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VDT's the future is now for functional/behavioral optometry

Abstract

This literature research deals with describing a new visual wellness model and applying this to vision care of Visual Display Terminal (VDT) users. A synthesis of information gleaned from many disciplines is incorporated with the Skeffington nearpoint visual stress model. From the roots of optometry's unique service, behavioral optometry must develop care for the visual needs of millions of new VDT workers. The visual wellness model is applied in a 26 day home-based training program. Next, the application of functional lens prescription is discussed as a biofeedback device for use at the VDT. Marketing vision therapy in a seminar format is described as the most efficient way to provide visual hygiene techniques, vision education and prevention to VDT operators. The rapid increase of VDT use in the years ahead is a signal that the future is now for functional/Behavioral optometry.

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VDT's
THE FUTURE IS NOW FOR
FUNCTIONAL/BEHAVIORAL OPTOMETRY

IN PARTIAL FULFILLMENT OF
THE REQUIREMENTS FOR
DOCTOR OF OPTOMETRY DEGREE
PACIFIC UNIVERSITY COLLEGE OF OPTOMETRY
MARCH 1984

BY

MICHAEL W. BAUMANN

ADVISED BY ROCKY KAPLAN, O.D., M.Ed.

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ABSTRACT

This literature research deals with describing a new visual wellness model and applying this to vision care of Visual Display Terminal (VDT) users. A synthesis of information gleaned from many disciplines is incorporated with the Skeffington nearpoint visual stress model.

From the roots of optometry's unique service, behavioral optometry must develop care for the visual needs of millions of new VDT workers. The visual wellness model is applied in a 26 day home-based training program. Next, the application of functional lens prescription is discussed as a biofeedback device for use at the VDT. Marketing vision therapy in a seminar format is described as the most efficient way to provide visual hygiene techniques, vision education and prevention to VDT operators. The rapid increase of VDT use in the years ahead is a signal that the future is now for functional/behavioral optometry.

VDT's, THE FUTURE IS NOW FOR FUNCTIONAL/BEHAVIORAL OPTOMETRY

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I. THE ROOTS OF OPTOMETRY'S UNIQUE SERVICE

Skeffington had the insight, intuition, and synthesizing ability to design what today is called the analytical or functional model of vision analysis. From looking at specific findings like the phorias, the ductions, the blur findings, and the cross cylinder findings to developing a functional concept of vision, Skeffington literally revolutionized Optometric Service.¹ Drawing extensively from the research of Hans Selye,² Darrell Harmon,³ and Samuel Renshaw,⁴ Skeffington proposed that going to school and working in occupations that required extensive periods of close work produced excessive visual stress.

Mismanaged stress⁵ forces the individual to make one of three adaptations; either withdraw from the nearpoint task, distort the binocular pattern of viewing, or shrink visual space inward.

Optometrists all over the world (currently, OEPPF., INC. members and organized study groups are represented in 26 countries⁶) were trained in analyzing visual problems using this adaptation model. Manas,⁷ Slade,⁸ and Hendrickson⁹ summarize this functional model and describe the mechanics of practical lens application. More recently, Kaplan has broadened the theory to include an interdisciplinary approach.¹⁰ Concurrently, this philosophy is being researched at the Skeffington-Alexander National Optometric and Education Learning Center in order "to promote the well-being of human vision, and visual processing".¹¹

A synthesis of the different approaches leads to a model that is most applicable to the modern day electronic workplace. Skeffington, and those who followed, claimed that our visual system was not designed to look at close objects for long periods of time. If that close viewing activity utilizes inappropriate looking strategies, then ciliary, or inner recti muscles are

used with less control.¹² This produces a wide variety of symptoms. Symptoms, from a functional perspective, are a wonderful message that we are not managing stress in our environment.

In the past, a number of environmental factors were blamed, such as inadequate lighting,¹³ below optimal nutrition,^{14,15} going to school,¹⁶ excessive pressure of school,¹⁷ and so on and so forth. The purpose of this paper is to address a new environmental factor, namely, the Video Display Terminal (VDT).

