

# Article ▶ The Use of Stress Reduction Concepts and Techniques in Vision Therapy

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## ABSTRACT

Stress reduction procedures may aid in the prevention and remediation of nearpoint stress-induced vision disorders and the reduction of symptoms associated with such disorders. A variety of relaxation procedures may be used to supplement conventional vision therapy in order to reduce stress activation while performing near work and during general daily function. Relaxation procedures may also facilitate the development of base-in fusional vergence.

**Keywords:** asthenopia, breathing, meditation, near-point stress, peripheral awareness, relaxation, stress reduction, visual hygiene, visual imagery

Skeffington<sup>1</sup> postulated that the “socially compulsive, near-centered visual tasks” common to our society provoke a stress reaction characterized by a drive for convergence to localize closer than accommodation. These near work tasks serve as stressors because, according to Skeffington, in contrast to biologic tasks, they require sustained concentration, immobilization for prolonged periods, and information-processing through symbols in a two-dimensional setting. Skeffington devoted scant attention to the mechanisms involved in this stress response. He indicated that the drive for convergence to localize closer might arise from visceral (autonomic) dominance during near work; that convergence is a faster acting system than accommodation; and that accommodation is ill-suited for the extensive near work imposed by our culture and hence lags.

Failure to resolve the effector system mismatch generated by nearpoint stress leads, according to Skeffington, to discomfort, inefficiency or avoidance of near work. He indicates that various skews in refraction (particularly myopia), accommodative and vergence function arise adaptively in the effort to resolve the nearpoint stress-induced drive for convergence to localize closer than accommodation.

Birnbaum<sup>2</sup> proposed a physiological mechanism for nearpoint stress based on autonomic arousal and physiological stress reactivity. Reading imposes demands for vigilant attention and mental effort which generate sympathetic arousal and a consequent shift of accommodation toward far. During reading, heightened parasympathetic innervation is thus required to overcome the sympathetic-induced shift of accommodation toward far; this increase in accommodative innervational effort generates increased accommodative convergence and is the source of the drive postulated by Skeffington for convergence to localize closer than accommodation.

Sympathetic activation (and consequent effector system mismatch) induced by attention and mental effort while reading is increased, according to Birnbaum, by psychologic stress. The “fight or flight” response, activation of the sympathetic nervous

system to facilitate action in response to biologic stressors, is induced by psychologic stress as well. Hence, Birnbaum suggests, the psychologic stress which pervades our society may compound the nearpoint stress response, especially when individuals are highly stress-reactive or read under conditions of psychologic stress.

Forrest<sup>3</sup> suggests that psychological factors not only contribute, but are in fact the primary determinants of the nearpoint stress response. One’s underlying belief systems and attitudes towards the nearpoint task and towards life itself, one’s cognitive-perceptual style, and one’s central-peripheral organization each influence the nearpoint stress response. Individuals who resist life as it is, who feel vulnerable and experience self-doubt and lowered self-esteem, who feel helpless and unable to control the events in their lives, who perceive themselves as being against the world rather than simply in harmony with life’s flow, are more likely to experience stress. Resisting a nearpoint visual task increases the stress response, while psychologic acceptance makes the task less stressful, and enjoying the task is even less stressful.

Individuals who are intense, rigid, and analytical tend to engage diligently in a task with strong concentration and drive for achievement. Such individuals tend to emphasize focal (central) vision with decreased peripheral awareness. Excluding periphery tends to facilitate concentration and reasoning, but is associated with increased expenditure of attentional energy. Hence increased focal attention with decreased peripheral awareness increases the stress response, and intense, analytic, highly focal individuals are more prone to develop stress-induced vision disorders.<sup>3</sup>

In the Skeffington model, low plus lenses are advocated for near use to resolve the effector system mismatch generated by nearpoint stress. Vision therapy is used to remediate vergence and accommodative dysfunction, develop flexibility between the vergence and accommodative systems, and foster acceptance of plus lenses when necessary.

