

**Vision, Vision Therapy and Autism**  
**Selwyn Super D.Optom., FAAO., M.Ed., Ph.D. (Psychology)**  
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**Overview**

Genetic and neurofunctional research in autism highlights the need for improved characterization of the core social disorder defining the broad spectrum of syndrome manifestations. As a developmental process *social transmission* and interaction require a foundation of *maturation*, and *experience* in order to react socially and to build levels of *self-regulation* in the process. Both quantitative and qualitative developmental potential are dependent on functional internal brain circuitry, control mechanisms, and increasing levels of self-regulation, that in turn, act as platforms for greater maturation, more and enriched experience, and better, and more effective communication, and social interactional skills.

Genetic endowment, environmental opportunity, and the capability and the choice of the individual to put these together, constitute integral parts of normal social interaction, and what are defined as core social disorders.

The following general questions need to be asked relating to autism and autistic spectrum disorders when vision is determined to be a contributory cause, and when vision therapy is indicated to resolve visually related malfunctions:

To what extent do genes entrench autistic spectrum disorders and have lasting and incurable effects?

Are social behaviors affected by a combination of genes and environment?

Do parental behaviors have profound and lasting effects on child outcomes?

Are social behaviors modifiable in different environments, through the process of learning, and the application of different therapies?

This presentation will attempt to answer these questions. The emphasis will be to consider visual contributory causes of autism and autistic spectrum disorders, and the role vision therapy can play in eliminating or ameliorating the visually related autistic functions and behaviors, and as part of the general resolution of autism.

For vision to develop normally requires a maturation of eyes and their conducting pathways into the brain that are mediated by light. Experiments on kittens reared in the dark attest to the devastating effects this has on their vision, and visual behavior. There is also evidence of the lasting undermining effects on vision that occur in infants born with congenital cataracts, or with developing refractive errors or ocular misalignments, that lead to vision loss and amblyopias.

However, there is no significant correlation between blindness and vision loss in the way it affects general development, intellect, and social interaction abilities. There are examples of individuals who have developed normal, and even superior mental intellects after becoming blind in their formative years. Helen Keller is the signal example, who at the age of 19 months, not only lost her sight, but also lost her hearing after a febrile disease, and went on to reach impressive academic and career heights. Such examples should not lead one to assume that vision plays no role in general development and the development of cognitive skills, but requires a broad investigation to detect comorbidities where developmental deficiencies and compromised vision are found to coexist.

At birth the infant displays a level of anatomical and physiological maturity to respond reflexly to the experience of inner and outer stimuli. This translates into displaying periods of wakefulness with eyes open and periods of sleep when eyes are closed. Observers will also be aware of infants' calmness on one hand, and of disquiet on the other hand, that can be seen in facial expressions that are evident in smiles, gurgles, grimaces, frowning, and crying. Within a short period of time, and particularly with mother/child bonding, the infant innately seeks out, and makes eye contact with his or her major caregiver.

This presentation focuses on defining vision, vision therapy and autism from three perspectives:  
From the perspective of the individual who is labeled as autistic;  
From the perspective of the parents and family whose lives are affected; and whose life they affect;  
From the perspective of educators and the different disciplines who advise and become involved in the treatment of the individual diagnosed with autism.

The major objective is to improve the lives of individuals who we label as autistic. A section of the presentation will consider what "normal" people think is abnormal, and what they do through their own perceptions, training and interventions to address what they consider abnormal.

As a trained clinician, whose first ethical obligation is to do no harm, it is imperative not to invade individuals' lives, and by so doing, compromise their quality of living.

Individuals with autism need to live comfortably within their own worlds, and to open themselves up to worlds outside of themselves, that they can see cognitively and sensorily to be safe, comfortable and socially inviting. It is our obligation to produce such outside worlds.

Vision therapy that focuses on the cognitive/emotional, perceptual and sensorimotor aspects of vision will be addressed specifically in this presentation.

