PERSPECTIVES ON BEHAVIORAL OPTOMETRY

By Paul Harris, O.D., F.C.O.V.D.

A MODEL OF VISION

Dr. Paul Harris received his Doctor of Optometry degree from the State University of New York, State College of Optometry in 1979. He is currently in private practice in the Greater Baltimore metropolitan area. He is a fellow of the College of Optometrists in Vision Development. Cochairman of the Baltimore Institute for Behavioral Optometry (an OEPF affiliated study group), and currently the Vice-President of the Maryland Optometric Association. He has served on the Task Force for the Future of Vision Development of the A.O.A. and he is chairman of the Public Relations Committee of COVD, and the Bibliography and Abstracting Committee for the Sports Vision Section of the A.O.A.

INTRODUCTION

What is behavioral optometry? This question is asked over and over again at meetings across the country. As a behavioral optometrist, I offer the following to illustrate the evolutionary changes that have taken place in the growth and development of my conceptual thinking and, in a global theoretical way, what that knowledge base is.

Through my optometric education, I was presented with many different concepts, models, and ideas of vision. These ranged from the early model of the "eye as a camera" to that of conventional wisdom, and to what some term the "functional model." I was also exposed to many different ways of performing diagnostic test batteries and many different ways to analyze the data collected. In many aspects my model or concept of vision evolved as did the model of vision of the profession as a whole. This model continues to evolve and it is understood that it will never stop changing. "What has facilitated this evolutionary process?" and "Where has that process led?" During my optometric education (1979 Graduate from the State University of New York, State College of Optometry, SUNY), I served as the national president of the American Optometric Student Association. This provided me an opportunity to observe what was being taught and practiced around the country. I learned that optometry was taught and practiced very differently in different optometric institutions and in different regions of the country.

At SUNY, courses were taught in graphical analysis, as well as the Skeffington courses were also taught about the ideas derived from the fruitful time that Dr. Jerry Getman and Dr. Arnold Gesell spent together. Their union added developmental concepts to the body of optometric knowledge. SUNY students were allowed to derive their own model of vision from that which was taught. No single concept or model was endorsed by the school.

During the first two years of practice following graduation, (devoted primarily to office centered vision therapy), I had my successes and, also, my failures. The model of vision that I had constructed from my education allowed me to help 90% of my patients meet their needs. However, there were those patients whose needs were not being met and who had needs that I couldn't identify from my then, limited model of vision.

A few months after I began practice I had the opportunity to hear, for the first time, a significantly different concept of vision. Dr. Robert Kraskin spoke for 12 hours about posture and vision. Many of the ideas were so new and so foreign to me that they were not understood nor did they change what was being done with my patients. My education gave me no basis to understand the substance of what Dr. Kraskin presented. It is only now that I understand that I did not have the proper frame of reference. (NOTE: From a Piagetian sense; my existing schemes were so far removed from that which was being presented that I was not able to accommodate or assimilate the information. I tried to understand it using my existing model of vision. Things didn't make sense.) Instead of dismissing these new ideas, I filed what I understood in the back of my head. From time to time ideas posed by Dr. Kraskin created conflict as they were at odds with my model of vision. These questions as well as the sequence and case meeting the needs of the patients.

For two years my model changed little. However, since December of 1981, my model has been in a state of rapid evolutionary change. New schemes are developing and current schemes are put to use in new and more effective ways.

Some of the milestones reached along the way included an understanding of the vital role that the 20% of the optic nerve fibers that go to lower order brain centers plays in the relationship between vision and the rest of the body. This opened up an understanding of the work of Harmon and others which relates posture and use of the body with vision. It also opened up my understanding of the "Antigravity" circle in Skeffington's four circles of vision.

My model of vision upon graduation resembled closely an accommodative convergence model of vision, or what has been termed a skills approach to vision. Emphasis was in the two circles of "Identification" and "Centering" but it did not address the "Antigravity" or the "Speech auditory" circles of Skeffington. I thought of identification as accommodation of the lens of the eye, centering as the relative convergence, and divergence or the primary visual axes of the eyes in relation to each other. According to the Skeffington four circles of vision, I was really not at anytime working with *emergent vision*. I was locked in at a skills level of accommodation/convergence concept of vision.