If the nearpoint stress response is exacerbated by intense application, attitude towards the task, general psychologic stress

and tension, then procedures which decrease stress reactivity may aid in the prevention and remediation of nearpoint stress-induced vision disorders, and in the reduction of symptoms associated with such disorders. I have explored the utilization of stress reduction procedures in three ways:

1. As an aid in the development of base-in fusional vergence;
2. In the use of visual hygiene procedures to reduce intensity of application and stress reactivity while reading or performing near work;
3. To reduce stress activation during general daily function.

### **Developing Base-in Fusion**

Since a hypothesized drive for convergence to localize nearer than accommodation is a key element of the nearpoint stress model,<sup>1,2</sup> developing base-in fusional vergence is an important aspect of vision therapy in nearpoint stress-induced vision disorders. Base-in fusional vergence is more resistant to modification than is base-out vergence.<sup>4,5</sup> This may result from fundamental differences in the physiology of these systems, or may simply reflect a tendency for convergence to localize closer than accommodation during tasks requiring vigilant attention and mental effort, so that base-in vergence is more difficult under such conditions.

Relaxation procedures can facilitate the development of base-in vergence. Instructing the patient to physically relax; to reduce tension the shoulders, upper back, neck and jaw; to breathe deeply; to smile; and to “look easy” often aid the patient to localize vergence beyond the plane of regard. Peripheral awareness similarly fosters a passive, more relaxed, less intense, “easier” looking which is often helpful.<sup>6</sup> The mechanism by which these procedures facilitate increased base-in vergence may relate to induction of the relaxation response. This is a physiological counterstress response in which sympathetic activation is reduced during states of passive concentration and reduced inner verbalization.<sup>7</sup>

Since a drive towards overconvergence is attributed to sympathetic activation induced by task demands and psychologic factors,<sup>2</sup> relaxation procedures which reduce sympathetic activation may be expected to increase base-in vergence.

Imagery procedures in which the patient visualizes near or distant objects have been used to develop convergence and divergence abilities, respectively.<sup>8</sup> I have found that an imagery procedure which combines relaxation with the visualization of distant objects is often effective in expanding base-in vergence.<sup>6</sup> The patient is seated in front of an instrument such as the Aperture Rule (Bernell Corp., South Bend, Indiana). The target is set at a base-in level just beyond that which he can achieve. The patient is asked to visualize a large wilderness lake, miles long, on a bright, sunny day; to see the ripples on the water and the sun glistening and reflecting off the ripples; to picture himself sitting in a clearing on one side of the lake

and to physically relax, to feel the warmth of the sun on his body and to be aware of relaxation beginning in the feet and moving up through the body, letting the feet, legs, body, shoulders, arms, hands, neck, jaw, and eyes relax; to look out across the lake at the mountains, trees, or sailboats miles away on the far side of the lake; and to keep the feeling of looking far away, miles across the lake, when he opens his eyes. Many patients achieve greater base-in vergence immediately upon opening their eyes. Visualization of a far away object facilitates the process of looking beyond the plane of regard, which is fundamental to base-in vergence.

The terms “visualization” and “visual memory” are commonly used to describe higher-level aspects of visual information processing. Forrest<sup>9</sup> points out that these terms are used differently by various authors and clinicians to represent diverse functions and approaches to information processing. He uses the term “visual imagery” to refer to “a very specific form of visual information processing, the internal ‘seeing’ of true images.” Forrest indicates that visual imagery is the key element which underlies visualization, visual memory, and visual information processing.

Forrest<sup>9</sup> indicates that visual imagery ability is frequently poor in individuals who are tense and in those who are highly logic oriented. Such individuals commonly demonstrate restricted base-in vergence. When visual imagery ability is weak or underutilized, therapy to develop visual imagery ability is prerequisite to the use of visualization to build base-in fusional vergence.

This author has found that visual imagery and relaxation procedures which are useful in facilitating the development of base-in fusional vergence are also helpful in enhancing accommodative relaxation and plus lens acceptance.

