.

Many of the correlates of dyslexia do not relate to vision, but are psychometric correlates which are usually measured by a psychologist. These include poor short term memory, difficulty with decoding, poor rhyming skills, defective planning skills, confused or mixed laterality and difficulties with sequential tasks.

Some of these physiological correlates represent skills which are important components of the reading process, (eg. short term memory and decoding), and are likely to be closely related to the reading difficulty.

In addition to these psychometric correlates there are some optometric correlates of dyslexia and reading difficulties.

It is this area in which the optometrist is most interested and able to investigate. The main visual correlates that optometrists are concerned with are:

1. **Refractive status**
2. **Ocular motor factors**
3. **Visual Perception**
4. **Meares-Irlens syndrome (colour).**

Signs and Symptoms

There are certain signs and symptoms that teachers and parents should be aware of. These may be indicative of the child having visual problems.

Signs

The child may:

a) Squint
b) Frown
c) Blink excessively
d) Rub their eyes
e) Cover one eye
f) Tilt their head
g) Adopt a very close working distance

Symptoms

The child may complain of suffering from:

a) Sore eyes
b) Ocular discomfort (asthenopia)
c) Blurred vision
d) Double vision (diplopia)

Signs and symptoms of visual processing or perceptual problems

There are certain other signs and symptoms which are slightly more specific to areas of potential visual processing or perception problems. These are:

a) Text/words moving
b) Words jumping
c) Words appearing distorted
d) Letters appearing "misshapen"
e) Words overlapping
f) Uneven spacing between words

It is therefore very important for both parents and teachers to look for the signs and listen to the potential symptoms of the eyes playing a role in any reading difficulty.

It should always be remembered that anything which causes general discomfort or difficulty will lead the child into a habit of avoiding close work and reading in particular.

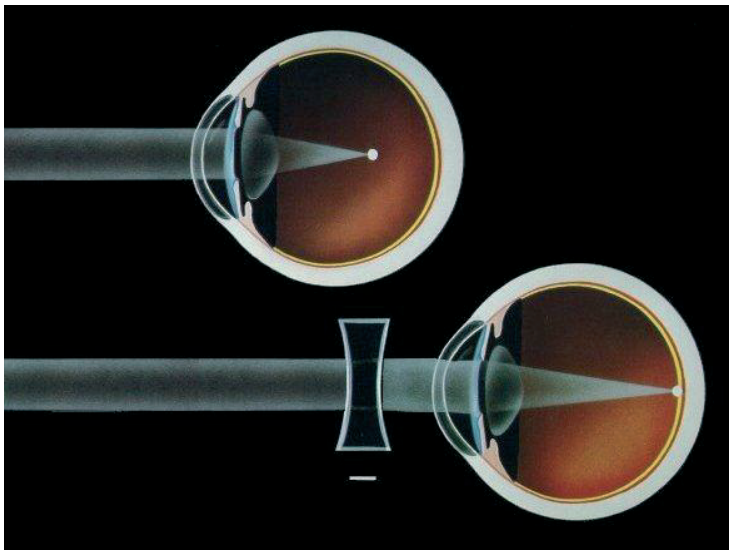
Visual Correlates

1. Refractive status

There are four main refractive states for the general population:

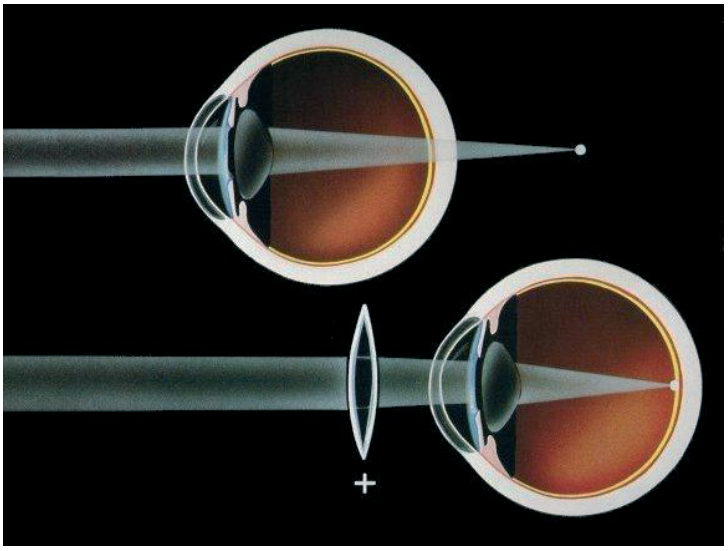
1) Short-sightedness (Myopia)
2) Long-sightedness (Hyperopia)
3) Astigmatism
4) Presbyopia

