The Alpha Omega Pupil:

Clinical Considerations, Testing and Recording Standardization

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Introduction

Pupil reactions are the most important objective measurement Syntonic optometry has for assessing the integrity of visual perception as it relates to autonomic nervous (ANS) balance and adrenal functioning. Sensitive measurement of the pupil is used for diagnosis, to determine the course of treatment and to objectively monitor the effectiveness of our therapy. The purpose of this paper is to present an update of our current understanding of pupil reactions and to standardize the testing and recording of this important clinical measurement.

The reactions of the pupil are arguably the most sensitive measure of ANS activity in the human body. The pupil has rightfully been called the "Window to the Soul" or the "Apple of One's Eye" and is a beautiful example of a closed-loop biological servomechanism.[1] It's revelations and complexity are profound enough to attract the interests of optometrists and ophthalmologists, as well as physiologists, psychologists, neurologists, physicists, neuroscientists and biological engineers.[8] There are volumes of studies that use the pupillary reactions to monitor such things as cognitive function, Schizophrenia, Alzheimer's, Autism, alertness and fatigue and even sexual preference.[3,5,6,9]

Alpha Omega Pupil (AO pupil)

The syntonic optometrist's observations of the pupil are unique; we monitor not only the pupil's immediate reaction to light called the dynamic pupillary light reflex (PLR), but also its continuous reactions under sustained illumination to light over a period of time. Abnormalities in these sustained pupillary reactions have been called the Alpha Omega Pupil (AO pupil), a term that was suggested by Dr. Paul Johnson in 1934 after listening to the presentation of a paper by Dr. Dulton Brewer on pupillary asthenia.[4] The name is unique to the practice of syntonics.[2]

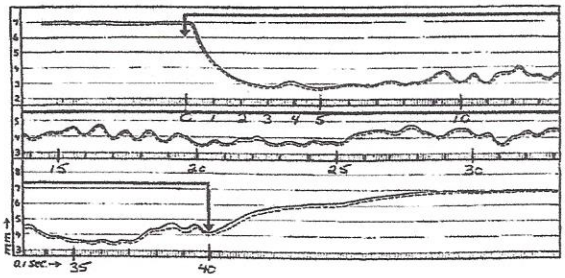
The AO Pupil is characterized by the abnormal re-dilation of the pupil during direct, constant light stimulation. According to Lowenfeld, a normal pupil should have a brisk PLR and hold this constriction without fluctuation for 8-9 seconds under constant light stimulation. As direct light stimulation is maintained, a slight fluctuation and re-dilation of the pupil of no more than 1-2 mm will occur over the next 40 seconds. This is termed "Pupillary Unrest" (see Figure 1).[7]

An Alpha Omega pupil may not constrict fully to light (decreased PLR latency and amplitude) and will show re-dilation and fluctuations before eight seconds of stimulation have elapsed. It differs from Pupillary Unrest in that its occurrence happens before 8-9 seconds have elapsed and has an amplitude that is greater than 1-2 mm. It is important to note that the abnormality is brought to normalcy with phototherapy treatment

In addition, the AO pupil is a key indicator of the limits of the functional visual field. There is an inverse relation that exists between the size of the functional field of vision and the length of time to re-dilation of the pupil. The quicker the release, the smaller the functional field.

Figure 1Pupillogram of normal 24 y.o. female under sustained light (Loewenfeld, "The Pupil")[7]

Light Stimulus begins



Light Stimulus ends

Neurological Etiology

The cause of the AO pupil has not been specifically determined and a detailed discussion of this is beyond the scope of this paper. Most pupil studies are done using the PLR as a reference with virtually no attention paid to sustained light stimulation. My research in this area indicates that the reactions are likely influenced by higher cortical pathways that exhibit sympathetic inhibitory inputs to the Edinger-Westphal nucleus probably by adrenergic inputs from the hypothalamus. There is also a nonadrenergic pathway from the nucleus coeruleus.

The neurological complexity of the pupillary reaction has been well stated by Loewenfeld.[7] "Any sensory, emotional, or mental stimulus elicits reflex dilation. Any sound, touch or pain, fear, joy or anger or spontaneous thoughts and intentional efforts all dilate the pupils. The amplitude of reaction depends on the degree of arousal caused by the stimulus and the subject's physical and mental state at the time of stimulation."

Testing

Below are the most important factors in pupillary testing. The key to accurate pupillary testing is consistency.

1. Room Illumination – The room should be dimly lit with the patient in dark adapted state.
2. Patient Fixation – The patient should look straight ahead at a non-accommodative, non-descript, distant target.
3. Light Source – A small, bright, concise light should be used that will remain consistent from visit to visit. A battery charged transilluminator is recommended.
4. Testing Distance and Location – The light should be introduced from below or temporal to the eye being tested to a location straight into the line of sight. The distance from the patient should be approximately 6-8" from the eye.
5. Duration – The light should be shone for approximately 10 seconds before each eye.

Questions to be Considered During Testing

(From Loewenfeld "The Pupil")[7]

1. Observe the size - too large/small for age, ambient illumination, etc.
2. Are the contractions to light and to near vision equally extensive?
3. Are they equal in size?
4. If unequal, is difference greater in dim or bright?
5. Do both constrict to light? Is the consensual response present?
6. Do both re-dilate when light is removed?
7. Is reflex dilation to sensory stimuli intact on both sides?
8. Are there other motor or sensory defects relating to the pupillary syndrome?

Observation of the AO Pupil

1. Observe the pupil under constant light stimulation for at least ten seconds.
2. Test right eye first and then immediately repeat the test on the left eye.
3. Observe the time that the pupil begins to re-dilate (release time), the amplitude of the re-dilation (change of pupil diameter from initial constriction to light to maximum dilation diameter) and any fluctuations.
4. Repeat at least three, observing changes with repeated stimulation.
5. Observe any sensory reactions such as: tearing, pain, photophobia, withdrawal, etc.

Table 1:
Recording of Pupil Reactions

OD		OS
0 1 2 3 4	PLR	0 1 2 3 4
0 1 2 3 4	Near Reflex	0 1 2 3 4
Yes No	Normal Direct	Yes No
Yes No	Normal Consensual	Yes No
_____	Pupillary Diameter	_____
_____	Time of Release	_____
_____	Amplitude of Release	_____
0 1 2 3 4	Fluctuations	0 1 2 3 4
0 1 2 3 4	AO Pupil	0 1 2 3 4
_____	Change in Repeated Stimulation	_____
_____	Sensory Reactions	_____