

Article ▶ Space Orientation Mechanism

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Space orientation is an integrated phenomenon arising from a variety of components and is much more than visual perception of objects and their locations.

That human body has specific orientation components that permit an organism to feel where it is in relation to objects in the surrounds, to determine where the objects are, if they are moving, their rate of speed and direction. Even blind persons develop space orientation as they move, walk, turn and reach. They have organized their sensors and their motor responses to meet their situation. Eye-hand or eye-foot coordination is a phase of space orientation.

The continuing ability of an organism to spatially orient itself in relation to its environment is a basic requirement for survival. The difficulties that arise from disorientation are twofold. The Organism is unable to deal effectively with the physical environment because of the general inaccuracy in motor activity and, in addition, to the physical aspects there are present the mental characteristics of Stress. Because their space world is disturbed, the organism is confronted with this distressingly difficult situation so, characteristically, they seek help. It is not unusual to have the pressing complaint be "I have dizzy spells," "things get blurred," "I think I am having trouble with my eyes," or "I am having headaches."

The exact sensations are difficult to explain, in fact they may be difficult to recall with preciseness because often the symptoms have come without warning or apparent cause and because they may be bizarre. Many symptoms may be sufficiently traumatic that the patient becomes emotionally upset and/or extremely frightened. S. Howard Bentley's often-quoted statement relative to ocular discomfort is pertinent here. He said, "Ocular discomfort usually is localized in the eye or head region, but may be much more diffuse." Skeffington has frequently stated that "he who is unstable in visual space is insecure in his own ego." Skeffington has also put himself on record as stating that a "blur" is a lessening or decrease in information processing and is NOT on the retina. With that as a basic definition, we offer the suggestions that any blurring, whatever its cause, could indicate a loss of some magnitude of information processing.

It is this aspect of a visual problem, the visual manifestation and space perception, that we plan to explore in this paper. To do this I must include the eyes, all the proprioceptive end-organs and kinesthesia, and vestibular apparatus and vascular system. The upper spinal circulatory mechanisms are essential to the processes of vision and emergent, by which the organism can continue to process information. This functioning is adversely affected by any interference with the blood supply to the brain.

D. B. Harmon has stressed the conformation of the vertebral column, particularly the cervical vertebrae, because of its intimate association with vision. He has demonstrated the cervical vertebrae with the structural arrangement of the arteries and veins and the spinal cord. Particular emphasis was given [to] the arrangement of the arteries and veins as they approach and enter the foramen magnum of the skull. Harmon noted a relation of this area to eye preference and total body performance.

From the evidence of recent research as well as from patients' reports there has come an increased awareness of the importance of the anti-gravitational mechanisms in the total proprioceptive-kinesthetic patterning of the soma in space orientation. Event changes in the pressure on one's feet notify the organism whether an elevator is going up or down.

It may be pertinent at this time to draw attention to the various processes and mechanisms essential in space orientation. The subject is so complex that confusion in diagnosis can occur, which could affect the prognosis and methodological approach to what may have seemed to be an apparent "visual problem." So great is the importance being attached to these developing aspects of the visual system that there is a tendency to ascribe developing refractive status irregularities to these difficulties in synthesizing or matching the patterning from ocular sensing processes with those of the total antigravity organization.

The alignment of the eyes upon some object in the immediate environment provides information for judging the position of the visually fixated object in relation to the body. Vision, the emergent, with all that that term means, provides important cues as to the relationships which objects bear with other objects in the environment and the environment to the person, thus vision is an important basic component of total body orientation as well as a means of discriminating an object in space.

The adjustments that the ciliary muscle makes on the curvature of the lens of the eye [are] important in the computations of the distance of the visually fixated object. We assume that the ciliary muscle has sensors which potentially can help in the judgment of distance of objects from the human eye. There is supporting scientific evidence that the extra-ocular muscles have such sensors which serve to provide subconscious sensations which are integrated in the higher nervous centers. This facet of the subject of space orientation is so familiar that other than mentioning these sensors, the major emphasis will be devoted to proprioception and kinesthesia, with special emphasis on the vestibular apparatus as it is involved in this topic.

