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***“Joy of the Synoptophore”***  
***“Working through Micro Strabismus”***  
***“The Cowboy Technique”***

**By**

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**Take Home Point:** The synoptophore is useful in breaking down central suppression characterized in ophthalmology journals as a “D-Shaped” scotoma or “Horror Fusionalis” regarding micro strabismus. However developing stereopsis requires a psychological acceptance of a single precept from the dual visual experience of both eyes synchronized in both time and space. Then the patient must transform visual disparity into a three dimensional Z-axis projection. I believe this acceptance is the unwinding of a sophisticated adaptation constructed by the patient to address the difficult problem of small angle diplopia that is managed over a lifetime. This sophisticated mental, emotional, and neurological adaptation built over a lifetime of struggle is difficult to let go and trust a new construction of the patient’s visual world.

**References:**

1. “Clinical Strabismus Management - Principles and Surgical Techniques”, Arthur L. Rosenbaum, Alvina Pauline Santiago, W.B. Saunders, 1999.
2. “Applied Concepts in Vision Therapy with disk”, Leonard J. Press, OD, FCOVD, FAAO, Mosby, 1997.

**Keywords:** D-Shaped Scotoma, Horror Fusionalis, Micro Tropia, Intellectual Disability, Fusion, Stereopsis, Projection, Synoptophore, Major Amblyoscope, Eccentric Fixation, Horoptor, Single Precept, Dual Precept.

**Key Questions:**

1. Is small angle strabismus worth treating since the eyes are cosmetically straight already?
2. Are subtle effects of stereopsis and depth perception really worth the effort when most modern day experiences of computer, reading, and video games are just two dimensional?
3. Is three dimension virtual reality more meaningful?
4. Why invest the time and money when the prognosis is guarded?

5. How to handle the possible risks of developing binocular problems of diplopia and asthenopia?
6. What are the benefits and what are the costs?

**Key Problem:** After deciding to pursue vision therapy despite the above concerns, how do you develop binocular function and stereopsis when bifoveal fixation is avoided or repulsed by the ocular behavior of the patient? This is a key problem for strabismus surgery as well.

**Patient Profile:** These cases involve micro or small angle strabismus with limited (400 seconds) or no stereopsis that may or may not be post surgical. The specific objective is to develop depth perception. The needs vary from a personal challenge, to meet specific career qualifications as in law enforcement or aviation, or to read better. These patients are often very driven, intelligent, resourceful, athletic, and accomplished. Often they have seen many doctors who state that “nothing more can be done”. They are cosmetically straight and many practitioners consider the micro tropia a minor inconvenience as patients have single and clear vision. Even central suppression may be considered a successful end point to strabismus treatments. So why pursue more treatment? The late Dr. Robert Kraskin said you accept a patient based on “patient needs and the viability of meeting those needs with optometric intervention not necessarily specific optometric findings”.

**The “Cowboy” Technique:** There are many procedures and various slides that one can employ on the Synoptophore, but for this paper I have just this particular procedure to share.

1. **The Goal:** to align and simultaneously perceive the central and mid peripheral targets concentrically.
2. **The target or slides:**
  - a. The slides that I prefer are concentric shapes alternately split between the two eyes that consist of one black central dot superimposed by a small ring, then a circle and last a square in the mid periphery.
3. **The Instructional set:**
  - a. Place the slide with the small central dot in front of the preferred or fixing eye.
  - b. Align the targets so that they are level horizontally relative to the patient’s perception not necessarily the therapist.
  - c. Have the patient manipulate the arms of the Synoptophore to superimpose the images together both from the base in and base out direction.
4. **The responses:**
  - a. Often the target will leap frog from one side to the other. Ophthalmological journals describe this as “*horror fusionalis*”. This is rationalized as the jump from the image passing through the “*D-shaped scotoma*” of an “*immature visual system*”.
  - b. Initially it may be difficult to see the complete target from either eye but usually more difficult to see the non-fixing eye’s target especially the smaller central targets.
  - c. As suppression decreases the patient may try to avoid superimposition with vertical movements or displacements between the eyes.