Optometrists schooled in the functional approach in dealing with vision problems have treated symptoms as the first stage in the development of structural eye distortions. These doctors have looked for the etiology or cause of the vision difficulty, rather than apply a "corrective" device to ameliorate the symptom.¹⁸ Skeffington recognized that treating the symptom did not deal with the primary source of the problem.¹⁹

The functional approach utilizes lenses,^{20,21} prisms,^{22,23} and vision therapy^{24,25} to restore the visual system to optimum functioning. These approaches are usually conducted in optometric offices and the therapy is usually done one on one. The number of persons being reached by such an approach has been limited. Multiple therapy,²⁶ is used in some instances, however, the general public, optometrists, ophthalmologists, teachers, physicians are still relatively uninformed of the value of vision therapy. The proliferation in the use of VDT's is a blessing for the Optometric Extension Program Foundation, functional optometry, and the future of all optometry. At last the public, industry, business and ophthalmology can be educated about the inadequacy of the human visual system in undertaking continuous looking at the VDT for hours at a time.

This leads to further exploration of the stress model. Kaplan calls this the Visual Wellness Model.²⁷ Drawing from the work of Skeffington,²⁸ Ott,²⁹

Lane,³⁰ and Kappel,³¹ he proposes that symptoms are an indication of mismanaged stress. If the symptoms of blurry sight, double vision, burning sensation, tired eyes, headaches behind the eyes, and red eyes are of recent origin, then it is likely that distortions measured in the 21-point visual analysis and vision skills profile will be mostly functional in nature. The symptoms can be viewed as a manifestation of distress. In the past, stress, or distress was viewed as something undesirable. Today, we accept distress as a message that we should slow down, practice a vision exercise, wear a stress-relieving lens, or take a break from the task.

Failing to address the distressing symptoms is related to not noticing the red generator light flashing in the automobile. For many at this stage of the developing vision problem, the optometrist measures functional distortions. Many people fail to receive counseling on restoration of the functional visual system, and the difficulty progresses to the next level where physical distortions are measured in the eye. At this point, the optometrist would psychometrically describe the difficulty as nearsightedness, farsightedness or astigmatism. The treatment of choice traditionally is the application of eyeglasses. Optometrists who subscribe to the functional way of thinking would still address the cause, and determine if the nearpoint, stress-relieving lenses would benefit the patient.³² In some cases, the distortion has progressed to the point where vision therapy is used in conjunction with therapeutic lenses.

If a non-functional approach is used, then there is the likelihood of the vision problem moving to the next evolutionary stage, known by the Visual Wellness Model as the "dis-ease" stage. There is a persistence of the symptoms or distress in this stage, irrespective of the lens or the vision therapy approach, unless an interdisciplinary approach is undertaken. The approach makes use of

nutrition, aerobic exercise and psychoemotional relationships to take care of the developing vision problem.³³

The Optometric Extension Program has funded numerous research studies that have validated this functional model of vision care.³⁴ Other studies have shown that the wearing of nearpoint lenses can bring about an alteration of physiology of the body,^{35,36} increased reading comprehension,^{37,38} increased speed of perception,³⁹ and a generalized reduction of visual distress.

II. VDT'S ARE OPTOMETRY'S CHALLENGE FOR THE EIGHTIES

With the arrival of the eighties, the computer era became a reality in the workplace as well as the home. Now there are millions of data and word processing operators who experience significant levels of eyestrain. The myriad of complaints can be viewed as the human expression of functional distress, according to the aforementioned Vision Wellness Model. The computer is changing the nature of the workplace, creating new stress and increasing reports of physical ailments in individuals who use VDT's for significant portions of their working day.⁴⁰

The stance that can be taken by functional optometry is one of educating consumers that, in visual terms, they come to the VDT ill-equipped. Kaplan asserts that the use of the VDT's exacerbates eyesight and vision problems already present.⁴¹ The VDT operator may be unaware until presented with instances of heightened visual stress. The good news for VDT users is that eyestrain and health related complaints can be minimized by seeking functional vision care. Not only do we need to educate the patient, the VDT operator, but also government agencies, unions, workman's compensation and insurance carriers so that vision care covered by third party services includes more than the examination and application of compensating lenses.

