VISION THERAPY AND OCCUPATIONAL THERAPY

AN INTEGRATED APPROACH

Lynn Fishman Hellerstein, O.D.
Beth Fishman, OTR

ABSTRACT

There are commonalities between the models of human performance used by optometry and occupational therapy. Both recognize the importance of the ongoing relationship between vision and movement in development and in human performance. Optometry stresses the role of vision as primary and movement skills as foundational. On the other hand, occupational therapy's major efforts are primarily on the individual's movement and balance abilities with vision being perhaps the most important sensory system. The purpose of this article is to describe the interaction between occupational therapy and behavioral optometry as practiced in the same office. Included will be a model demonstrating interdisciplinary evaluation and treatment.

KEY WORDS

occupational therapy, optometry, motor skills, sensorimotor integration

A tenet of the behavioral optometrist is that most non-pathological vision problems do not have a genetic etiology, and that these problems are modifiable by active clinical optometric interventions. There are two etiologies that cause the majority of these dysfunctions.

The first is vision problems resulting from insufficient neurological development. These neurological sites may lie primarily in the visual system or in another system associated with visual performance. These difficulties are considered to be developmental in nature.

The second etiology is functional. Here the difficulties are the products of the body's response to biologically unacceptable stress associated with nearpoint visual activity and result in ocular and visual dysfunctions.[1] These problems occur unless care is provided that reduces or eliminates the unacceptable stress. For both functional and developmental problems, the main goal of behavioral optometrists is for their patients to achieve a level of efficient and comfortable vision in order to perform maximally in the classroom, at the workplace, in athletics or in other desired activities.

Vision is not conceptualized as merely a camera image of an object that is conjugate with the retina but rather a complex sensorimotor process. Consequently, successful behavioral optometric care goes beyond considerations of the end organ, the eye. It is broadened to include holistic aspects of human performance. "Visual training, also referred to as vision therapy, is the art and science of developing visual abilities to achieve optimal visual performance and comfort."[2]

Occupational therapy focuses on several components of performance that an individual must possess in order to function optimally in his or her activities of daily living, occupational, and/or scholastic roles. One of these components is sensory integration. This is the organization of sensations for subsequent use.[3] It is the ability of the central nervous system to take in, sort out and interrelate information received from the body and the environment to allow for purposeful goal-directed responses. This sensory integrative process includes, but is not limited to, tactile awareness, stereognosis, kinesthesia, proprioceptive awareness, ocular control, vestibular awareness, auditory awareness, gustatory awareness, olfactory awareness, body scheme, reflex maturation, postural security, awareness of both sides of the body, and motor planning. These mechanisms lay the founda-

tion for perceptual motor skills such as visual-motor integration, visual-spatial skills and auditory language skills. These perceptual motor skills thereby provide the basis for academic learning, emotional and social adjustments, and activities of daily living. Occupational therapy is dedicated to research, testing, and improvement of sensorimotor integration; and certainly, occupational therapy has always approached treatment from the framework of holistic aspects of human performance. With this common focus, behavioral optometry and occupational therapy have a compatible link.

Table 1 illustrates the sensorimotor and perceptual motor components placed in a developmental framework. In general, although there are exceptions, the occupational therapist deals with problems in "basic sensory processing," "development of motor skills," "sensorimotor integration," and, to varying degrees, "perceptual motor areas." Children whom the occupational therapist treats show significant fine and/or gross motor problems, low muscle tone, poor motor planning, etc. The behavioral optometrist, while fully cognizant of the foundational position of these areas for vision, deals more with problems in visual processing abilities in patients of all ages, "perceptual motor areas" and, to varying degrees, "sensorimotor integration." The patients the optometrist treats often show dysfunction in binocularity and ocular motility and/or in visual motor and visualization performance. There is certainly some overlap in treatment, but for the most part, each field, optometry and occupational therapy, has its specific strengths and areas of expertise.

Table 2 demonstrates the patient flow for testing and treatment in our office. The majority of patients are initially referred for a visual evaluation. An extensive case history is taken, including: self and family ocular health, developmental, academic performance, coordination abilities, symptoms and medical histories.