In this conference, devoted to visual training, there is always a full inclusion of visually guided activities all depending upon the response to gravity. Gravity is the constant force pulling vertically downward. Whenever the response with gravity can produce a desired movement, we soon learn, in the interest of muscular economy, to let the muscles relax and allow gravity to do the work.

The inquiring scientific mind has always been attracted to human movement, with attempts to understand, analyze, and teach movement skills to others. Greek philosophers believed in the unity of body and mind, even noted and wrote about such commonplace activities as walking. Present day emphasis is on general efficiency and reduction of energy expenditure and rehabilitation. C. Judson Herrick write that "Motility is the seedbed of [the] mind."

The movements of the spine are the result of motion between the articular facets; some glide between the bodies of the vertebrae and compress the intervertebral discs. The movement between any two vertebrae is very slight, but summations of all give the apparent flexibility. The articular facets of the cervical vertebrae are small; the plane between their surface lies approximately horizontally. Movement is more or less free in all directions, so the head can rock and rotate freely, or the movement can be distributed farther down the cervical vertebrae.

The normal functions of the muscular system depend upon the normal functioning of all other systems of the body. The strength of the muscular contraction depends upon the strength of the stimulus. The coordination of muscle groups depends upon the proper sorting of stimuli, central and peripheral, motor and sensory.

The Nervous System is the communication system of the body. It is imperative that we recognize the totality of the body receptors in total body orientation. Stimuli affect the nervous system through the various receptors. If the source is outside they are called "exteroceptors;" if the source is inside, "Interoceptors." The neural basis of muscle sensations is the Proprioceptors. The total is intimately associated with the autonomic nervous system. Tactile receptors also play a role. Joint receptors are important. The muscle, tendon, and joint receptors signal the length and tension of the muscles of the limbs and the limb orientation. The labyrinth of the inner ear is situated far from the motor mechanism but is another source of movement sensation. Any interference in any of these results in a disorientation, principally of the local structure in which the receptor is situated. A general body disorientation occurs when the neck or vestibular receptors are damaged. Any disturbance in these complex interrelationships alerts the organism that all is not well, that survival may be threatened. They seek help. They may complain of headaches, blurring, or they or their environment may seem to be spinning. The general insecurity is of course distressing.

When space orientation is jeopardized, the organism characteristically responds in some manner, sometimes the

response is adverse. They may arise from bed too quickly, black out, and the next moment find their limbs do not support them. They may fall in a dead faint, fracture a bone as they fall, or may be so dizzy that they wildly attempt to catch up with the "runaway bed" that keeps whirling out of reach. As we said before, Skeffington has frequently stated that "he who is unstable in visual space is insecure in his own ego." It is not surprising that such an individual is frightened and becomes emotionally upset, seeks help. The patient's report may well be that of "dizzy spells." The doctor may note it on the record as "vertigo." It may well be time to differentiate these — dizziness can be defined as "light headedness, unsteadiness, confusion, faintness, giddiness, feelings of unreality." Dizziness most commonly is caused by some circulatory or vascular problem of the central Nervous System. It may be severe enough to cause unconsciousness. It can be of a psychoneurotic origin. Dizziness could be the result of disturbed circulation in the brain resulting from structural damage to the cervical vertebrae as by arthritis, or as from "whip lash" accident. More and more frequently, we see individuals wearing collars to support the weight of the head because the individual has had the misfortune to damage the cervical vertebrae in an automobile accident. Young children, after whirling round and round, become "dizzy," may even fall down. Skaters, dancers, trampolinists, even swimmers may have dizzy spells similar to seasickness or the over indulgence in alcohol. Because of the intimate relationships of such a wide variety of organs and systems, 'dizzy spells' and vertiginous episodes are difficult to diagnose.

Vertigo is the more serious manifestation. Vertigo is an hallucination of motion. It is an objective vertigo when the patient has the sensation of being stationary while the room seems to be spinning around him. It is a subjective vertigo when the patient himself seems to be spinning and tumbling yet the environment seems stationary.