### **The learning objectives**

The learning objectives are:  
to recognize the extent and the complexity of the bigger picture;  
to appreciate that there is no one panacea;

to produce a visual living environment that opens the eyes of individuals with autism and of practitioners to the effectiveness of specific vision and integrative therapies.

### **The definitions**

**Vision** is a bottom up, and top down process that is regulated from the outside by light that impinges on the eyes, and that directs body movements and thought and cognitive processes from the inside.

**Vision therapy** is therapy designed to develop, maintain and enhance the functions of vision, and to correct and prevent vision malfunctions.

**Autism**, or more broadly, autism spectrum disorders are complex neurodevelopmental disorders with a broad spectrum of symptoms and varying severity for which no biological diagnosis currently exists. Autism primarily affects social integration, speech and language, and the normal translation of visual and auditory behaviors, that are otherwise responded to normally by individuals who do not display these signs and symptoms.

### **Stages of normal development and stages of Autistic development**

In developing a program of therapy, whether it be vision therapy, cognitive behavioral therapy, speech and language therapy, it is crucial to take the individuals' stages of development into account, and to measure these in relation to their levels of developmental anomalies and delays.

### **Critical Periods**

Critical periods which can be shown to be important to different stages of development need to be taken into account in developing therapy programs.

### **Social Multipliers and enhancing normal development (good genes X good environments)**

Social multipliers are those combinations of good genes and good environments that are multiplicative, rather than additive, that lead to healthy development of structures, functions and behaviors. It is important here to distinguish between the differences between heredity, nature and genes, and the differences between nurture, and environment. Essentially, heredity is the gene pool we inherit from two parents. Different combinations of genes express predispositions that affect structure, function, and behavior through active, and imposed nurturing, and more passive environmental interactions.

### **Antisocial Multipliers and retarding normal development. (aberrant genes X poor environments)**

Antisocial multipliers are those combinations of bad genes, bad nurturing, and bad environments that are multiplicative, rather than additive, that lead to maldevelopment, and produce undesirable structures, functions and behaviors.

## **The role of Stress and the role of Distress**

*Stress*, or more aptly, *eustress*, is the amount of actual and perceived mental and physical tension that an individual can cope with that leads to healthy growth and development, in the face of changing challenging demands. Healthy stress copes with disequilibrium, and adapts through accommodation and assimilation mechanisms, and through high functioning homeostasis and balancing processes.

*Distress* is the amount of actual and perceived mental and physical tension that interferes with an individual's healthy growth and development, and adversely affects structures, functions and behaviors. Distress leads to maladaptation, and to compromised homeostasis and balancing processes.

## **Defective genes**

The role of defective genes that give rise to developmental structural, functional and behavioral defects that limit the potential for normal development in living human beings, are no reason for not considering interventions that can work on non defective genes to improve the quality of their lives.

## **Brain Damage**

Interventions to improve the quality of life of individuals with brain damage are important in reducing the effects of such damage, and to restore normalcy as far as is possible in the activities of daily living.

## **Autism as experienced by the individual who is autistic.**

Whatever the cause or combination of causes of autism or autistic spectrum disorders, these are not terminal diseases, that threaten the lives of those affected. It is therefore important to provide environments in which autistic individuals do not become distressed and as a result, increase, and aggravate their autistic signs and symptoms.

Depending on the age at which autistic tendencies appear to manifest, it is necessary and pertinent to find out the different ways an autistic individual experiences his or her autism. This can be assessed by observing how the autistic individual functions and behaves in his or her different natural surroundings, e.g. inside the home, outside in the grounds of the home, and acts and reacts when alone and when in the company of family and strangers, and in the presence of pet animals. It will serve a useful purpose to ask:

How does the individual react visually and auditorily and kinesthetically to different intensities of visual and auditory, and touch/movement stimuli? How obsessed is the individual with television?

How does the individual respond to different types of music, singing and talking?

What perseverative acts appear to reinforce the functional and behavioral habits of the autistic individual?

What makes the individual appear safe, at peace, and content, and what makes the individual appear insecure, anxious and unhappy?