In 1982, one million computer terminals joined the four million already in use, and the number is expected to increase by some 25% each year through 1990.⁴²

Verbatim Corporation, which in 1982 studied office workers' perceptions of this new technology, expects that six million people will work at computer terminals by 1986.⁴³ The Optometric Extension Program predicts that 30 million people will be working with data and word processing systems in the next ten years.⁴⁴

The Verbatim Corporation study uncovered some interesting reactions. Sixty-eight percent of the 1,263 secretaries, administrative assistants and word processing operators polled stated concerns about health effects of the equipment. Sixty-three percent complained of eyestrain, and thirty-six percent pointed to backache. Eighty percent requested better lighting. The office workers' concerns are the subject of numerous newspaper and magazine articles as well as research reports. Journalists themselves are subject to the problem they report in VDT users, for computer technology has become the newest means for information transmission in the newspaper industry itself. Occupational Health and Safety magazine reports in an article by Martha Tabor that:

while dismissing radiation as a health problem of consequence, researchers at NIOSH (National Institute of Occupational Safety and Health) are now confirming that European Studies have already shown and what most VDT operators will tell you themselves: they are plagued by problems with equipment design, workplace design, and job design. Organized workers are bringing their complaints to their unions which, in turn, have started bargaining for contract protection and have turned to NIOSH requesting health evaluations of a number of different work sites where VDT's are in use.⁴⁵

If no conclusive evidence exists that instrumentation is the causal factor creating symptoms reported by VDT users throughout the world, then what is the cause of high incidence of vision related difficulty (i.e. blurred sight, ocular fatigue and nearsightedness) when people spend time with a VDT? Part of the difficulty is in the way people use their eyes. Functional optometry assists individuals in managing visual distress similar to that seen in VDT operators by utilizing its own clinical research and scientific studies. Also, as previously discussed, Tabor further points out the illusion caused by the

immediate improvement in productivity with computer use. Computers are an unmitigated blessing. Some of the value ascribed to increased productivity may be lost in the long run if workers fail to maintain their visual and their decision making powers.⁴⁶

III. THE VISUAL WELLNESS MODEL APPLIED

Use of the computer is in the process of revolutionizing our lifestyles, our workplaces, and our concepts of communication. It behooves functional optometry to educate operators of VDT's in proper use of techniques in preventing and maintaining high level visual wellness. The result will be enhancement of the individual's ability to work, to grow and to communicate. Without the awareness of how eyes are used in each individual's particular case, they will suffer more and more as the use of VDT's increases. Eyestrain connected with use of VDT operators is not significantly different from eyestrain experienced by paper directories in a well controlled study of telephone operators.⁴⁷ Yet, the comparison based on total number of discomforts suggests a pattern of somewhat greater discomfort among VDT operators.

It may well be described as a generalized, whole-body discomfort. Computer use simply provides us with a particular case, and one which could create quite significant problems for the future.

Nearsightedness (Myopia) is the most prevalent measurable eye problem in the United States affecting 30-40 million Americans.⁴⁸ Difficulty seeing objects at distance of 20 feet and beyond has been reported since the beginning of the Industrial Revolution. With the use of VDT's there is little doubt that such cases of functional adaptation will show phenomenal increase. In an article entitled, "VDU's on Site", a report by Grundy and Rosenthal published by the Association of Optical Practitioners in London quoted figures that indicate that:

In the U.S.A., the incidence of myopia has increased from 12% to 70% in the past 80 years. The average myopic error has increased by 1/4 diopter in the past 10 years.⁴⁹

An article published in Science News (Aug., 1983) by Janet Raloff, entitled "VDT's: The European Experience", reports on a study of air traffic controllers researched by Olov Ostberg. The report indicated how well air traffic controllers could adjust the focus mechanism of the eyes after work at a VDT for two, three, and four hour periods. The strongest effect was measured when an individual worked with a VDT for three continuous hours without a break. Over that period of time, the controller's vision system suffered a temporary myopic effect of 1/4 diopter loss in distance visual clarity.⁵⁰ The point is that if combining the statistics from the English article quoted, and the Science News report respectively, then the average increase in myopia over a period of 10 years also took place in air traffic controllers in just three hours! Specific myopia cases will be presented to the functional optometrist in epidemic proportions.