The system most commonly involved in vertigo is the vestibular apparatus. Since Dorland's Medical Dictionary lists 41 different causes of vertigo, it is obvious that no attempt will be made to discuss each. An attempt will be made to consider those conditions particularly pertinent to those interested in visual training. It is my wish in this paper to mention some anatomical relationships that may account for this presenting symptom.

All the vestibular structures are encased within hollowed-out bony canals in the temporal bones. These bony canals are considerably larger than their membranous contents, the ducts, and are identically designed. Unlike the eyeballs, part of which is exposed to the outer world, the vestibular structures of the inner ear or labyrinth, lie completely imbedded in and sheltered by the temporal bones. Sheltered as they are, still the labyrinth or inner ear is vulnerable to fracture of the temporal bones or to infection in nearby structures, including the middle ear and meninges, as well as to blood-borne toxins.

In considering this topic, note the differentiation made in the terms “canals” and “ducts.” The bony canals of each of the vestibular structures connect with an enlarged area, the vestibule. Each canal is lined with a thin, fibrous membrane enclosing the “perilymph” which acts as a hydraulic shock absorber for the ducts. The duct walls are composed of three layers, an outer fibrous layer containing blood vessels, a middle homogeneous basilar membrane, and an inner layer of epithelial cells. The ducts occupy only about one-fourth of the area of the canals. Within the ducts is the endolymph.

The endolymph of the ducts is continuous throughout the cochlear and vestibular portions of the labyrinth or inner ear. The endolymph of the ducts and the perilymph which surrounds the ducts have disproportionate sodium and potassium ratios. This normal chemical dissimilarity between these fluids may explain some of the disorders of the vestibular system. The direct continuity of the endolymph in the ducts explains the usual association of the symptoms in Meniere’s Disease (so commonly associated with vertigo) and which is also known as “endolymphatic Hydrops” because of an unexplained increase in the endolymph. In Meniere’s disease, the endolymph may accumulate in such quantity as to almost obliterate the surrounding perilymphatic space. This increase in endolymph causes the abnormal pressure on the hair cells in the cochlear duct and is doubtless responsible for the associated tinnitus and progressive loss of hearing. Pressure on the hair cells of the labyrinth is responsible for the vertigo.

The labyrinth or inner ear portion of the vestibular system consists of two intercommunicating systems: 1) the anterior and 2) the posterior. The Anterior Labyrinth consists of the cochlea with its two and one half turns, which houses the hair cells concerned with hearing. The Posterior Labyrinth is concerned with equilibrium and motion. It is made up of two tiny chambers with the smaller ‘Saccules’ and the larger ‘Utricles.’ The Saccules probably are not associated with movement sensation. They communicate with the Utricles and the cochlear ducts of the auditory apparatus by small ducts.

The larger Utricle, which connects the ends of the three semicircular ducts, contains neuroreceptors. The three bony semicircular canals, which house their three membranous semicircular ducts, open off the Utricle, in a half loop form. These lie at right angles to each other, like the primary planes of the body. Each describes about two-thirds of a circle lying at right angles to each other like the three sides of a cube that come together at one corner of the cube. Each semicircular duct, just before it communicates with the Utricle, ends in a widened area, the Ampulla. Each of the three Ampullae contain a septum of “Cristae” which is ideally placed to detect movement or pressure changes in the endolymph. They extend into the Ampullae like a dam, to intercept changes in “flow” of the endolymph. As the head is moved quickly, the endolymph in the semicircular ducts flows through them just as water in a dish spills because it does not move as the dish is moved. The

movement of the endolymph provides a source of information regarding the angular acceleration of the head and body.