Short-sightedness (Myopia)



10% of school children are short-sighted to a significant degree. There is however, no correlation between myopia and dyslexia. In other words dyslexic people are no more likely to be myopic than good readers are.

Long-sightedness (Hyperopia)



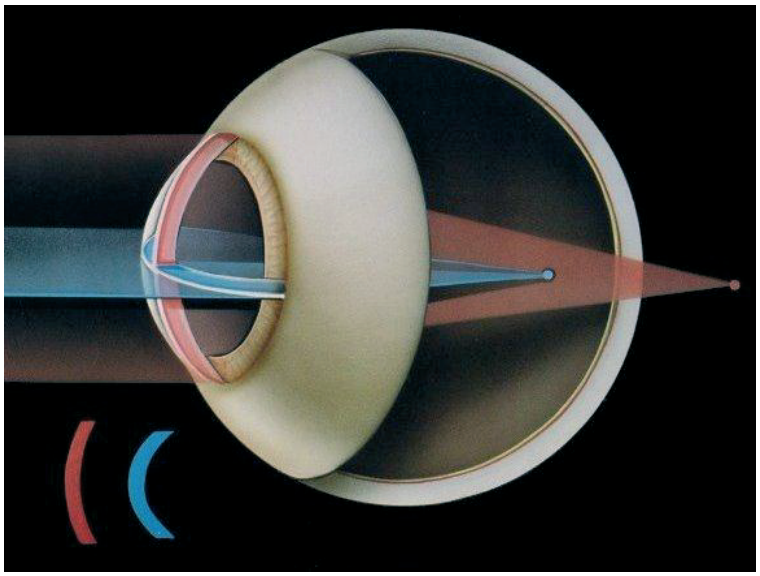
5% of school children have a significant degree of hyperopia. This is where the focusing system is too weak and they therefore have to accommodate, (to use the ciliary muscles to change the shape of the lens to aid focusing). This is discussed in more detail later. When you accommodate you also have to converge and this can cause significant problems.

It is quite normal, even in people with excellent eyesight, to have to accommodate for viewing near objects. However, over accommodating can cause eye strain and headaches. In addition to this excessive accommodation causes over convergence and the eye muscles therefore have to work to prevent this from happening. This in itself can lead to eyestrain and headaches.

Hyperopia and dyslexia

The research is somewhat contradictory and, in some cases, not conclusive. However, it does show that dyslexic children and those with reading difficulties are at least and probably more likely to be hyperopic than the general population. Uncorrected hyperopia can lead to headaches, eyestrain and blurred vision. All of which will discourage a child from reading. Hyperopia will not cause dyslexia but it may contribute to reading difficulties

Astigmatism and dyslexia



Astigmatism is where the eye, in particular the cornea or the lens, is rugby ball shaped. This causes a blur when viewing at all differences. However, the effect is more noticeable when trying to resolve fine detail, especially reading. The higher the degree of astigmatism the greater the blur will be. 5% of all schoolchildren have a significant degree of astigmatism.

Astigmatism correlated to Dyslexia and Reading Difficulties

Most research indicates that astigmatism is no more prevalent in the dyslexic population than in the general population. However, any child or adult with a significant degree of astigmatism will find concentrated visual tasks, such as reading, more difficult.

Anisometropia

Anisometropia is a condition where the two eyes have a markedly different refractive error. In other words, one eye requires a much stronger lens to correct it than the other. This often happens in long sighted patients and has the potential to lead to an amblyopic or "lazy" eye condition.

Anisometropia is not especially prevalent in the dyslexic or reading difficulties population and is not thought to be a correlate.

