

# An introduction to autism for today's optical professional

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09/10/09 ADVICE

The visual world of those on the autistic spectrum is often very different from that which is usually encountered in optometric practice. Current paradigms are often inadequate and standard optometric practice may be inappropriate and may, in some cases, be abusive. It is therefore essential that optometrists, dispensing opticians and practice staff are aware of and know how to recognise and manage the person with autism in order to deal with their visual difficulties. This may require a significant change in attitude and methodology, as discussed in this article.

## What is an autistic spectrum disorder?

Autism is the name given to a range of presentations characterised by difficulties in communication, which result in problems with social interaction. These presentations vary from the non-verbal, totally isolated patient to one who exhibits marginally eccentric or strange behaviour. Outward appearance of people on the autistic spectrum may be misleading, with individuals who initially appear very capable having great problems, and, in contrast, those who appear mute and disabled, may have great understanding and insights (but alternatively may live in a perpetually confused world). There are also a number of conditions that can show symptoms consistent with autistic spectrum disorders (ASD), for example schizophrenia, and these may be difficult to differentiate.

Autism usually manifests itself in childhood but a diagnosis may not be given for many years due to the range and mix of symptoms. These symptoms may be very confusing, even to the expert. This observation is of great significance in optometric practice as it may be necessary to assume autism in those who have not been formally diagnosed, as a precautionary measure.

It is vital to understand that those on the spectrum may respond in very different ways to the same input ie it is

not possible to predict the effect of an optometric intervention based on "norms". This is critical in visual sensory processing, with some on the spectrum being sensory seeking, ie requiring increased sensory stimulus, and others as sensory defensive, ie requiring a reduction in stimulus, but both may have identical presentations. It makes evidentially-based science extremely difficult and extrapolation of results from small-scale trials unsafe. Professional judgement must be used for every patient on the autistic spectrum and it follows that all professional staff require sufficient understanding to be effective. As it may be unsafe to use simplistic empirical optometric interventions, the professional should only act within the bounds of their competence.

## Prevalence

The prevalence of ASD is difficult to determine, with estimates ranging from 0.33% to 1.50% of the population.<sup>1</sup> The National Autistic Society suggests a figure of 1%. It has been thought to be much more common in males but this is now disputed as female presentations are more difficult to diagnose correctly.

## Diagnosis

Full diagnosis of autism uses either the Diagnostic and Statistical Manual of Mental Disorders (DSM-IV) or International Classification of Diseases (ICD-10) criteria, or both, but this is complex and beyond the scope of this article. In general these may be simplified to criteria known as the "triad of impairments". These are:

- Difficulties with social interaction
- Difficulties with social communication
- Problems with social imagination/rigidity of thought and activities

In addition, there are a number of other features commonly seen in those with ASD, although they are not yet accepted as diagnostic criteria. Sensory



processing problems are very common<sup>2</sup> and in fact some people believe them to be causative, with the triad of impairments being the response. All sensory systems can be affected to varying degrees. These include:

- Praxis and movement difficulties – posture, movement and hand eye coordination is often poor. Spatial awareness may be defective.
- Attention difficulties – short concentration span in areas other than their obsessions is common, together with impulsive behaviour.
- Dietary and food problems, together with swallowing difficulties and reflux are common.
- Sleep problems and bedtime hallucinations – night terrors are seen in a significant number of children.
- Mood / behaviour problems – a small number of those on the spectrum may

exhibit violent behaviour, or may become unmanageable in social situations.

The most common conditions on the spectrum of autistic disorders are categorised using diagnostic criteria within a set framework and are of unknown aetiology. These are Kanner's autism and Asperger's syndrome. In addition, conditions such as Attention Deficit Disorder (ADD), Attention Deficit and Hyperactivity Disorder (ADHD), global development delay, pervasive development disorder and sensory integration disorder, have many similarities whilst there has been a marked increase in co-morbid presentations such as Down's syndrome. Differences may only be subtle and therefore it is safer to err on the side of caution and assume that autistic symptoms are present and to utilise procedures that are suitable.