Kaplan refers to the many personal experiments he undertook with his eyesight and vision.⁵¹ Even though the interdisciplinary techniques he used from various schools were not always traditional ones, a number of functional optometrists are beginning to use the broad interdisciplinary concept in search for vision development strategies for enhancing vision for VDT operators. Kaplan presented research evidence at the 1980 Annual meeting of the American Academy of Optometry with results showing a 16% improvement in visual clarity for individuals complaining of myopia after they relaxed for a period of 12 minutes. The measurable change in the control group was only 7.6%. In an earlier paper, Kaplan reported on the frequent use of optometric hypnosis for the treatment of vision problems.⁵²

The stress symptoms reported by VDT users result from what can be considered a hypnotic state. (No office manager wants a staff of hypnotized workers!) The VDT worker can be mesmerized by the moving cursor, flickering display images,

flourescent overhead lights, white noise from office machines, building systems and office conversation. This situation can create changes in mental states. When animals are afraid, they stare and stop breathing. Since, for the VDT operator, the stare is broken when the operator leaves the VDT, the mind's interpretation is that the VDT's are to blame, It is for these reasons that one of the basic approaches functional optometrists can use in treating VDT related vision problems is the incorporation of suggestive relaxation. This technique makes use of specific suggestions while the VDT operator maintains a relatively relaxed posture and visual focus on the road to managing visual distress. This can be accomplished by use of music,⁵³ a relaxation tape,⁵⁴ breathing,⁵⁵ or visual hygiene excercises.⁵⁶

Of particuTar interest is the alternation of patterns of staring and shallow breathing. Gottlieb presented a theoretical and clinical model for these practical suggestions. The Alpha Rhythm, a brain wave of 8 to 13 cycles per second as measured by an electroencephalogram is a state of relaxation. The alpha state is one of the first stages of sleep. It can also be developed through meditation techniques. The alpha state is present when creative processes are at work, and it is a relatively slow state. By contrast, a VDT operator who is typing and thinking heavily may become exhausted because the body is working at too high a rate of speed, analogous to a car at a stop sign with the engine revving.

By slowing the body's functioning while maintaining clarity and awareness, the VDT operator can protect the eyes, avoid distress, maintain binocularity and retain balanced brain and body functioning. Vision therapy can teach the individual to monitor breathing, break up the stare, alternate between close-up and far distance focusing, excercise, and relax the eye muscles, and preserve binocular vision while increasing productivity and supporting clarity.

IV. FUNCTIONAL OPTOMETRY'S LENS APPLICATION AS A BIOFEEDBACK DEVICE FOR VDT USERS

Functional optometrists have been prescribing specialized eyeglasses for close working distances for the past fifty plus years. The premise is that eyeglasses prescribed for seeing objects clearly at 20 feet compensate for that distance and beyond. No spectacles at all might be applied for nearpoint tasks as stress relieving lenses. This design solved a great number of desk and/or paperwork problems experienced by office workers, students and professionals.

With the introduction of the VDT, it was natural for these functional optometrists to consider special focusing lenses for VDT operators. Kaplan presented results of an investigation at the 1980 American Academy of Optometry meeting on fifty-two randomly selected myopic subjects. Wearing their habitual minus lens prescriptions that enabled resolution of 20/20 visual acuity, seventy-five percent demonstrated a fixation disparity. At the recommended VDT viewing distance (40-50cm)⁵⁷ and at the 20 foot distance, significant fixation disparity was measured. Given that Mallett refers to the fixation disparity as being lack of tolerance for visual stress,⁵⁸ the behavioral implication is that the 20/20 lens prescription creates less tolerance for visual distress in a significant percentage of myopic individuals. In seventy-eight percent of the subjects, the fixation disparity could be reduced to zero by the application of plus lenses to an acuity level of 20/40 distance visual acuity. The amount of minus dioptic lens power that the subjects wore correlated clinically to the near point net findings of the OEP analytical analysis. Kaplan referred to this nearpoint VDT lens as a biofeedback device. Gathering hundreds of case studies, he observed that patients could be trained to look further and further into distance space over time. This meant "flashes"⁵⁹ of 20/30 or even 20/25 could result. Kaplan began correlating these acuity changes to nutritional and physical exercise variables. As patients