Initially, an approach to diagnosis and treatment which related to specific findings to specific labels to specific treatment regimens was followed. Different labels were given to different findings. Thus, a totally different treatment program was offered. Conditions were labeled as a "convergence insufficiency" or an "accommodative infacility" or "divergence

excess." Once the diagnosis was made, then a specific treatment plan was laid out for that diagnosis. This approach placed a lot of weight on specific probes of the visual system.

MY CURRENT UNDERSTANDING OF VISION

Throughout the remainder of the paper, definitions of terms that are used and abused on a regular basis by members of the profession are presented. These definitions are crucial to understanding my model.

VISION is deriving meaning and directing actions through the use of light energy. It is acquired through both overt and/or covert movements of the person.

DEVELOPMENT and LEARNING (in the Piagetian sense) indicated the two basic routes through which vision may be acquired.

DEVELOPMENT is the process during which new schemes are created or synthesized by the individual; it is usually associated with the "ah ha" phenomenon.

LEARNING is the acquisition of facts or data, and the acquisition of knowledge.

KNOWLEDGE is the data (the raw facts) that are scored about things.

NEW SCHEMES result from probing the outside world and recognizing conflict.

EXISTING SCHEMES are the ways available to the organism to organize, store, retrieve and utilize the knowledge base, and to probe the outside world for meaning to direct actions. Schemes for vision are developed and then used by the thinking person. Further elaborations of these schemes are constructed; they expand the usefulness of vision.

A VISUAL PROBLEM is an unmet visual need of the patient; it may or may not be reflected in the optometric data.

OPTOMETRIC DATA PROBLEM is a deviation of a finding or set of findings from some postulated norm (or expected) that may or may not related to a visual problem. As a behavioral optometrist, I am most concerned with patients' visual problems whether or not there is evidence of such a problem in the optometric data. Optometric data problems, in the absence of visual problems are of far less importance in behavioral optometry. This is not to say that optometric data problems found in the course of diagnosis are not used as part of the continuing case history to uncover visual problems as the diagnostic procedure continues. However, it is acknowledged that there can be significant optometric data problems without associated visual problems. This is rare.

STRESS is that which causes a dis-homeostatsis on living organisms which facilitates change (either positive or negative). Stress is a response to a number of sources, such as the actual physical action of an outside object on an organism (falling object on a foot), the use of the organism itself by another organism (infections, parasites, etc.), the use or abuse of the organism by itself in the course of living, or the perceived consequences of any of the above on the individual by the individual. Stress has, according to Selye, both a local and a general effect. The general effect for all stresses is the same in the human organism, although of different intensities, with the local effects having specific sites and types of actions.

POSTURE is the relative position of the physical parts of the body to each other and in relation to gravity, at any point in time. Posture is dynamic and always present. There is a relative homeostatic point of least resistance or maximum efficiency about which the person moves in order to act on the environment.

MOVEMENTS are successive changes in relation to gravity and in the relative positions of the body parts to each other or in relation to another object.

Behavioral optometrists deal with visual problems of patients that are either problems in acquiring vision, or are alterations or maladaptations in the visual process resulting from the action of real or perceived stresses on the patient. SPACE WORLD is the internal representation of reality (some may argue that that is the reality) that each person constructs within their mind. This representation is, by its nature very incomplete. This representation includes the knowledge that the individual has along with the schemes available to the organism to utilize that knowledge. Lack of coordination or correspondence between the measurable physical world and the representational world exists for each person. These areas of dis-coordination are the basis for inaccuracies or inefficiencies in performance. The diagnostic evaluation performed by a behavioral optometrist probes not only the direction and degree of the dis-coordination between these two worlds but probes the current direction of adaptation and the level to which these dis-coordination have been compensated for in changes in the actual structure of the patient.