In the lining of the Utricles are sensory cells similar to those of the Ampullae. Gravitational pull affects the thin calcium concretions in them, known as “Otoliths,” which provide information relative to static position and linear acceleration. These receptors are connected to the Central Nervous System by the vestibular nerve. Fibers terminate in a specific vestibular area near the junction of the pons and medulla. Other fibers connect neurons going to other parts of the Medulla and Cerebellum. It is these portions of the hindbrain that control equilibrium reflexively through appropriate facilitation and inhibition from efferent neurons leaving the Pons and Medulla.

The nervous pathway connecting the vestibular structures with the nuclei of the extrinsic eye muscles explains the occurrence of Nystagmus. Pressure changes in the endolymph result in neural impulses in the vestibular tracts, which have a wide distribution within the brain. Impulses reach the nuclei of the nerves to the eye and neck and head muscles, [and] even involve neurons of muscles of the body and its extremities.

The connections with the peripheral musculature explain why a person who has an hallucination of motion produced by a defective vestibular apparatus may be unable to sit or walk, must lie down quietly with his head fixed, or when reflexively seeking to correct for the imagined change in position, may take a false step which lands him on his back. Such inappropriate behavior may cause him to twist his steering wheel, head his car into an oncoming stream of traffic. For this reason it is important that such a patient should not drive motor vehicles.

Neural connections also exist with the autonomic system, which accounts for the perspiration, nausea, vomiting that commonly accompanies attacks of vertigo.

Tinnitus is usually a minor annoyance which is often ignored and may not be mentioned unless the patient is specifically questioned about it. The type of noise in Tinnitus is highly variable. Usually it is described as a low-pitched roaring or rumbling (like ocean surf) or it may be a high-pitched whistling or hissing. Tinnitus may precede the first attack of vertigo by weeks or months, or it may be noticed only during the acute attack of vertigo, or it may be a part of a preceding feeling of “fullness in the ear.” It usually becomes constant but may increase in intensity during the attacks.

This paper is primarily based on the many factors of space orientation and some of the causes of disorientation. The most dramatic manifestation of disturbed space orientation is the hallucination of motion and rotation called vertigo. Vertigo is a prominent symptom of Meniere’s disease, the vertiginous attacks of which may last minutes to hours but always subside and recur. They do not threaten survival although they do frighten and emotionally disturb the patient. Meniere’s disease is usually unilateral. The increase in endolymph may rupture the over-distended labyrinthine walls. Healing permits another slow reaccumulation and distention, with recurring ruptures

and symptoms. Because of the continuity of the ducts of the vestibular apparatus, the Cochlea is damaged. Hearing deficits are taking place on that side, may in fact even precede the vertigo by many months. The hearing loss, which is so characteristic in this disease, may not be noticed at first because hearing is bilateral. It is characteristic for increasing hearing loss with each attack of vertigo.

Cochlear damage may be tested in the office by:

- Watch tick test to each ear
- Whisper in one ear; the affected ear may not hear the whisper at all
- If talk is a little louder than usual in that ear, the patient may find it painful

The affected ear may have distortions of speech and music reception. The tone of the turning fork may seem different in each ear. There may be an actual distortion of the sounds on the side of the affected ear.

Among the many causes of Vertigo and dizziness are Episodic vertigo, positional vertigo, and vertigoes caused by vascular disorders. These may be difficult to differentiate because they are so closely related.

Episodic Vertigo may be caused by the interference in the flow of blood through the vertebro-basilar arterial circulation. A bony outgrowth of the Axis, where the artery turns sharply to reach the Foramen of the Atlas and from there into the skull via the Foramen Magnum, can embarrass the circulation. Rotation of the neck even in "normal" subjects can impair or even abolish the intra-cranial circulation from the contralateral vertebral artery. If the vessels on one side happen to be larger, it can reduce the circulation and cause orthostatic hypotension on one side. If the situation is corrected immediately, it results in a brief moment of more or less severe vertigo or a sense of fullness in the ear or perhaps discomfort or headaches. It is to be expected that it will be associated with a sensation of uncertainty, insecurity in the manipulation of one's space world, consequently ego damage.

Vascular disorder of the central nervous system usually produces symptoms described as "faintness, light-headedness, giddiness, feeling of unreality," or even unconsciousness.