Testing includes:

1. Internal and external ocular health
2. Visual acuity near and far
3. Contrast sensitivity
4. Ocular motilities (pursuits, saccadic fixations)
5. Binocular motor and sensory functioning (cover test near and far, nearpoint of convergence, phorias near and far, fusion ranges, fusion

TABLE 1[4]

DEVELOPMENT OF THE COMPONENTS COMPRISING THE DOMAIN OF SENSORIMOTOR SKILLS

BASIC SENSORY PROCESSING		DEVELOPMENT OF MOTOR SKILLS
Infant to 2 Years	Tactile Visual Vestibular Auditory Proprioception	*Integration of primitive reflexes *Development of posture and balance *Development of fine and gross motor skills
SENSORIMOTOR INTEGRATION		
Preschool Years		Motor planning Bilateral motor integration Postural control Reflex integration and balance Body scheme, coordination
PERCEPTUAL MOTOR		
Preschool to School Age		Visual-motor integration Visual-spatial skills Auditory language skills
ACADEMICS		
School		Concepts, reading, writing, math

TABLE 2

PATIENT FLOW IN VISION/OCCUPATIONAL THERAPY PRACTICE

PRACTITIONER	TESTING	OUTCOME (As determined by findings)
Optometrist	Visual evaluation	Glasses, contact lenses, treatment and/or referral for ocular or systemic disease
Optometrist	In-depth binocular and/or amblyopic evaluation	Vision therapy
Optometrist	Developmental visual evaluation	Vision therapy
Occupational Therapist	In-depth sensorimotor testing	Occupational therapy

flexibility, evaluations of central and peripheral suppression, Worth four-dot test, Brock string)

6. Accommodation (near retinoscopy, negative and positive relative accommodation ranges, amplitude of accommodation, accommodative flexibility)
7. Near stereoacuity and range of stereopsis

At the completion of testing, several options are available and are applied according to the particular findings. These include: treatment or referral for pathological conditions, prescribing of glasses or contact lenses, rescheduling for additional strabismus or binocular testing. In addition, rescheduling for a developmental vision analysis (DVA) is recommended, depending on the case history or the result of the visual evaluation. Specific concerns that would warrant this further testing include difficulties in writing, spelling, reading, poor sight vocabulary, reversal of letters or words, coordination and/or sports problems. The DVA testing includes some or all of the following battery:

1. **Test of Visual-Perceptual Skills** (non-motor)[5]—This test is designed to measure non-motor visual perceptual abilities. Included are subtests in visual discrimination, visual memory, visual-spatial relationships, visual figure-ground, and visual closure.
2. **Getman Visual Recall Test**[6]—Abstract pictures are presented and then removed, allowing the patient to draw the pictures from memory.
3. **Developmental Test of Visual Motor Integration**[7]—This test requires the patient to grapho-motorically reproduce shapes of increasingly complex forms.
4. **Piaget Left-Right Awareness Test**[8] **or Test of Lateral Awareness and Directionality**[9]—These tests are designed to establish the patient's level of self-lateralization and directional concepts.
5. **Wold Sentence Copy**[10]—The patient is asked to copy a four-line sentence so that handwriting speed, accuracy and letter formation can be assessed.
6. **Birch Belmont Auditory/Visual Integration Test**[11] —A sequence of pencil taps is presented and the patient is asked to match the auditory sequence to a visual pattern.
7. **Test of Auditory Analysis**[12]—This test probes the patient's ability to analyze a spoken word into subcomponent parts.
8. **Balance and Coordination Screening**—This includes balancing on one foot with eyes open and closed, jumping sequences, skipping, and screening of primitive reflexes.