Chronic postural and movement assymetries are the results of intrinsic dis-equilibrium or dis-coordination which lead to warps or distortions of the space world. Another way of assessing the space world is by taking an inventory of which schemes the patient has available to them at any time and which schemes the patient uses for which tasks. Systematic warps of the space world or directional movement of the space world, under certain conditions of demand, are evident in the behavioral optometric diagnostic procedures.

The person acts on the environment using their space world as a base of understanding and organization. The person will direct action towards the spatial location of the object in the space world which may or may not correspond to the actual position of the object in reality. Contrary to the ideas of information processing, we are not constantly bombarded with information from outside stimuli from which we select that which we want. We go out and get from the environment what we seek knowledge about or which is creating conflict.

The person incorporates elements of all senses to construct a space world. Each individual may be aware of their space world and more or less aware of certain senses. Thus, the concept of an internal visual space world has been avoided as the person uses all the senses to build the space world.

Changes in the structure of the organism or maladaptations include but are not limited to myopia, adverse hyperopia, astigmatism, Amblyopia, strabismus. They are attempts by the person to resolve inadequacies of equilibrium between their space world and reality. (An adaptation becomes a maladaptations when, in the course of making the change, the potential of the organism to meet future unforeseen demands has been limited in some way.)

There are several directions of movement of parts of the space world that are normally identified. These include inwardizing (towards self, centripetal), Outwardizing (away from self, centrifugal) and directional changes in the volume of space being utilized (compression verses expansion). Inwardizing movements of the space world occur when areas of the space world shifted nearer the person than the corresponding object is in reality. Outwardizing movements occur when areas of the space world are shifted away from the person, relative to the corresponding

position of the actual object in the concrete world. Compression and expansion relate to the amount of space or the portion of the space world that is being utilized at any point in time by the person from which the individual is currently basing his decisions. The person who has compressed space deals with relatively smaller portions of the space world at any moment in time. By expanding the attended space volume, more of the space world is used by the individual. It is recognized that both inwardizing and outwardizing directions of movement are present in the same individual in relatively different amounts, in different directions of action, and under different conditions of attention and performance. As part of the diagnostic testing, we measure relative tendencies toward one direction of movement over the other.

EMBEDDEDNESS is a measure of the level to which a discoordination between the space world and reality has been or is being adapted in changes in the structure of the organism. When an adaptation is said to be less embedded, it is less so in structure and more evident in a space world discoordination, A more highly embedded adaptation is one that is more a part of the structure of the organism. At the highly embedded endpoint, inwardizing and outwardizing tendencies may have reached a more balanced state. If this is so, the adaptation tends to reveal itself in changes in the volume of space, compression or expansion.

VISION IS AN EMERGENT!

Vision does not reside in the eyeball nor in any single structure in the human but rather emerges from the coordinated use of the entire organism to derive meaning and direct action. The Skeffington four circles provides a vehicle for understanding this concept.

FOCAL is the subset of the visual process which is served by 80% of the optic nerve fibers. It carries, primarily, information from the macula area of the eye that runs to the visual cortex and serves primarily identification, and secondarily, centering and the speech auditory.

AMBIENT is the subset of the visual process which is served by 20% of the optic nerve fibers. It carries, primarily, information from the majority of the retina, less the macula area, which run to lower order centers in the brain stem which serves primarily the centering, and secondarily, the antigravity and identification.

When confronted with the stress of near centered demands, the individual, as well as all living organism, may elect to fight or fly from the stressor agent. Although this appears to be a black and white, this is not really the case. There is actually a continuum between extreme fight and total flight. The difference is obvious immediately when one considers the differences about how a sports page is read versus how a technical article is read when it is being read for a test. The differing levels of intensity are not from the reading material. They are from within the individual and they are in proportion to that persons' perception of how strong those stressors agents fire.