Because of the relatively long intracranial course of the vestibular nerve and vessels, with their many inter-communications, vertigo may be caused by a wide variety of conditions – vascular, degenerative, neoplastic. Listed in the vascular disorders are spasmodic, thrombotic, hemorrhagic, aneurysmic. These usually produce symptoms described as "faintness," etc. Only when true vertigo occurs with the sensation of rotation is the vestibular tract probably involved. Vertigo having a vascular cause is much more likely to be due to the vertebral-basilar system than to the carotid supply. Any angiographic study in cases of vertigo must therefore include the vertebrae. Since the vertebral arteries pass upward thru the Transverse Foramina of the cervical vertebrae, they are subject to pressure of osteoarthritis spurs and other vertebral abnormalities and injuries. Arteriosclerotic changes

may compromise the lumen of these vessels and make them vulnerable to such postural changes as simply turning the head. In old people, suspect vertebral artery involvement if the vertiginous attack is initiated by turning the head but not if there is a similar quick turning of the whole body while the neck is held rigid.

Senescent Positional Vertigo is caused by a disturbance in circulation as by the occlusion of the anterior vestibular artery. In the benign paroxysmal type, it may do little more than cause a momentary dizziness or blurring. It may seem to have an obvious cause but is usually associated with some specific movement. Involved with this may be major histologic features such as degeneration of the Utricle, Superior, and horizontal canal Cristae, with preservation of the posterior canal Cristae.

Positional Vertigo occurs when the head is turned in a particular manner or assumes a certain "critical" position. It may come when a patient lies down, or when [he] turns in bed, or when the head is turned quickly to the right or left, or when tilting the head to look back or look upward. Each of these positions is essential in piloting a car in traffic. It is not necessarily limited to the aged. Aviators are known to be so afflicted and find flying in formation very difficult and hazardous for their group. Football players have been so involved and can only play successfully when on one side of the field. Individuals so involved learn from experience that it is expedient to sit next to a wall so they will not inadvertently move the head in the wrong direction. The immobilization of the head and neck can reflexly disturb their normal cervical functions and increase their difficulty in interpreting their visual space world. Visual field studies of these individuals may prove completely negative, no stress is being imposed upon the neck, and no disturbance is occurring in the circulation. Such an individual may profit by visual training which establishes adequate fusional range without involving their peculiar anatomical handicap. One such individual was able to move around without staggering after sitting quietly, studying stereoscopic pictures.

Positional vertigoes may occur in a wide variety of lesions of central or peripheral origin. Among the central lesions most commonly involved are brain tumors, degenerative neurological diseases, drug intoxications. Among the peripheral lesions must be included Otitis Media, Labyrinthitis, vascular insufficiency of the Labyrinth, trauma of the ear secondary to accident, or ontological surgery.

Some neurological signs stemming from inadequacy of blood flow through the branches of the vertebro-basilar system are such visual disturbances as: episodes of "spots in front of the eyes," the appearance of brilliantly colored shimmering spectral lights (Trichopsia), and Scotoma with a homonymous distribution indicative of an excitation then an inhibition of the visual cortex; diplopia; intermittent blurring of vision for which no peripheral cause can be discovered. There may be attacks of headache, often severe, usually occipital and bilateral, sometimes frontal, often called migraine.

Episodic tingling in the face (trigeminal) discomfort, even pain, in and around the ear (glossopharyngeal) transient dysphagia; parathesia and weakness of arms; unaccountable dropping of objects; weakness of legs with frequent stumbling and uncertainty of gait [sic]. Consciousness may be clouded and/or even loss of consciousness. (Meniere's never does). Nystagmus is seldom elicited. Inadequacy of blood flow through the branches of the vertebro-basilar system usually does not disturb hearing unless presbycusis [exists].

Transient graying or dimming of vision may be such short duration it may be ignored but is a symptom of episodic cerebral ischemia. If the episode of bilateral visual blurring lasts a minute or more, the patient is alarmed, although the loss of acuity is rarely absolute. When the episode lasts an hour or more, it is due to a vascular occlusion and leaves a homonymous visual field defect.