### **Reducing Attentional Intensity**

Many individuals apply themselves to near work with great intensity. Such individuals read with extreme concentration, attending strongly to the nearpoint task and excluding the background from awareness. Strong concentration and restricted peripheral awareness are accompanied by increased muscular tension. Intense concentration requires considerable energy expenditure and exacerbates sympathetic activation.<sup>3</sup>

Guidance regarding appropriate visual hygiene to reduce intensity during near tasks may serve to reduce nearpoint stress.<sup>10</sup> Intense concentration is associated with increased muscular tension. Reducing such tension while reading fosters a more relaxed approach, with reduced sympathetic activation.

Harmon<sup>11</sup> describes a physiologically optimal posture for near work. He indicates that muscular tension and physiological activation are at a minimum when near work is inclined at 20° from the horizontal and when the distance from eye to task is equal to the distance from the point of the elbow to the second knuckle of the middle finger.

To facilitate the maintenance of an appropriate working distance and to minimize muscular tension, patients are

counseled to work in a comfortable chair at a height which permits both feet to rest comfortably on the floor, to work at a desk which is appropriately sized to permit a proper working distance, and to arrange lighting which is adequate and glare-free. When reading, the book should be inclined at 20° from the horizontal to minimize muscular tension. When writing, a tilt-top desk inclined 20° from horizontal will similarly permit task performance with minimum tension.<sup>10-12</sup>

Intense individuals frequently tend to pull reading material very close. Such patients should be advised to read in a relaxed posture and to hold reading material at the physiologically optimal reading distance described by Harmon.<sup>11</sup> The recommendation to maintain a longer working distance is designed to promote general relaxation and reduced intensity of application, not simply to reduce accommodative demand.

The patient is advised, when he sits down to read, to assume a comfortable, relaxed posture, to be aware of any muscular tension in the body and to relax, to breathe deeply, smile, and maintain general awareness of the surround. This attitude promotes a more relaxed style of visual use. The patient is encouraged to notice, once he begins to read, if he begins to tense or tighten up, and in such event, to relax, smile, breathe, and regain passive awareness of the periphery. The patient is more likely to be aware of bodily tension while reading, and be able to reduce it, if he has previously been introduced to and experienced breathing, progressive relaxation, and peripheral awareness procedures. Such procedures are used to facilitate awareness of tension and enhance ability to maintain passive concentration with reduced attentional intensity. They will be described in the next section (“Procedures to Reduce General Stress”).

Patients who read intensely are further advised to look at a distant object momentarily at the end of each page, while turning the page, and to get up and walk about for a moment after 10 or 15 minutes of near work. Such measures, which have been commonly recommended to relax accommodation and prevent spasm, often serve to reduce nearpoint asthenopia. The effectiveness of these procedures may relate as much or more to their effect in reducing intensity of application as in their presumed effect upon accommodation.<sup>10</sup>

Movement serves to reduce activation of the sympathetic nervous system. Biologically, sympathetic activation facilitates action as an individual fights or runs from a stressor agent. When this movement relieves the stress, sympathetic activation subsides. However, much of the stress in our society is psychological. In response to psychological stress one neither fights nor flees, but rather maintains an apparent outward calm. No movement occurs to relieve stress and restore equilibrium. A major value of exercise is its role in stress reduction, as movement reduces the physiological neuroendocrine changes induced by stress.<sup>13</sup>

Since movement reduces stress activation, and since sustained immobilization is itself a source of stress which increases sympathetic activation, moving about during breaks

may serve to reduce physiological stress activation. The patient may be advised to walk about, to do aerobic exercises, or to perform stretches designed to relieve upper body tension for brief periods after 10 to 15 minutes of near work. I have found that such activities often reduce asthenopic symptoms in intense individuals.

These suggestions for reducing excessive attentional intensity during near work can reduce sympathetic activation and nearpoint stress-induced effector system mismatch, with consequent reduction in the need to adapt and in asthenopic symptoms. In my experience, individuals who apply themselves very intensely to near work frequently experience severe asthenopia. Symptoms may be out of proportion to the optometric findings and may persist after appropriate lenses and vision therapy have been applied. Guidance as to reading in proper, relaxed posture with reduced muscular tension, and advice to look up frequently during near work and to take short breaks involving movement, are frequently effective in relieving symptoms.