The higher the level or intensity of stress induced, the stronger the conflict and the more polar, fight or flight, will be the response. For example: Less Conflict is caused by reading the newspaper or the funny papers and, therefore, the people reading this material would be broken up into rather narrow distribution from flight to fight. Very little force to change is generated in those continuing to read and very few people throw in the towel and give up. The forces are generally weak, and a narrow differentiation is made. Conversely, the conflict is strong when technical reading

material is read for a test. The forces for strong fight or flight are present. It is hypothesized that those who continue will do so with higher levels of general, local measurable stress than when reading the lower demand material. Those that fly will do so earlier and they do it more totally. In our society (which is far too goal oriented) total fliers are looked down upon. Fliers may develop a style of deriving meaning from near centered tasks which artificially reduces the intensity of the conflict. This is done by developing Reduced Visual Efficiency.

REDUCED VISUAL EFFICIENCY is a way of deriving meaning while reducing the intensity of the presented conflict by remaining somewhat aloof from the demand, yet continuing to attempt to derive meaning. From all outward appearances the person looks as though they are doing some work, but appears to be lazy. They tend to get a general impression of the material read. If tests are made on the global aspects of the material rather than on specific pieces of information this individual may do well in subsequent testing. Reduced visual efficiency is the most popular adaptation to chronic stress in our species. It preserves the integrity of the organism. There is another way to think of the reduced visual efficiency person – it is a relative de-emphasis of local vision in relation to ambient vision.

STRESS SYNDROME

In circumstances that appear to have a physiological (hormonal) component as well (80% are prepubescent females) the individual may become frozen at the moment of conflict and decide not to choose either fight or flight. Over time, there is a reliance on the ambient system at the expense of the focal system as the indecision continues and the choice continues to be postponed. Visual acuity drops in accordance with the decreased role of the focal system and the identification circle. Low powered lenses are effective as they create a different view of the world and allow a resolution of the problem. A low powered plus lens resolves the conflict on the side of fight by organizing conditions for a reduction of stress. A low powered minus lens also resolves the problems it brings the person through on the side of flight. The increase in the level of the intensity of stress creates a decision to throw in the towel and fly. Once either happens, there will be a rebalancing (homeostasis) between focal and ambient aspects of vision.

BEHAVIORAL DIAGNOSIS

Following are several of the underlying concepts which guide me in the actual collection of data and formulation or treatment plans.

Diagnostic testing is a stage setting to observe behaviors from which the optometrist hopes to glimpse the space world of the patient and the schemes available to the patient. Each test sets up a standardized condition for observation. The patient's responses to this standard arrangement of conditions is observed and at times, questioned to gain insight into the schemes utilized and the organization of the space world. Although each test has a name which normally connotes that it is testing one thing in particular, it usually yields valuable insights into many other areas of visual performance totally unrelated to the name of the test. There is no one test or sequence of tests that is a behavioral diagnostic testing battery. Each behavioral optometrist will develop their own testing sequences which best suit their observanonal abilities.

The tests presented are those tests which are performed with every patient at every visit. Many other tests and probes are

available. The tests includes history, eye health, acuities, cover test, motilities, convergence near point, reach grasp release, color, randot stereo, stress point retinoscopy, worth 4 dot at distance and at near through + / - 2.00, "my" analytical, cheiroscope tracing, Van Orden star, and vectogram.

The key word is behavioral diagnosis is observation. Observations are made during every moment of contact with the patient. Assessments are drawn from the observations made and the affect on visual behavior that the patient brings to the examination. Each of the above tests are a vehicle to examine the patient as the patient reacts to a prearranged situation. I arrange a set of circumstances, then observe and "feel" how the patient deals with this set of circumstances. What are the relevant factors that the patient is acting upon? What is the patient aware of and what passes them by? The behavioral approach recognizes the importance of the process used by the patient and communicated to the observer. The language used by the patient may be as important and in many ways is actually more important than the finding itself.

Although the lists of tests above are standard tests done in the optometric community, a behavioral optometrist cannon function with just the findings of the above tests. Only with the inclusion of the additional factors observed and felt by the behavioral optometrist could a treatment plan be devised. Most of the tests give insight into the current level of Sensorimotor (Piagetian conceptual term) intelligence that the individual has as well as the schemes available to the individual as to how to use that hardware to derive meaning and direct action. Those models of vision that use the concepts of accommodation and convergence as the main components of the visual process are dealing only with the physiological aspects of the visual process.