Symptoms will manifest themselves in a variety of ways. Children can often appear aloof and appear to ignore responses in conversation. This does not mean that they do not understand what is happening, but they may appear not to be taking part. They may be obsessive or have repetitive behaviour, may not understand social clues and may have some difficulties in expressing or understanding emotion. In some cases this may be due to visual processing problems. They may concentrate on detail, eg some on the spectrum recognise people by their teeth, and do not see the "big picture". Rigid attitudes are often a feature, and it is essential that professionals are aware of this and respond appropriately. If you say you are going to do something, it is essential that you do, precisely. Literal interpretation of language is common, with idiom and metaphor often difficult for the patient to understand. To say something like "her eyes were out on stalks" can be extremely distressing. Those with ASD often have a keen sense of humour but it may be of quite a different style from that of neuro-typical (normal) development. Irony may be a difficult concept for someone on the spectrum to understand, so it is best avoided.

### Autistic spectrum disorders (ASD)

Autism is a spectrum of disorders and the individual may display facets of the triad of impairment in varying degrees. It is classed as a disability, carrying with it all the legal protections, and professionals have a duty of care to make appropriate and reasonable

adjustments.

#### Sensory processing and integration

Visual processing problems are generally accepted to be common for those with ASD. They are affected by other sensory input both positively and negatively, eg auditory processing disorders both affect and are affected by visual processing for some patients. This is a new concept for optometrists; the idea that visual stimulus can be as important to the patient as the refractive error. This extremely controversial statement is problematic in optometry, but is becoming well-accepted by those who deal with patients with ASD. Whilst this constitutes a paradigm shift in approach, effective assessment can bring huge benefits to both adults and children on the autistic spectrum. It must be remembered though, that it might not be possible to utilise normal optometric parameters and measurement techniques.<sup>3</sup>

#### Optometric profiles

There are a number of well-accepted optometric profile differences. In two studies, the prevalence of strabismus has been estimated to be between 20% and 50% of patients with ASD.<sup>4</sup> Post rotational nystagmus (optokinetic nystagmus) is very common in autism (sensory defensive but not sensory seeking) and is associated with gravitational insecurity ie fear of movement. Other binocular vision problems are also extremely common in children with autism and must be investigated. Anecdotally, resolution of processing problems will correct binocular effects in many cases and traditional orthoptic interventions may not be necessary. There have also been a number of reports of abnormal retinograms and visually evoked responses.

#### Differing sensory processing profiles

Patients with ASD often have a wide variety of visual and other sensory processing problems, and a few "normal" optometric difficulties may be affected by sensory processing; the mix, however, varies between individuals. Addressing one sensory processing problem may also impact another, positively or negatively. It is therefore essential that any visual intervention has either a neutral or a positive effect on the other sensory systems.

For some with ASD increased sensory stimuli may be necessary

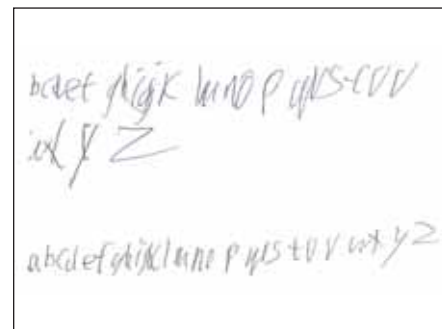


Figure 1. Praxis in handwriting may be caused by visual processing problems (top). An Optimeyes task lamp was used to effect immediate improvement in hand eye coordination (bottom).

whilst for others it is essential to reduce the stimuli. For some patients it may be necessary to have mixed stimulus increase and reduction. To make matters more complex, these needs may vary depending on the situation and therefore modifying one stimulus may change other sensory needs. This makes optometric assessment and prescribing extremely difficult and hence the prescribing optometrist will find himself or herself using a completely new paradigm.

### Synesthesia

Synesthesia is an abnormal response from one sensory system when another sensory system is stimulated eg a sound may be "heard" as a colour. There are many forms of vision response synesthesia and they are common in ASD. The most common types are related to seeing letters or words in colour (perhaps not true synesthesia – only one sense is involved), or hearing/vision crossovers, eg visually perceived movement may be heard as a sound. This is an important factor in addressing visual processing problems – the visual symptoms may be due to another sensory system or, conversely, other sensory system problems may be due to visual input anomalies. Therefore it is essential that optometric assessments incorporate investigation of potential synesthetic effects in ASD patients either as causative or as a response.