As a result, such guidance and advice have become an integral part of my treatment approach for patients suspected of extreme intensity in their near work application. These include patients who demonstrate myopia or esophoria at near; patients who hold reading material excessively close, or who work at increasingly close distances as near work proceeds; and patients whose asthenopic symptoms are out of proportion to the optometric findings, or persist after appropriate vision therapy and lens application.

### **Procedures to Reduce General Stress**

Procedures to reduce stress activation may be useful adjuncts to optometric therapy, serving to reduce the visual stress response. Meditation, diaphragmatic breathing, and progressive relaxation are procedures commonly used to teach relaxation and stress reduction.

Meditation has been utilized over the centuries as a means of achieving altered states of awareness, consciousness, and spirituality. Although many different meditation procedures have evolved, most share a number of commonalities. The individual assumes a relaxed posture, breathes deeply, and maintains a state of passive concentration with awareness focused on a meditation object. Depending upon the specific form of meditation, this may be a physical object such as a flickering candle, an image, a word or phrase which is repeated over and over, or one's own breathing. In some forms of meditation, the individual may focus awareness on the entire visible world or on the thoughts and emotions which arise while meditating. During the course of meditation, various thoughts typically intercede and distract awareness from the meditation object. The meditator seeks to notice such distracting thoughts, gently push them away, and return to passive awareness of the meditation object, observing without judging. Meditating on a daily basis leads to an ability to detach oneself from the inner verbalization, distracting thoughts, and judgmental attitudes

which restrict awareness, reduce attention, and exacerbate the stress response in daily life.<sup>14,15</sup>

The physiological stress response is a product of inner verbalization and judgmental attitude towards a stressor object or event, as much as from the object or event itself. The inner verbalization is frequently a means by which we replay and evaluate the events of the day, particularly those which are disturbing. Inner verbalization hence tends to exacerbate the stress response. The regular practice of meditation leads one to be more aware of this inner verbalization and to become a more dispassionate observer of it, maintaining passive awareness and hence greater emotional distance. As a consequence, the meditator is less affected by inner verbalization and is more relaxed, with consequent reduction in physiological stress reactivity.<sup>13-15</sup>

Meditators typically report increased relaxation and awareness with reduced anxiety, stress, and tension. Physiological correlates include a marked reduction in the body's oxygen consumption, lowered heart rate, lowered respiration, decrease in metabolic rate, increase in intensity and frequency of alpha waves in the electroencephalogram (alpha waves are associated with relaxation), and a decrease in blood lactate (lactate is produced by the metabolism of the skeletal muscles and is associated with anxiety states).<sup>16,17</sup>

Benson<sup>7</sup> considers the physiological changes accompanying meditation to constitute an integrated mechanism to reduce stress by means of lowered activity in the sympathetic nervous system. Benson views this "relaxation response" as a mechanism opposite to the "fight or flight" response. He advocates daily use of a meditation technique to elicit the relaxation response and reduce stress. The technique consists simply of sitting quietly and comfortably; relaxing all muscles; breathing through one's nose; on every exhalation, repeating the word "one" to oneself, continuing for 10 to 20 minutes; and maintaining a passive attitude, ignoring distracting thoughts. Benson, a cardiologist, advocates the use of this technique for reducing or preventing high blood pressure and other disorders which may be associated with stress, attitude, and mental state.<sup>7,18</sup>

## Peripheral Awareness

Considerable research documents that narrowing of attention takes place when arousal is high.<sup>19,20</sup> Under stress one constricts peripheral awareness. Maintenance of peripheral awareness requires a relaxed attitude and passive concentration. Hence, procedures which emphasize peripheral awareness can be used to foster relaxation.

Peripheral awareness procedures generally present two barriers to achievement. One is the tendency to over-concentrate on either the central target or the peripheral space volume, so that there is an alternation or sequential awareness. To overcome this, one must achieve a "letting go," a relaxed, passive attention which allows simultaneous awareness to occur. This "passive contemplation" is the state sought for in the meditative disciplines.