Attitudinal effects of the patient and their affect on the doctor-patient relationship are also a very significant part of the behavioral approach to vision care. Great care is given to inform the patient that there no right or wrong answers. Their answers are all correct from their point of view. If the patient says that 2 + 2 equals 7, then, that is correct from the point of view of the patient and no value judgments are placed upon the answer. Our job is to determine on what basis the number 7 was derived and to gain insight into the underlying thinking. Questioning patients is done from this vantage point; patients are helped to understand that this is a place that they can "let their hair down."

Along with looking at the attitudinal effects of the patient, the behavioral optometrist must be concerned with (what I term) "the dependency factor." This is the ability of the patient to take charge of their own life and to determine the outcome of events. The types of questions investigated include: How dependent upon others is the patient? Do they look towards their parents or spouse before giving an answer? Are their answers stated as conditionals depending upon other peoples' opinions? Can they self-generate movements? Are they willing to become involved in helping themselves improve? How well do they separate from others and work independently? Each of these questions is critical in determining the possible outcome of a vision therapy problem or, for that matter, any treatment program.

CHARACTERISTICS OF MY ANAYLTICAL

Following are simple premises which guide me as a behavioral optometrist:

Stress point retinoscopy represents the maximum plus lens at near beyond which drive the individual into flight

responses rather than fight when confronted with sustained near point activities. This is not the prescribed lens. Rather, it is an endpoint beyond which one will illicit the flight response to near point activities or to the lens. A near lens higher in plus than this amount will not be accepted effectively by the individual.

My analytical is different in many ways from the Skeffington analytical. Although similar types of tests are run and similar deductions about the patient visual states are made, my analytical is less complex and affords me greater insight into the patient's visual development rather than simply determining the "safe" lens (the stated goal of the Skeffington analytical).

Targets used are larger in terms of their overall size. This does not mean that large letters are used. As an example, for distance duction findings (9,10 and 11 findings) a block of letters from 20/60 to 20/20 is used.

Questions are all of the "flat" or "open" type rather than pointed or directed. Following is a pointed question I have used in the past to elicit an equilibrium finding: "Tell me when the letters get blurry, or if and when they break up, or double," Following is the "Flat" question now used instead for the equivalent test, "I would like you to give me a running account of everything that seems to be changing." The first question tells the patient the specific things that you want. In general, they will react only when the events to which they were directed occur and they will let so many other things go by without the optometrist gaining any insights. The use of the flat or open questions opens up the possibility of gaining insight into what the patient attends to and to what is relevant to that individual. Size and distance changes, changes in the amount of space being utilized, along with blurriness and diplopia are freely given by many patients. A report noting no changes as the prisms are changed to 40 or 50 diopters also gives significant insight into one's vision. The attitudinal aspects of the open questions gives the patient freedom to make whatever response the patient feels is appropriate. The directed question places the patient on the spot. If the patient does not see what they are directed to see, they may feel inadequate and may place themselves under additional stress.

Although the analytical is but a snapshot in time, information is available to the examiner about the past, the present and what the future will hold. The number seven finding tells about both the present and the past. It tells what path of adaptation the patient has gone through. It also yields the current state of refractive adaptation. Anything other than equal amounts of low hyperopia is indicative of past episodes of adaptive behavior. The type of maladaptation can be determined from the number seven finding.

The ratios of the recoveries to the associated break points on the equilibrium findings are an indicator of the current level of embeddedness. Different levels of embeddedness may be observed for both distance and near structural adaptations. The lower the recovery to break point ratio, the less embedded is the adaptation.