What functions and behaviors of others appear to be abnormal and unacceptable to the individual?

What makes the individual angry, violent and throw tantrums?

What foods and drinks are liked and disliked?

To what does the individual display allergies, and how serious are the allergic reactions?

How fussy or not fussy is the individual about the clothes he/she wears?

How does the individual experience hot and cold?

How pain sensitive is the individual?

How much does the individual inflict self-injury?

What eye contact does the individual initiate with stationary and moving objects, and with living beings?

What physical strength, stamina, flexibility and fitness does the individual exhibit?

What are the sleep patterns and the excretory routines of the individual?

How does the individual spend most of his/her day?

How independent or dependent is the individual?

What activities of daily living are most adversely affected?

### **Vision and vision therapy and autism from three perspectives:**

**From the perspective of the individual who is labeled as autistic;**

**From the perspective of the parents and family whose lives are affected; and whose life they affect;**

**From the perspective of educators and the different disciplines who advise and become involved in the treatment of the individual diagnosed with autism.**

### **Vision and vision therapy and autism from three perspectives:**

#### **i) From the perspective of the individual who is labeled as autistic;**

What can the autistic individual communicate to us that tells something about how he or she sees, or wishes to see, or not to see? Where and on what does the autistic individual look and fixate and for what length of time? How flexible and accurate is the individual's fixation ability in moving from one target to another, and accommodational ability in focusing on different objects at different distances? What is the quality of binocular vision and depth perception? How does this seeing contribute to his or her autistic functions and behaviors?

#### **ii) From the perspective of the parents and family whose lives are affected; and whose life they affect.**

The effects of active nurturing and passive environment play a role from the perspective parents and family whose lives are affected, and whose life they affect. The amount of attention paid to an autistic individual will reduce and compromise the amount of attention paid by and to other family members. This may lead to over-indulgence or under indulgence and may cause measures of resentment. On balance this may cause emotional and economic strain on the family dynamic, and cause marital conflicts and problems.

### **iii) From the perspective of educators and the different disciplines who advise and become involved in the treatment of the individual diagnosed with autism.**

Because of the enormous complexity of autism and autistic spectrum disorders, it is natural that educators and different disciplines who advise and become involved in treating the individual diagnosed with autism, should hold different points of view. Such differences may, and do give rise to limited faith in one's own interventions, and skepticism and even total disbelief in the interventions of other practitioners in and outside of one's own field of expertise. Organized groups yield influence on what is, and what is not recognized as being acceptable treatment, and especially when this linked to third party health insurance. Such positions appear to be more political than scientific, and do much to discourage cooperative efforts where interdisciplinary intervention, administered practically and rationally, can offer multiplicative benefits.

### **The Role of Vision Therapy as part of the treatment of Autism.**

The literature abounds with evidence that autism affects the way the autistic individual sees, but scantily, if at all, focuses on how seeing and vision may cause autistic behaviors. However, it is rare to isolate autism from other developmental disorders and delays and in most instances comorbidities have to be taken into account. Here a large range of signs and symptoms may manifest with individuals who have been born blind or partially sighted, or lost vision at crucial stages of development, or whose sight has remained supposedly normal and unaffected. Initially, this depends on whether or not there is a sensory loss of sight that accompanies autism. A blind autistic individual will not react at all to light, and may, or may not react to other ocular reflexes, while a sighted autistic individual will react to light, e.g. the pupils will constrict directly and consensually, when light is shone into the eyes, and may not respond to other ocular reflexes.

### **Psycho-optical reflexes which involve eye movements where the retina acts as the primary stimulus and the eyes:**

The psycho-optical reflexes which involve eye movements where the retina acts as the primary stimulus, direct the eyes to objects of interest, and act to maintain fixation to ensure that the images formed by the two eyes fall on the foveae.