The other barrier to achievement in peripheral awareness tasks is the tendency for the mind to wander, for thoughts and daydreams to enter and interfere with spatial awareness. To maintain spatial awareness, one must passively notice that the mind is wandering, and gently return to maintaining spatial awareness. In this regard, peripheral awareness techniques bear much similarity to meditation techniques.<sup>6</sup>

In order to achieve relaxation and reduced stress reactivity, aspects of meditation may be incorporated in peripheral awareness procedures. The incorporation of meditation can lead to greater control over the distracting thoughts which limit awareness, and may be effective in eliciting a physiological relaxation response with reduced sympathetic activation. One example of a procedure which lends itself to peripheral awareness and control of inner verbalization is a thumb rotation in which the patient moves his arm in a circle and follows his thumb visually. Once eye movement ability is satisfactory, the patient is advised that his goal is to maintain simultaneous awareness of the thumb and his surround; that one of the things which will limit his awareness is the stream of thoughts which frequently intrude; and that when this occurs, he is simply to notice it, to gently "push away" the distracting thoughts, and to return to maintaining total spatial awareness.<sup>6</sup>

Once the patient experiences this passive awareness and develops some ability to control inner verbalization, he is asked to use it as a relaxation procedure in everyday seeing. The patient is instructed to create the feeling of "looking easy," physically relaxing, maintaining peripheral awareness and avoiding distracting thoughts many times each day, for a few seconds at a time, regardless of the particular object he is looking at or the task in which he is involved. The patient must remind himself to look passively and expand peripheral awareness frequently, 20 or 30 times daily, and to maintain peripheral awareness for five or six seconds each time, so that a greater awareness of periphery and a more relaxed looking style ultimately become habituated. The patient may find it helpful to use frequently occurring events as triggers to remind him (e.g., relax and expand peripheral awareness each time a commercial is on TV, or each time he stops for a red light).

## Breathing

Abdominal or diaphragmatic breathing is integral to virtually all relaxation procedures. During meditation, or when eliciting the relaxation response, the patient is asked to breathe deeply, to focus on the breath, and to notice and push away distracting thoughts which may intrude.

Diaphragmatic breathing may be used by itself to generate relaxation. The patient, reclining or lying comfortably with eyes closed, inhales deeply and slowly, breathing so deeply that the diaphragm expands and the abdomen rises. The patient then exhales deeply and slowly, expelling as much stale air as possible so as to make room for fresh air on the next inhalation. During each exhalation the patient physically relaxes, releasing

all tension in the body. Awareness is focused on the breath, and distracting thoughts are gently pushed away.<sup>21</sup>

Patients generally report a feeling of greater relaxation following this breathing activity. They may be advised to perform deep breathing for 10 minutes once or twice daily, or to take 10 breaths, count each exhalation, and focus on each breath.

Once a patient learns and experiences relaxation with diaphragmatic breathing, deep breathing can be used to relieve tension in daily life. I have found that whenever one feels stressed, taking two or three deep breaths (while doing whatever one is doing) is frequently sufficient to break the cycle of anxiety and provide immediate relief.

### **Progressive Relaxation**

Progressive relaxation is based on the assumption that it is easier to learn to relax when one is more aware of tension. The patient sits comfortably, and beginning with the toes and moving up through the remainder of the body, alternately tenses and then relaxes each small muscle group. By tensing first and then relaxing, the patient learns to notice muscular tension when it occurs, as well as to release it. Further, in going through the body, the individual notices where he or she is likely to localize tension.<sup>22</sup>

Similar to other relaxation procedures, progressive relaxation should be performed on a daily basis to facilitate awareness of muscular tension and ability to relax. Once one is aware of tension and able to release it, this awareness may be used to facilitate relaxation while performing near work. The patient is asked, when sitting down to read, to assume a comfortable posture and to notice and release any physical tension which is present. As he performs the task, the patient may tense up. He is asked to notice and release any muscular tension which arises as the task is performed.