Episodes of bilateral blurring of vision produced by vertebrobasilar insufficiencies are distinguished from monocular blackouts associated with carotid artery insufficiency and from the binocular blurring associated with papilledema or true migraine. Repetitive attacks usually follow the same pattern, generally are corrected before irreparable damage to the nervous system tissue occurs. If they last five minutes or less, there may be an associated facial numbness.

Insufficiency of bloodflow to the visual cortex may occur from fluctuations in bloodflow through the vertebral or basilar arteries; congenitally there can be variations in collateral blood vessels, some channels can bypass severe or total occlusion of the vertebro-basilar system.

Intermittency may be due to local changes in the demand for oxygen by the cortex. Cardiac output can compromise an already precarious cerebral blood supply. Microemboli can penetrate into and temporarily occlude the terminal arterioles of the visual cortex as well as the retina. Atheromatous plaques in the vertebral artery may serve as a nidus for the formation of fibrin-platelet microemboli.

This is a very condensed outline or description of some of the mechanisms involved in Vision the Emergent. Effort was made to emphasize the widespread association [between] central and peripheral, sensory and motor, that affect the functioning of the soma, the effectiveness of which is intimately related to thought processes and ego stability.

The subject of Space Orientation, the mechanisms of achieving it, some of the pathological changes that can disturb orientation, have been presented. An interference in any of these mechanisms contaminates the whole, results in deterioration of Information Processing. Vision IS Information Processing. Kurt Goldstein, in his book *The Organism*, stated that an impairment in one area of performance spreads to the total performance. Vision is the DOING of something. C. Judson Herrick stated "Motility is the seedbed of Mind." Ward Halstead stated "Vision and Intelligence are one and the same thing." These familiar statements considered in the light of the material presented carry more meaning. Any interference in

any mechanism, however seemingly remote, contaminates the whole, thus reducing Information Processing.

It had been stated that a person's perception of his position in space and his space orientation depends upon the instant integration of impulses received from the eyes, and with the various sensors throughout the body that are specifically involved in the response to gravity.

Emphasis was given [to] the mechanism of the vestibular apparatus, its anatomy, physiology, and pathology. The relation of the neck structures was considered. The possibility of bone changes and maladaptions disturbing circulation and interfering with the biochemistry of Information Processing was mentioned. The importance of proper posture or postural adaptions to relieve symptoms was noted.

The close interrelationships of all these functions was shown by the widespread effects involved in the phenomenon known as "Vertigo," with its hallucinations of movement. The vertigo associated with Meniere's disease was mentioned and brief reference made to some of the other vertigos.

Functional interrelationships were also stated in the possibility of adverse reflex responses that cause the collapse of the joints, with possibility of fractures, and related trauma. The involvement of the autonomic nervous system was indicated by the pallor, nausea, vomiting so often associated with disturbances of space orientation. The inappropriate judgment of spatial relationships which causes gait changes and dropping of objects is involved in space disorientation. Hearing fictitious noises, as in Tinnitus, is an inappropriate interpretation of spatial content. Reduced hearing, particularly unilateral, can be the result of increased endolymphatic pressures. Some simple tests for hearing were suggested. Emphasis was given [to] the mechanisms of the vestibular apparatus, its anatomy and physiology, as these are specifically related to space distortions and functions. The symptom of blurred vision with some of its causes was noted. The etiology of this phenomenon is varied. Surveys of the literature concerning it are disappointing, yet it is a common complaint, difficult to diagnose and may be the reason for profitless references. "Blurring" in the context of this paper is not correctable by any lens combination. It is a gray haze over everything. May be unilateral, not infrequently may involve alternate eyes, the uninvolved eye continuing to see adequately. The impenetrable uniform haze of the involved eye can so disturb stereoscopic space sense that the operation of a moving vehicle can be dangerous. Skeffington has often stated that the "Blur is IN you, is NOT on the retina." Borrowing Ronchi's statement of "Putting the Effigy out there," this individual's effigy is reduced in efficiency, inadequate and contrary to the way the individual has learned to know his visual space really to be. He seeks help because of it.