Presbyopia

Presbyopia is the natural aging process of focusing within the eye. It is due to a decrease in the flexibility of the lens in the eye and it usually starts at around the age of 45 years.
It is corrected easily in most patients with the use of reading spectacles, bifocals or varifocals.
It does not affect children and there is no evidence to suggest it affects dyslexic people at an earlier than normal age.

The importance of an eye examination

All the above refractive errors should be picked up by an eye examination. It is often the case that once the refractive error is removed, reading difficulty is consequently removed. In some patients this has a dramatic effect on their reading ability.

2. Ocular Motor Factors

This is the second of the visual correlates and it can be summed up as being "how the brain controls the muscles that focus and move the eyes".
Ocular motor factors can be broken down into three separate parts:

1) Accommodation
2) Binocular co ordination
3) Eye movements

Accommodation

Accommodation is whereby the shape of the lens inside the eye is changed to focus on close objects by the contraction of the ciliary muscle. There are three areas of accommodation that we are particularly interested in:

1) The amplitude of accommodation, which can be defined as "the maximum amount of focusing that the eye can exert".
2) Accommodative lag. This is the accuracy of the focusing.
3) Accommodative facility. This is the ability to change focus from distance to near objects.

Types of accommodative anomaly

There are several accommodative anomalies that are important, all of which can lead to blurred vision and slow focusing and therefore make reading more difficult. These are:

1) Accommodative insufficiency. This is where the amplitude of accommodation is below that which is expected for the patient's age.
2) Accommodative lag. This is where the focusing is not actually in the plane of the book but it is behind where it should be. This excessive lag will lead to blurred vision.
3) Accommodative spasm. This is where the accommodation is too active and indicates poor control and in many cases the plane of the focusing will alternate from behind the book to in front of it. This obviously makes reading significantly more difficult.
4) Accommodative infacility. This is the inability to change focus from distance to near objects. This inability causes severe problems for children when they are trying to copy work from a blackboard/whiteboard onto a book in front of them.

Treatment of all four conditions is normally in the form of special eye exercises. However, in some cases spectacles will be necessary.

Are accommodative anomalies correlated to dyslexia?

The research indicates that reduced amplitude of accommodation is definitely a correlate to dyslexia and reading problems and can produce severely blurred vision. It is thought that both accommodative lag, although a problem when reading, is not directly correlated to dyslexia and nor is accommodative spasm. It is thought that accommodative infacility is a possible correlate to dyslexia.

It should be noted that any accommodative anomaly potentially will cause blurred vision when reading and should therefore obviously be corrected.

Binocular co-ordination

Binocular co-ordination can be defined as the ability of the two eyes to work together. Binocular vision problems affect approximately 5% of the general population. If the two eyes are not properly co-ordinated and not working together several problems can arise. These problems include double vision in severe cases such as a squint (strabismus). Visual perception distortions can also occur, signs of which are words "moving or wobbling and blurring or flickering".

This occurs in mild cases or variable degrees of misalignment of the two eyes.
Good binocular coordination gives good depth perception and 3D vision.

Binocular coordination: Strabismus/Squint

Strabismus is a marked manifest misalignment of the two eyes. It is due to problems with the motor control of the eyes in other words either the extra ocular muscles or the nerve impulses to those muscles are malfunctioning.

Research indicates that Strabismus is not a correlate in dyslexia or reading difficulties.

Binocular coordination: Heterophoria

Heterophoria is the slight tendency for the eyes to misalign. It is usually overcome by the brain making the eye slightly converge or diverge to compensate for this. This compensatory heterophoria produces binocular stability. However, heterophoria can become de-compensated and this can cause significant problems. Factors which cause this de-compensation can include long sightedness, stress, fatigue and age.

The classic symptoms of a de-compensating heterophoria are headaches, aching eyes, sore eyes, double vision, words moving or wobbling and blurred vision.

Treatment of a de-compensated heterophoria is ideally with eye exercises or spectacles if appropriate, (as in the case of long sightedness), and in severe case if exercises do not work then prisms incorporated into spectacle lenses may alleviate the problems.

Heterophoria and dyslexia

De-compensated heterophoria is common in the general population. There are conflicting reports as to whether they are more prevalent in the dyslexic population. The evidence seems to be that they probably are. Some symptoms of de-compensated heterophoria can indirectly contribute to reading problems by making reading less comfortable. Thus, all incidences of de-compensated heterophoria should be treated.