### Timing

Timing of sensory information in ASD may be very different from "normal". It is essential that this be taken into account in the eye examination, as otherwise responses may be misunderstood and the effects misdiagnosed. Timing of peripheral



Figure 2. Extreme forms of facial recognition problem are common in ASD.

visual information may be different from central information; polyplopia and diplopia are common, either monocularly or binocularly, and they may be of unusual form. Occasionally there may be an annulus of diplopia and sometimes the images are timed differently, i.e. the object viewed centrally may be seen with a non-identically timed peripheral object (usually moving at a different speed from that of the primary image); the double vision is time related. Image refreshment may also be a problem; the original object viewed may be superimposed onto the next object viewed. Synesthetic effects may also be time modified, so visual stimulus effects may be due to some other stimulus that is not concurrent.

The Pulfrich effect<sup>5</sup> (the change of position in laterally moving objects due to timing variations between the eyes) must be taken into account when assessing those with ASD, as it can have major effects on every aspect of their life. It is important to realise that when a patient suffers from even low grade Pulfrich phenomenon effects, it causes modification to their spatial awareness and praxis. They are likely to have gait and postural problems and many sports will be affected. Panic attacks and anxiety in shops and classrooms is often a reaction and can be addressed successfully using a vectored response, i.e. Pulfrich effects in which transverse movement can be speeded up or slowed down using band filters rather than neutral density (ND) filters.

Timing of proprioception/vision integration is important in that praxis cannot be achieved without timing synchronisation. It may be that integration may differ depending on the body position and it is essential that timing of touch reception and visual processing are coincident. It is easier to modify visual timing than proprioceptive timing, since the former can be achieved using band filters.

Synchronisation of sound and vision may also be affected by timing problems in the visual system. Difficulties will result in mimicry problems and poor spatial awareness. Understanding the spoken word may be a problem as the McGurk effect will affect the sound perceived. The McGurk effect is an over-ride of the auditory processing system by the visual processing system, i.e. what is seen changes the perceived sound. In addition, static objects may appear to move and moving objects may appear to be stationary. This can make crossing the road extremely hazardous.

### Mapping

The maps in time and space of a person with ASD are often de-sequenced, time-delayed, size modified and metamorphosed. These mapping problems often result in difficulties processing information and responding in the usual way. People with ASD who react unusually are often responding appropriately to very unstable and often unpleasant inputs. It is essential that optometrists understand this and how optometric interventions can be appropriate.

### Symptom presentation

The sensory world of those with ASD makes it almost inevitable that they have educational and other difficulties even if they appear to be coping well. The most common are dyslexia, dyspraxia and dyscalculia. These are briefly described in the next few sections.

#### Dyslexia in autism

Dyslexia is, like ASD, difficult to define. Some people consider it principally a language-processing problem whilst others have a much wider view. For some in optometry there is a view that it is approached as a reading speed/accuracy difficulty, but this would not be acceptable to many in education (and this form of testing would usually be inadequate

for those with autism). A simple definition of dyslexia would be "difficulty with words". This can be due to vision, visual processing to language, memory or other factors. Colour/illumination can be extremely important but simplistic optometric interventions such as overlays are often a very poor remedy for the autistic child and instead, behavioural optometric interventions may be appropriate. However, there can be significant problems with assessment and management in ASD.

#### Dyspraxia in autism

A very common co-morbidity with ASD is dyspraxia. These are difficulties with planning and execution of movement. Whilst this term is normally applied to motor control effects that affect hand, arm and/or leg movements, for example writing (Figure 1), it can also apply to speech, swallowing and eye movement. Dorsal stream difficulties may be critical and it is therefore essential that the optometrist is aware of, and addresses, this visually evoked response.

Auditory processing problems are also likely to be co-morbid if magnocellular processing difficulties are suspected. Visuo-spatial awareness difficulties are common in ASD and children may have significant difficulties in the recognition of differences between edges and lines. This may make progression through doorways or stairs a problem. Lateral eye movement problems, e.g. pursuit breaking into saccade, and asymmetric convergence, which varies depending on position of gaze, are common.

#### Agnosias and related cognitive problems

Agnosias and related problems are extremely common in people with ASD, and these will be examined in detail in a future article by the author. It is essential that optometrists manage visual evoked agnosias, as the effect can be life changing.

#### Stimming

Self-stimulation, which is also referred to as "Stimming", is common in ASD. This can include any of the following physical motions: flapping, spinning to produce nystagmus, pressing on the eyes, and finger movements in front of eyes. It appears to relieve stress in many cases

although the mechanism is not understood. Stress will often produce stimulating responses in the consulting room and the optometrist should be aware of these so that they can then respond appropriately.

### Developmental factors and controversies

It is believed that ASD are genetically influenced and there is some debate as to the importance of other factors such as immune problems and environmental triggers. Most professionals will have heard of the measles-mumps-rubella (MMR)

must be considered in responses.