### **Conclusion**

In this author's experience, stress reduction procedures are a useful adjunct to conventional vision therapy. Procedures which utilize visual imagery, muscular relaxation, and peripheral awareness facilitate the development of base-in fusion and accommodative relaxation abilities. Patients are taught to perform near work tasks under conditions of relative relaxation, so that the nearpoint stress response is reduced. As

a result, patients are less at risk to develop nearpoint stress-induced vision disorders. Asthenopic symptoms associated with tension and intense concentration often diminish markedly.

Stress reduction procedures may be used to reduce physiological stress activation during everyday living. To the extent that heightened stress activation underlies the development of nearpoint stress-induced vision disorders, such procedures may play a significant role not only in the remediation but also in the prevention of such disorders.

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## The Lasting Impact...

Martin H. Birnbaum, OD was an astute clinician, an author, a lecturer, a teacher, an academic, and a man for all seasons within the optometric profession. In his mild-mannered way, he was also a visionary. This article, which was written almost thirty years ago, integrated many different disciplines within the fields of education, psychology, and health care. He was able to see beyond the vertical silo of his optometric education.

Some key points were: 1) his ability to propose a physiological mechanism for the nearpoint stress model that had been proposed by Skeffington, 2) his awareness of the impact of psychological factors on nearpoint stress and ultimately the visual system, 3) his clinical insights regarding the importance of stress reduction techniques as an adjunct to conventional vision therapy programs, and 4) his ability to develop strategies to address stress from both a visual and a health perspective.

Ironically, Dr. Birnbaum's insights have fallen on blind eyes. Our profession has continued to over-emphasize visual acuity and eye health. His approach was more focused on a patient's quality of life versus our current crisis-care model. Meditation, visual imagery procedures, relaxation techniques, and visual hygiene techniques are unique therapeutic options, which are often underutilized in our approach to patient care. Although it has been noted that the eye is a window of health, many practitioners do not truly understand this concept. Dr. Birnbaum was a man before his time, who saw vision as more than a limited process but a process that influenced both our human potential and our health status.

— Richard Laudon, OD

Martin Birnbaum, OD was a gifted clinician, author, and teacher and a deep and divergent thinker who was a true giant in the area of Behavioral Optometry. His book, *Optometric Management of Nearpoint Visual Disorders* (available through OEP) is a must read for anyone practicing and prescribing behaviorally.

Marty was my teacher, my colleague, and my friend, as he was to so many. He is sorely missed, but through his writing, such as this, and the many who learned so much from him, his legacy lives on.

Early in my Optometric career, this article gave me crucial insights into the relationship between stress and vision and the importance of central-peripheral integration during the reading process, which is now the foundation of my behavioral prescribing of lenses and optometric vision therapy. I thank OVP for republishing this still-relevant Optometric gem of an article so that another generation can learn from Martin Birnbaum's insights into the visual process.

— Robert Sanet, OD

What Dr. Birnbaum had written in 1989 is even more relevant today in 2018. With so much emphasis on increasing myopia and myopia control, we are not looking at the bigger picture of overall relaxation and thus reducing stress, which is the precursor of nearpoint stress. Society in general is highly stressed and as mentioned by Dr. Birnbaum overtly innervated by sympathetic responses. Success of vision therapy has always been in looking at the human being as a whole rather than a pair of eyeballs floating in space! A holistic approach has differentiated vision therapy from orthoptics. This article rekindles the importance of the magnocellular system, which is so important to our sensory wellbeing in relaxing the stress-inducing, but important, parvocellular focal system. A harmonized relationship between the two is of utmost importance.

In the eastern world, where I belong, we have always stressed the body as a whole, meditation, breathing relaxation, and an overall holistic approach in treating a human being. Ayurveda believes in normalising the harmony of the human system rather than treating the disease. In the run for fast treatments, we have lost out on the holistic cures. The article has brought a whiff of fresh air into the otherwise stagnant, over-stressed world that we are living in today. I'm sure these approaches when resorted to will be helpful in reducing the prevalent anxiety-induced stressors and hence provide a new dimension to today's burning issues of myopia increase and myopia control.

— Aditya Goyal, B.Optom.