Phorias are not thought of as simply a tonic positioning of one eye in reference to the line of sight of the other. Phorias, along with the balance of the equilibrium findings, observations on the chair tests, and observations of the cheiroscopic tracings, the Van Orden Star and the vectogram are all combined to yield a picture of the direction of movement of the individual. The types of questions that are usually answerable after a behavioral examination include but are not limited to the following. Is there a systematic shift of the space world inwards towards the individual or outwards away from self? How is the shift or direction

of movement different in different locations of space? (It is conceivable that the space world could be moving closer at some points and moving further from self at other points all simultaneously.) What conditions trigger the relationships and directions of movement to change? How flexible is the individual to switch directions of movement from one instance to another? How much space does the individual use for deriving meaning and directing action? Is there a minimizing or expansion of space that is not necessarily along the "Z" axis? How does this relate to convergence and divergent thinking styles and to problem solving strategies?

LENS EFFECTS

Lenses alter the distribution of light on the retina. Whether or not the person will be able to use the new distribution of light to improve their deriving meaning and directing action is not directly related to the compensation of a refractive condition. Lenses have significant effects on the spatial distribution of light which are beyond the simple converging or diverging of rays or, in the case of a prism, the alteration of direction. An example is the relative spatial compression at the base of a prism and the relative spatial expansion at the apex.

When applying lenses, there may be different effects on the person stemming from the application of the same lens. In general, a plus lens tends to expand space and a minus lens tends to compress space. When a yoked prism is used, the differential spatial compression and expansion at the base and apex respectively may actually be seen by the patient as a relative inwardizing and outwardizing movements shifts. A paradoxical shift may actually be seen by the patient if they happen to attend to the inward and ouward shift versus the expected spatial compression or expansion.

TREATMENT

Several different levels of treatment are offered to patients. They are related to the outcome of the diagnostic process. They include a compensatory lens, a lens treatment program, or treatment lenses with vision therapy.

A *compensatory lens* is a lens which restores standard visual acuity and merely compensates for the maladaptation which the individual has made. In no way does it treat the underlying problem.

A *treatment lens* is used to either direct future change in the visual status to a less adapted state, or to improve performance of the individual by decreasing the intensity of the visual stress acting upon the individual. It creates a better coordination between space world and reality.

Vision therapy is both a development and a learning experience for the patient. Conditions are arranged to create conflict between existing behaviors (schemes) and that which is demanded of the task. The process of resolving the conflict – assimilation and accommodation – for new behaviors is the outcome of the therapy. The patient will then have more behaviors upon which to call to serve them in meeting new demands. Vision therapy is a sequential program building upon the schemes already available to the individual and or trying to provide wholly different schemes in cases where the individual is using totally inappropriate ones. For example: a strabismic uses their eyes in such a way that the lines of sight are not coincident when looking at an object. In the non-pathological case, this is the use of an existing scheme in an inappropriate manner. Rather than sequentially build upon this scheme one hopes to reach down inside the individual to find appropriate schemes and build upon

them. When the treatment is complete and the strabismus is "cured" the schemes for strabismus will still be available to the patient and under extreme stress or fatigue may revert to this behavior. New schemes reduce, alter or embellish the actions of the person and, over time, permanently change the behavior of the person.

PLASTICITY AND CRITICAL PERIODS

Current brain research is beginning to support views held by behavioral optometrists. Although there may be some naturally observable critical periods in the development of the brain, there are mechanisms of attention that can open the floodgates to the formation of brain synapses, and thus new schemes, for nearly any purpose at any time in the person's life. Concepts of critical periods and their relation to Amblyopia and strabismus have not and do not enter my thinking about vision. By tapping the right attentional centers, nearly any behavior can be altered.

CONCLUSION

This paper is an attempt to share with the reader a current level of understanding that guides me in the diagnosis and treatment of patients using behavioral concepts of optometry. It is hoped that this paper stimulates more questions in the reader than are answered and that it provides the reader with some food for thought. I welcome the opportunity to discuss this topic further and invite your comments.

ACKNOWLEDGEMENTS

I would like to recognize the significant influence of the following individuals in my growth and development: Dr. Bernard Saltysiak, Dr. Don Getz, Dr. Robert Kraskin, Dr. Paul Lewis, Dr. Elliot Forest, Dr. John Streff, Dr. Bruce Wolf, and Dr. Harry Wachs, to name only a few. To them, and to those that I have not mentioned, thank you.