Questions should be short and direct. Non-professional conversation should be avoided, and "open" questions are often inappropriate. The history and symptoms must cover other sensory processing and the optometrist must be aware of synesthesia and timing problems. The patient should be observed with respect to their gait, posture, speech and the way they respond to the environment. Be aware of and take into account the Pulfrich effect and observe reactions. Prosopagnosia (difficulties with recognising faces;

## "The challenge for today's optometrist is to... start addressing visually evoked problems in the autistic spectrum patient"

vaccination debate in respect of regressive autism. The majority of professionals believe that there is no risk, yet a significant minority of professionals and parents of children with ASD disagree strongly. In addition, many interventions in ASD remain controversial in conventional quarters, such as the defeat autism now (DAN) protocols, applied behaviour analysis (ABA) intervention, chelation (heavy metal removal) and auditory integration therapies. These may influence optometric procedures and responses. Drug interventions may be used with idiosyncratic results and there is no accepted treatment for autism. However, unpleasant symptoms can be treated in individuals with some degree of success.

### Problems faced in optometric practice

Knowledge of a patient's autism or related diagnosis is always useful as steps may be taken prior to the consultation to reduce anxiety, and strategies adopted to elicit appropriate responses. The patient may wish to see the room, have procedures explained and generally get used to the practice and staff. Lights may have to be extinguished and practice sounds modified. Puppets may be useful in some cases to help in discussions. Making decisions is often difficult for those with ASD and it may be appropriate to use an imagined third party for questioning. In high-functioning patients, careful phrasing of questions is essential and echolalia

Figure 2), dysmorphia and expression recognition should be assessed.

A routine refraction is suitable for many, but adjustments and modifications are often necessary. Do not use any form of medication unless the benefits justify it. Reactions to drugs may be completely different from those expected, i.e. they may cause prolonged pain, the dosage may be inappropriate and the responses may be unexpected. Do not use routine cycloplegia or mydriasis for anyone with ASD; obviously if pathology is suspected then the ends may justify the means and drugs should be used, but be sensitive to potential unusual side effects.

In cases of high functioning autism or Asperger's syndrome, subjective refraction may actually be easier to carry out as the child will answer the question without deviation. Eye movement, convergence and tracking are often idiosyncratic and should be assessed routinely. Asymmetric convergence is also common whilst physiological diplopia should be addressed. Head rotation rather than eye movement is common and the relationship between peripheral processing and central vision processing should be considered; eccentric viewing may be observed frequently. Strabismus is often a sign of the Pulfrich phenomenon and can be treated successfully in these cases. Visual fields may be sensitive to ambient lighting and synesthetic effects, particularly auditory processing problems.

### Discussion & Conclusions

Standard optometric procedures may be inappropriate, inaccurate and unsuitable for those with ASD. There is a need for a great deal more research into how optometrists should address visual processing problems, which are so common yet rarely addressed. Cross-sensory problems are common in every practice in the country and patients are routinely told that there is nothing wrong with their vision, when there may be major visual processing disorders present. This is of particular importance for those with ASD but is virtually never recognised.

Symptoms are consistent and measurable and the effects of visual processing interventions can be observed and measured relatively easily in most cases but for some, it is impossible to be accurate using standard assessment methods. Unorthodox techniques may be necessary in these cases, e.g. relying on parental interpretation of responses and looking at synesthetic responses.

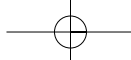
Visual and visual processing interventions can change the lives of people with ASD. The differences are not confined to normal visual effects since cross-sensory changes can be marked, cognitive processing can be enhanced significantly and the emotional effects are often great. Currently, occupational therapists, audiologists, speech and language therapists and other professionals are involved in the treatment of sensory integration difficulties, but visual processing problems are frequently ignored. It is therefore vital that optical professionals address visual processing disorders. The challenge for today's optometrist is to take the lead and start addressing visually evoked problems in the autistic spectrum patient, be they the primary difficulty or a secondary effect.

### About the Author

Ian Jordan is a dispensing optician working with his optometrist wife in their specialist practice in Ayr, Scotland. He is a director in Orthoscopies and is heavily involved with research and development. He has written a number of books, has lectured at international conferences to a variety of audiences and has produced a DVD in association with Coventry University.

### Acknowledgements and References

See [www.optometry.co.uk/references](http://www.optometry.co.uk/references)



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