### **The fixation reflex**

The fixation reflex develops early, and within days after birth, a sighted infant will fixate a bright light and follow a moving object, and will move in the direction of a peripheral visual stimulus

### **The Visual Triad**

The visual triad combines three major functions of the visual system:

Fixation  
Focus

Fusion

**Vision fixation** is related to the body's musculoskeletal system and is responsible for the eye movements, pursuits and saccades that transport the eyes into areas of regard and then steady down movements so as to fixate on objects of regard. Visual fixations operate both reflexly and involuntarily and voluntarily.

**Vision focus** is related to the body's visceral autonomic nervous system, to bring objects of regard into sharp focus for the purpose of identification. Vision focus involves functions of ocular accommodation through changing the shape and curvature of the crystalline lenses in the eyes, and through constriction of the pupils so as to focus light on to the retinae. The amount of focus is regulated the degree of clear understanding required cognitively.

**Vision fusion** is related to the cortical function of the two brain hemispheres and is responsible for the movements required to coordinate the two eyes in binocular vision. Vision fusion acts to pinpoint objects and objectives in spacetime stereoscopically and stereotemporally (3D depth perception and perception of past, present and future). Vision fusion is an integral part of the brain's memory, processing and planning executive functions that rely on past experience to carry out present coordinated function and to plan and visualize, and anticipate actions in future environments.

## **Infant eye movements**

### **Observing the infant's eye movements**

At birth and for some days after, the infant sucks with eyes tight shut, with *reach, grasp, manipulate, and release* mechanisms which function initially at reflex levels to satisfy nutritional needs, but later become integrated in head and neck, mouth, eyes, limbs, hands, legs and feet movements in the processes of *locomotion, location, labeling, and language*.

What starts out as reflex sensorimotor function regulated by innate, intuitive, and inbuilt perceptual brain regulatory functions gives way to increasing measures of voluntary controls of sensory inputs and motor outputs through perceptual and cognitive mechanisms designed to integrate inputs for the purpose of maximum understanding and for most effective action.

In Piagetian terms this development is stage driven and dependent on levels of brain and body maturity, experience, social transmission and levels of self control. In the formative stages these relate to initial prespeech and expressive language in the first few years of life, to be followed by stages of preconceptual operations, concrete operations and lastly in the prepubescent to hypothetico-deductive reasoning. Qualitatively noticeable changes in abilities arise in periods of disequilibrium through adaptive accommodation (environment controlled by genes) and assimilation (genes constrained by the environment) processes.

## **Sensorimotor, Perception, Cognition**

Vision does not exist in a vacuum, but in a living body. Vision can be present in individuals with sight and without sight, while vision may be absent or minimized in individuals with normal sight. Vision is dependent on sensorimotor, perceptual and cognitive integration, and on stages of maturity, experience, social transmission and self-regulation. It has been stated that vision operates through the human being's total action system, and that the human being's total action system operates through vision.

For vision to become a dominant sense it is essential to optimize the integration, synthesis, and synchrony of *seeing* with the other senses, namely, *basic orientation, hearing, moving, balancing, , touching, smelling, tasting, breathing, and thinking*. In combination they answer best the questions of what, where, and when objects were, are, and will be present, and why and how we should want to pay attention to them.

Senses that do not integrate, synthesize, and synchronize with the other senses, and give rise to mismatches, are a major cause of confusion and disorientation. This in turn leads to fear and anxiety and to erroneous under and overreactions and to poorer performances. Research in multi sensory processing shows the effects of sensory mismatches and the importance of getting the systems to work in harmony at preconceptual levels.

At the most passive and least invasive levels, colored light, sound resonance, and vestibular stimulation have all been shown to have beneficial integrative effects when used separately, but appear to be even more effective when applied simultaneously. The balance thus achieved appears to stabilize the inner perceptual systems and to make the individual more aware and receptive to outer perceptual signals. Promising results have been found in measurable physiological and behavioral changes in improving concentration and attention span, memory, sleep patterns, and in stress reduction in individuals who have displayed developmental delays, and brain injury. Beneficial changes in vision have been evidenced in cases of visual neglect, constricted visual fields, and in improvements in visual fixations, focusing and fusion, that lead to overall improved visual performance.