- d. The dot may slide around the ring but not enter the ring.
  - e. Interestingly, if the patient achieves central alignment often mid periphery is displaced because the patient exhibits a special displacement over a temporal displacement or suppression.
  - f. The “cowboy technique” may take several months to a year to fully resolve.
  - g. Once central simultaneous perception is manifested by the patient, they can then work to transform central binocular visual disparity into a three-dimensional Z-axis projection. This is very difficult as the patient still understands their dual visual experience from each eye to be separate non-fused experiences. The conversion to a single precept centrally from a dual experience is foreign to the patient.
5. **Therapist Counsel:**
- a. “Work it until it surrenders like breaking in a horse” hence the **“Cowboy”**
  - b. “Let it be as opposed to make it be”
  - c. “Be patient”
  - d. Allow patient to control time on the machine 10-30 minutes
  - e. “Can you align both central and mid peripheral targets concentrically at the same time?”

### **Discussion:**

This adaptation is described in **Ophthalmologic texts as a “D-shaped scotoma” or “Horror Fusionalis”**. The “D-shaped” scotoma is the area in which the central target of the fixing eye projects to the strabismic eye on the retina. It is a small central area of suppression truncated by the midline necessary to avoid central diplopia. Horror fusionalis refers to the repulsion behavior of the non-fixing eye projected on a horopter that creates a notch as it “skips” over the space associated with the “D-shaped” scotoma. Ophthalmological texts characterize this as an “immature” visual system. I beg to differ on the “immature” characterization as I believe this is a very sophisticated adaptation. Significant individual effort went into this difficult visual accommodation to near diplopia.

In my experience small angle strabismus is more prevalent or associated with those with **higher intelligence and ambition**. Those with intellectual disabilities tend to have larger angles. I believe this is due to the difficulty in managing diplopic images that are close together like a shadow than images that are far apart. The question is which image or eye do they prefer for daily tasks? I believe that decision is simpler with separated images than with overlapping images. Hence small angle strabismus requires more cognition, energy, and neurological creativity to function efficiently. This adaptation is constructed and maintained by the patient’s ongoing visual experience at great personal sacrifice in terms of energy and efficiency. This adaptation is complicated by the concentration of neurology around the macula in the retina that has more direct neural connections to rewire.

My mentor **Dr. Harry Wachs** used to say that to work on strabismus you need **“to get inside the angle of strabismus”**. The problem with micro strabismus is that it is a very small space. To get inside a micro strabismus you need small targets and precise angular control of those targets. The Synoptophore is very adept at managing that small area and allows for dynamic adjustment to the visual axis of each eye along with brightness adjustment and flashing to break suppression.

I recollect the late **Dr. Robert Kraskin** once saying that the key to strabismus is ocular alignment. If the patient was unable to achieve ocular alignment in a reasonable period of time he would dismiss the patient to try another time.

I find the **big challenge is to develop a single precept** from the dual visual experience of two eyes. They have habituated two separate worlds: a right eye world and a left eye world and the two shall not meet. Generally I find that starting with higher level fusion and working down works best for most strabismus. That is starting with stereo targets to flat fusion and then simultaneous is best and a reversal of “Floms” criteria. However in micro strabismus the suppression is so strong that it masks visual disparity preventing stereoscopic perception and fusional responses. In fact the opposite occurs with bifoveal avoidance or “*horror fusionalis*” in that central simultaneous perception seems to be prerequisite to finer stereopsis and subsequent three dimensional projections.

Interestingly, with my recent patient as he breaks the central suppression he **rejects spatial synchrony**. In this case one may think of suppression as a temporal displacement meaning one does not see the targets at the same time but can see them at alternate times. But if the patient does see both targets simultaneously then he may spatially displace them as to again avoid the single precept in a spatial sense rather than a temporal sense.

The patient can develop diplopia and binocular problems as they work through the therapy and central suppression. This can cause eye strain and frustration reading. My recent patient decided independently to use a clip on patch to manage his reading instability.

Many of these **patients are very analytical** and often describe their problem. The more they talk about the problem the more real it becomes and the harder it is to fix. I try to counsel them to look past the problem to what they want to do and “*just do it*”. I encourage them to focus on what they are doing, not how they are doing it or more specifically how they are seeing it.