Binocular instability

As previously mentioned heterophoria can become de-compensated and for them to become compensated the brain is required to instigate slight convergence or divergence of the eyes. The brain does this by using the fusional reserves of the extra ocular muscles in the eyes. If a patient has low fusional reserves this will lead to binocular instability. Once again this produces symptoms similar to a de-compensated heterophoria.

Binocular instability must be treated. Once again eye exercises are recommended or spectacles if necessary.

Binocular instability and dyslexia

Most research literature agrees that dyslexia is correlated to binocular instability. The reason for this is that the eye muscles have to work harder to maintain alignment of the eyes and this therefore, leads to more symptoms.

Convergence insufficiency

This is the reduction in the eye's ability to converge. It is the most common of all binocular vision anomalies and affects approximately 8% of the general population. It is often associated with a de-compensated heterophoria and accommodative insufficiency.

Research is divided as to whether convergence insufficiency is a correlate to dyslexia. However, it is generally agreed that if the convergence insufficiency is severe enough it will cause symptoms and therefore must be treated to prevent reading problems.

Eye movement in reading

Eye movement is the third of the ocular motor factors. It is imperative that when reading the eyes move. In the normal reading process the eyes make a step-like series of movements known as "saccades". Saccades are separated by fixation pauses and it is during these fixation pauses that information from a text is acquired.

The width of a text from which information is taken is known as the "perceptual span". At the end of each line of text there is a large saccadic eye movement known as the "return sweep" to the start of the next line. Most saccades are from left to right, except the return sweep. However, occasionally saccades go from right to left and these are known as regressions.

Eye movements and dyslexia

Research indicates that dyslexics are more likely to have an increased number of fixation pauses, an increased number of regressions, have a decreased perceptual span and a decreased reading speed.

Why do dyslexics do this?

There are three possible hypotheses as to why eye movements are different in the dyslexic population. The first of these is that dyslexics have a fundamental eye movement problem and that this is the cause of the reading problem.

The second is that the increased number of regressions, the decreased perceptual span and the increased number of fixation pauses is due to the difficulties in understanding the text (i.e. cognitive reasons), but that the fundamental mechanical eye movements are normal. The third hypothesis is that abnormal eye movement patterns are neither the cause nor the effect, but are a non-causal correlate. This means that they are present in dyslexics but they are of no relevance.

The evidence from the majority of studies has shown that there are no fundamental defective saccadic eye movements in the dyslexic population. This would therefore support the second hypothesis in the view that it is cognitive reasons that make eye movements different in the dyslexic population.

Essentially one would expect eye movements to be normal in dyslexics, however, if an eye movement problem is revealed it must be corrected in order to avoid it causing reading problems.

What are visual perception skills?

Visual perception skills allow us to make sense of the information the eyes are sending to the brain. Our visual perception allows us to interpret and analyse information to make sense of what we are seeing. So, before a child even begins to read, they must have obtained a degree of competency in visual processing. These important skills allow a child to recognize words they have already seen, see how letters work together to form words and recognize the difference between letters such as B and D. Without these skills children simply see words on a page without understanding them.

So, as you can see these skills are very important. If children have weaknesses in some areas of perception it could significantly affect not just their reading but also their writing and spelling abilities. Visual perception develops throughout childhood maturing at around 12 years of age.

There are many visual perception skills but the main 7 are as follows:

1. Visual figure ground
2. Visual memory
3. Form constancy
4. Visual closure
5. Visual discrimination
6. Visual sequential memory
7. Visual spatial relations

1. Visual Figure ground

The ability to identify objects within busy or a distracting background. A child who has a weakness with visual figure ground may have trouble focusing on a difficult word within a passage, because they are having trouble blocking out words around it on the page. Similarly, they may have trouble finding "chunks" within a word because they cannot zone in on a specific vowel team or diphthong without being distracted by the other words around it.

2. Visual Memory

Visual memory skills play an important role in a child's ability to read, especially when it comes to sight word recall. As an example; a child who has looked at a word over and over again and yet can't remember or recall what the word is after 5 minutes, may have a weakness in their visual memory skills.