were taught to monitor what variables affected their acuity, they were able to use the VDT eyeglasses as a biofeedback device. When they had physically exercised, maintained a visual hygiene program at the terminals, their visual acuity levels dropped and it was noted that processed foods had been consumed. Haynes emphasizes that in order to fully understand what physiological correlates are involved, research must separate each of the constituent factors.⁶⁰ Nevertheless, it is hypothesized that certain foods can produce an allergic response for certain people. This author expounds the process of understanding visual relationships rather than the scientific end-product which may or may not be true depending on the individual. To belabor the point, this in no way implies throwing all scientific studies away nor eliminating all processed foods from everyone's diet.

Persons going through these clinical studies were able to incorporate the interdisciplinary concepts of their daily lives. VDT operators were able to protect their distance eyesight and reduce the incidence of eyestrain. The wearing of the lesser prescription lenses proved the mismanaged, socially compulsive nearpoint stress theory of Skeffington correct. Kaplan reported that in virtually ninety percent of the clinical cases reported, no further increases in myopia were found in persons using the biofeedback devices.⁶¹

V. MARKETING FUNCTIONAL OPTOMETRY THROUGH 26 DAYS TO VISUAL WELLNESS

Kaplan presented the Ultimate VisionTM Home Based Training Program for over 1,000 persons during a twelve year span. At one point, he evaluated the visual acuities of forty-four individuals to determine the validity of this program.⁶² Kaplan found that subjective visual acuities improved on the average thirty percent, (20/110 to 20/70) in just 26 days. No significant changes were obtained in the control group. For the VDT operator, this means that if they notice a loss of

distance acuity (a high probability according to Ostberg), then the return of efficient visual function is possible through their functional optometrist. Results provided by this interdisciplinary training program occur in as little as a 26 day period. More importantly, skills are developed to provide lasting results.

Kaplan also reported a significant development in stereopsis through the distance lens prescription during the 26 days, as well as an increased range of tolerance to handle visual distress as measured by fixation disparity. In addition, a significant reduction of visually related behaviors were noted in the experimental group. These findings, when generalized to the VDT population of the near future, have impressive implications. One study showed that there are a host of health complaints such as burning eyes, eye strain, irritability, colds, and sore throats in over 50% of either the professionals using VDT's or the controls.⁶³

An interdisciplinary home-based vision training approach, including the functional optometric model, can be taught to VDT operators by optometrists. The initial orientation to vision and VDT's is a process that calls for a full explanation of visual hygiene techniques outlined by Kavner in Total Vision. Perhaps why vision training has not caught on as much as it is necessary is that optometry has never fully utilized a marketing approach as practiced in the business community. The patient, in this instance, the VDT operator is both a patient and a consumer of health care through vision; therefore, functional optometry as a member of the health care team must expound on prevention and education.⁶⁴

With the arrival of VDT's, operators are providing functional optometry with an ideal vehicle to promote the value of vision training. The emphasis here should be placed on mass education rather than each individual functional optometrist

trying to tell one patient every hour. The merits of VDT eyeglasses are important, but true vision care must be provided by on-site visual hygiene exercises for operators while working at the VDT.

The first hurdle to overcome is the ignorance of untrained management and supervisors of VDT operators. Manufacturers of furniture are not delaying in advertising and selling ergonomically designed workplaces, yet most companies are still relatively unaware of the impact of poorly functioning visual systems. What will it take? Vision therapy has to be put in the context of brain research. Cool reported many studies relating eye and brain function of the cat that supports a total functional approach.⁶⁵ Kaplan, in his book, Ultimate VisionTM, provides a dynamic model of how central/peripheral mechanisms of seeing are perhaps related to left/right brain functioning. Kaplan has utilized this model in educating groups of lay persons and VDT operators on the importance of vision training. He reported that using this approach allows for persons to experience the need for developing vision as opposed to only concentrating on eyesight.⁶⁶ This approach can be used by optometrists working with VDT operators, their management, or supervisors.