The computation of the Space orientation is so affected that some individuals have found it necessary to drive to the

side of the road to allow the first severe effects to subside enough to make cautious driving safe.

These particularly troublesome episodes of lowered acuity are usually associated with exertion and circulatory disturbances. One such case had been studied neurologically with a multitude of tests requiring days of hospitalization and much discomfort. The tests proved negative, the blame was put on the patient. The symptoms were labeled psychogenic. Another doctor inquired about a history of whiplash accident. "Oh yes, I've had several such accidents." She was past middle age, the cervical vertebrae were damaged, resulted in restricted blood supply to the intracranial contents. This was sufficient cause for her symptoms, but added to this was her demanding job with a complaining aged mother. It was more than the organism could handle; something had to "give;" her internist put her on a tranquilizer. It was a wise therapeutic measure, her response was dramatic. Rest, more than is ordinarily deemed necessary, is frequently a solution to such problems for it serves to relieve disturbed alignment, permits resumption of adequate circulation. Visual training, properly planned could be an excellent adjunct therapy.

One case, a young mother complaining of headaches and backaches and allergies asked to have visual training. While she was being examined, one eye became hopelessly blurred. No lens combination helped. The doctor reached around, touched the base of the skull on the side of the affected eye: "Ouch, I did not know it was sore." Specific inquiry was made concerning her back. She had fallen down a flight of stairs while holding her baby in her arms. This fall resulted in a lifetime of pain. The result of the accident and the severe allergy was limiting the blood supply to the visual centers. Until these other matters could be cared for, the prognosis was too guarded to consider [her] a proper candidate for visual training.

Some cases were presented in a previous paper. One was K. W., whose presenting request was "please remove my right eye." The pain was intolerable. By using the String, by means of which he could check and correct his misperformances, his problems were eliminated. Another was E. H., who was so disturbed by her incapacity to manipulate her Visual Space that she could not work, could not go down a flight of steps without holding onto her husband's shoulder as he preceded her. She had vertigo, she had dizziness, she had blurring. She had had many lens combinations, but her visual training was the solution. She returns occasionally for "refresher courses,"

she is comfortable and can now work. There was nothing in the case history that precluded the utilization of visual training. Structurally, all was well; functionally, she was misperforming. She learned to perform properly, the general efficiency level improved; a happy conclusion to the case.

It is obvious that candidates for Visual Training should not be accepted without careful screening. The complexities of the visual processes require broad understanding. To give assistance to an individual with space disorientation, many tests will [be] required, some are as simple as the watch test to each side; some require the painful and expensive tests of neurologists and otologists. Some patients have already had such tests without benefit. They still experience space disorientation, they have lost confidence in all therapeutic approaches, and what is worse, have lost confidence in themselves, for "He who is insecure in his visual is insecure in his own ego."

Visual Training, as such, may not suffice to relieve all symptoms, but when carefully planned, characteristically can do no harm and usually proves beneficial to some degree. In many cases, the individual is sufficiently benefitted that he can resume his normal activities.

The experience of Space disorientation can be sufficiently frightening and traumatizing to the Ego that this individual tends to accept the fact that he must limit stressful activities, get more than the usual amount of rest, establish new and often superior ways of living. This world is in need of mature individuals whose physical activities must be restricted but whose mental activities are available and can be enhanced.

Visual Training makes proper functioning of the complex visual processes possible and as such deserves recognition as a therapeutic device. When dealing with the human organism always remember never to say "always" or "never."

It would be unwise to assume that visual training can care for all problems of space disorientation, but those who have the essential skills needed to prescribe visual training are also expected to be wise enough to recognize severe pathology and to refer such a case for consultation before attempting any training.

The proportion of individuals with pathological damage is small. Therefore use your body of knowledge to the great benefit of the majority who have Space disorientation without pathology.