3. Form Constancy

This is the ability to accurately identify and understand that symbols and objects remain the same, even when the object changes size, colour, direction, font and texture. It is an important skill in helping children to recognise and organise what they see. An understanding of the basic qualities of the shape or object is a prerequisite to form consistency and therefore reading.

4. Visual closure

This is the ability to recognize a symbol, form or an object even when it is only partially visible. In other words, having visual closure skills means that even if you only see part of something your brain can fill in the rest. So, when we have visual closure, the brain sees the whole word not each letter individually.

This skill is especially critical to reading fluency, as it helps a child to read with improved speed and accuracy. It helps us to sight read words and decode unknown words quickly.

A weakness in the visual closure abilities of a child can lead to slow, laboured reading and feelings of frustration.

5. Visual discrimination

This is the ability to see differences and similarities between objects and forms. Children who have difficulty with visual discrimination may have problems seeing the differences between similar letters and numbers e.g. the letter S and the number 5. They may also struggle to see the differences between such words as "won't" and "want".

6. Visual sequential memory

Visual sequential memory requires items to be recalled in a specific order, such as days of the week, months of the year. If a child has problems with visual sequential memory skills, then this will affect their ability to read and spell correctly as every word consists of letters in a specific sequence.

7. Visual spatial relations

Visual spatial relations is the ability to perceive the relationship of an objects position, in space. Children who reverse letters are often lacking in this important visual skill. They may also have significant problems with laterality (rights and lefts) and directionality (up, down, front, back etc).

Visual perception skills are of paramount importance in learning to read and in a child's development in general. Visual perception skills can be improved by specific exercises and training. We can help with some of these, however an Occupational Therapist specialising in this field may also be of benefit, particularly if there are issues with writing and possibly spelling.

The use of coloured overlays and tints in Meares-Irlen syndrome.

The use of colour, in overlays or tints, is not new. There is anecdotal evidence of coloured overlays being used in schools in the U.S.A in the 1930's. Other papers have been written which cite the case of a boy in 1958 who could read from yellow paper but not on white paper.

The major breakthrough in this field occurred in the 1980's. In 1980 Olive Meares, a special needs teacher from New Zealand, presented a paper outlining how perceptual distortions experienced by some children when reading could be relieved by using coloured overlays.

Her work was followed up in 1983 by Helen Irlen, an American physiologist, who reported that she had found that some adults with reading difficulties were able to read better when the text was covered with a coloured sheet. She stated importantly that there was an optimum colour which was specific to each person and had to be chosen by the individual concerned. It was Helen Irlen that coined the expression "Scotopic Sensitivity Syndrome".

More recently the name "Scotopic Sensitivity Syndrome" has been changed to "Meares-Irlen Syndrome". This is defined by The Institute of Optometry as "the presence of visual discomfort and distortion, which cannot be explained either by refractive needs, binocular vision anomalies or pathological conditions and that it responds to the presence of colour".

These distortions may include the blurring of print, the movement of words or letters whilst reading, the fading of print whilst reading, the patient seeing patterns in the text whilst reading and the patient commenting that they experience glare or dazzle when trying to read. In addition to this there may also be symptoms such as headaches and general photophobia.

A major breakthrough occurred in the 1990's following a double-blind study into the use of coloured lenses in dyslexics by Professor Bruce Evans from The Institute of Optometry in London and Professor Arnold Wilkins, an applied psychologist from Cambridge University.

There clinical trials showed that some children who reported anomalous visual effects and asthenopia during reading do experience a reduction in symptoms with the use of tinted lenses in their preferred colour and the benefit is significantly reduced if a colour differing from there optimum choice colour is used. This study showed that tinted lenses cannot be purely attributed to the placebo effect.

How does the use of colour work?

There are several potential explanations. The two main ones are:

1) Colour simply reduces the asthenopia associated with binocular vision problems. However, this does not explain the specific nature of the optimum tint.
2) A much more feasible explanation is that the colour reduces the pattern glare when trying to read.

Pattern glare has been described as being like looking at a stream of words running into each other to produce a continuous black line as opposed to seeing individual words of text on a page. The degree of pattern glare depends upon the spacing between words and that between lines of text.