The idea is first clarified between sight and vision. Investigation of split brain functioning through pioneering research studies in this area carried out by Sperry⁶⁷ and Gazzaniga⁶⁸ at the California Institute of Technology in the 50's and 60's provides the evidence. Their research subjects were epileptic patients who had undergone medical operations severing the two halves of the brain. Here lies the opportunity to study how the two halves of the brain function independently versus which brain functions only when the two halves of the brain work together. One begins to wonder how this research is related to a discussion of the effects of working with VDT's? This research creates a model for how the brain works, and for how people use the brain to interpret what they see.

Describing mental and visual functioning helps to better understand the mechanism of eyestrain symptoms in VDT users. Incorporating this brain model, optometrists can better determine whether the problem lies in the work environment, with the operator's eyeglasses, or with the VDT system. Using professional optometric judgement, functionally sound alternatives can be offered to the vision care seeker. Functional optometrists must explore techniques for improving both sight and vision of VDT operators. Instruction on how to better use both eyes and the brain in a more relaxed and conscious way is an integral part of the visual wellness method.

The studies of Sperry and associates opened up the possibility that each hemisphere of the brain has specific functions in relation to other parts of the body, including the eyes. For most individuals, the use of the right hemisphere of the brain (right brain functioning) is thought to be related to intuitive, pictorial, spatial, creative and other non-specific functions. Left side brain functioning is thought to be, for most people, more logical sequenced, more temporal and more mathematically oriented.

How do left brain and right brain functioning relate to our concepts of sight and vision? Sight being physical, logical, mathematical and quantifiable corresponds to left brain functions. The opposite is true of vision and right brain functions. With this understanding, we can also connect left brain, logical functions with specific occurrences of foveal focusing, and right brain, intuitive functions with a more diffused response to light by the retina. Foveal viewing is associated with central processing while retinal viewing with a peripheral style of looking.⁶⁹ This correlates to what Greenwald listed as two types of retinal ganglion cells called sustained (central) and transient (peripheral) cells that form a direct line from retinal to cortical function.⁷⁰

Most people tend to use predominantly either the central or peripheral visual style. This preference determines how they see the world. The optometrist's goal is to teach VDT operators to see in a balanced way. The result will be more success in their computer use.

The purpose, then, is for optometrists to teach VDT operators in a "whole brain" way. Kaplan reports that the VDT can actually aid in this process by challenging the operator to be conscious of how their eyes and brain work. Explaining vision training in a model that includes a brain paradigm satisfies the clinician, the scientist, and the business individuals that make up the industry. The VDT adds stress to the operators visual system causing problems to surface which were probably already present. Without such awareness, use of VDT's can lead to future poor sight, inefficient vision habits, increased stress on the organism, too much near focusing and excessive use of logical patterns of thought.

VI. SUMMARY...THE FUTURE PLAN

In closing, a self-help, visual wellness model of vision enhancement is recommended for VDT operators and taught in seminar format. This can be accomplished by having optometrists skilled at delivering introductory marketing presentations to key management personnel. The stage will be set for later group seminars to teach the visual hygiene skills that can be practiced while at the VDT. The scenario evolves to functional optometry becoming known in the community as the professionals who can solve the dilemma of eyestrain associated with the VDT (computer) use.

It is apparent that there is a connection between the way the VDT operator focuses through their eyeglasses designed for 20 feet, their state of relaxation, and their reported eyestrain symptoms. The challenge of functional optometry is

to continue educating the patients for the need to use modified lens prescriptions for VDT use. Applying the model of reducing visual distress, preventing further deterioration and using eyeglasses as a therapeutic biofeedback device has proven useful in explaining this need.

Margach emphasizes that the survival of optometry as an independent profession depends on developing a new public image.⁷¹ Utilizing this interdisciplinary approach in a visual wellness model may well put optometry on the leading edge of rescuing VDT operators. The future is here for functional optometry to serve those millions of VDT users facing new environmental challenges of computer technology.

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