How do we assess whether colour will help?

There are two main ways in which we can investigate whether a child's signs and symptoms will be improved by the use of colour. The first of these is to perform The Institute of Optometry Overlay Test, where a series of coloured overlays are laid over text and the child is asked whether each overlay makes the text easier or more difficult to see.

The concern over this method has been the question of how we can know that the child is actually benefiting. Latterly a Wilkins Rate of Reading Test has been developed, which actually measures the effect of coloured overlays. It has been shown that if the overlay can improve a child's reading speed by 5% or more then this is classed clinically significant. In this instance it is considered worthwhile to proceed further.

We generally recommend the use of an overlay for approximately 6-12 weeks and assess the patient's progress after this time.

The Intuitive Colorimeter

The second way of assessing whether colour can help is by using an Intuitive Colorimeter. This is an instrument which breaks artificial white light down into its constituent parts of Red, Blue and Green light using filters. It is then remixed on a white surface by the practitioner, who can control the hue, saturation and brightness.

From the Colorimeter we derive an optimum set of coordinates which can then be equated to a specific tinted lens. These lenses can then be incorporated into spectacles. The Colorimeter can be much more precise in its measurement of a specific tint than overlays as there are up to 120,000 permutations of tint available. It should be noted however, that the colour of the initial overlay may vary from that tint specification produced by the Colorimeter.

The whole subject of colour and its effect upon reading is an extremely controversial one. There is ongoing research into this field, but there is no doubt that for some dyslexic people and those with reading difficulties, coloured overlays and tinted lenses can significantly improve their reading. Research has also indicated that specific tinted lenses may also help migraine sufferers and possibly epileptics.

Conclusions and Discussions

The role of eyes in dyslexia and reading difficulties is a most interesting and controversial one. Evidence suggests that although visual problems are not a major cause of dyslexia and reading difficulties, they can contribute to the overall difficulty in reading, in many cases. The problems with vision may be 'direct,' by causing some reading errors, or 'indirect,' causing eyestrain or headaches which will make a person reluctant to read. We must therefore, always investigate any person with reading difficulties to ensure that there are no visual problems and if there are problems treat them accordingly.

How do we do this?

It is important to follow a strict protocol, which for us involves four stages:

Stage 1 - An extended eye examination

Stage 2 - A full binocular vision investigation of ocular motor factors; accommodation, convergence, heterophoria, binocular stability and eye movements. As well as looking at basic visual perception skills.

Stage 3 - Assessment using coloured overlays.

Stage 4 - Assessment using Intuitive Colorimeter

Sequential Management Plan

(SUSPECTED) LEARNING DIFFICULTIES

↓

Stage 1

Referral to Optometrist

ARE THE EYES HEALTHY?

No → *Refer*

Yes

↓

IS THERE A SIGNIFICANT REFRACTIVE ERROR?

Yes → *Correction*

No

↓

Stage 2

IS THERE A SIGNIFICANT ORTHOPTIC ANOMOLY?

Yes → *Correction/Treatment*

No

↓

ARE THERE STILL SYMPTOMS?

No → *Monitor*

Yes

↓

Stage 3

TEST WITH COLOURED OVERLAYS

Negative → *Monitor*

Positive

↓

IS THERE A SIGNIFICANT BENEFIT?

No → *Monitor*

Yes

↓

Stage 4

INTUITIVE COLORIMETRY

Negative → *Monitor*

Positive

↓

PRECISION TINTING

Summary:

I hope that this booklet has increased your knowledge of the potential role that eyes can play in dyslexia and reading difficulties. In addition to this I hope that you can understand the logical process of how we assess and manage patients with these problems.

If you have any further questions or if you would like to arrange an appointment, please contact the practice.

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Useful Contacts:

- **Dyslexia North East**
  www.dyslexiane.org.uk
  0191 466 1299

- **Toucan Education**
  www.toucaneducation.com
  0191 486 2499

- **ENABLE - Occupational Therapy and Physiotherapy for children**
  www.enable-therapy.co.uk
  Contact Via email on website

- **British Dyslexia Association**
  www.bdadyslexia.org.uk
  Contact via email on website

- **British Association of Behavioural Optometrists**
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