If any suspected deficiencies are found in motor performances, additional sensory motor testing by the occupational therapist is recommended. This testing may include:

1. **Southern California Sensory Integration Test**[13]—This includes probes into visual and somatosensory perception, motor performance, ability to cross the body's midline, right/left discrimination, postrotary nystagmus test, clinical observation of postural maintenance, and gross and fine motor assessments.
2. **Bruininks-Oseretsky Test of Motor Proficiency**[14]—This is a test of fine and gross motor skill development in children from age 4 to 14 years.
3. **Miller Assessment for Preschoolers**[15]—This screens for potential school-related problems and developmental delays, so that early interventions can be initiated for children age 2 1/2 to 5 1/2 years of age.

After all testing is complete, a one-hour consultation is scheduled with the patient, optometrist, occupational therapist, parents/guardians, and other professionals who are involved in management of the patient. The test findings are presented and discussed in terms of performance and its relationship to the patient's overall academic, sports and behavioral status. If visual dysfunctions were found or if it is felt performance can be enhanced, vision therapy (VT) options are discussed. If the majority of difficulties lie in sensorimotor functioning, balance, or coordination, then occupational therapy (OT) options are discussed. If problems exist in sensorimotor and visual areas, which is frequently the case, a combined program is presented. The combined program involves a weekly session with the occupational therapist and a weekly visit with the optometrist. Home therapy activities are given if compliance is adequate. An in-depth report is then written by the optometrist and occupational therapist (if additional testing was given).

An example of patient flow through this office is demonstrated in the following case. It concerns a 6 1/2-year-old female, S.S. She was in first grade. A school conference had been completed because of her teacher's concern with S.S.'s performance in reading and writing. She appeared to be a bright youngster, quite verbal. However, psycho-educational testing at the school revealed problems in fine motor skills, organization, visual memory, and visual perceptual skills. S.S. had difficulty participating in sports and often avoided them. She had a positive attitude in school and demonstrated good attention in class. She had been assigned to a special classroom for reading tutoring and was referred by the reading teacher for a vision evaluation because of frequent complaints of ocular fatigue. Developmental history indicated a normal birth with no complications. S.S. passed through the normal developmental milestones of rolling, turning, sitting, standing, walking and dressing. She rarely crawled, but rather used a scooting movement more frequently. S.S.'s general health was good, other than experiencing the usual childhood illnesses. She had no history of allergies and was not taking any medication. Family history revealed diabetes and hypertension occurring in a grandparent. S.S.'s mother wore glasses for hyperopia (+4.00 Diopters OU) and had received vision therapy as a child. Her father did not have any significant visual history. This was S.S.'s first vision evaluation.

OPTOMETRIC TEST RESULTS

All ocular health tests were within normal limits. Pupils were equal, round and reactive to light and accommodation. A dilated fundus examination revealed a healthy disc (C/D .3 OU), with good color and sharp margins and intact posterior pole and periphery. Maculas were clear in each eye. Biomicroscopy disclosed clear corneas, open angles and clear and quiet anterior chambers.

Visual Acuity:

20/20 for each eye, distance and near

Cover Test:

3 prism diopters exophoria at distance

10 prism diopters exophoria at near

Nearpoint of Convergence:

5/10 inches, left eye suppression

Oculomotor Survey:

Pursuits were full and unrestricted, however they were not fluid. It was difficult for S.S. to disassociate eye from head movements. Saccades were inaccurate and often showed undershooting.

Randot Stereopsis:

Forty seconds of arc

Keystone Telebinocular Skills:

Unstable exophoric posturing near and far, combined with an intermittent left eye suppression

Phoropter Testing:

#4 (Distance Retinoscopy)

OD +0.75

OS +0.75

#5 (Retinoscopy) at 20 inches

OD +1.75

OS +1.75

#7 (Subjective Refraction)

OD +2.00

OS +2.00

#7A (Maximum plus to best visual acuity

OD +1.00

OS +1.00

#8 (Induced distance lateral phoria)

4 prism diopters Exophoria

#12 (Vertical phoria at distance)

Orthophoria

All near tests were performed with maximum plus to best visual acuity (#7A)

#13B (Lateral phoria at near)

9 prism diopters Exophoria

#14B (Fused crossed cylinder)

+1.00 add

#15B (Lateral phoria through fused crossed cylinder)

12 prism diopters Exophoria

#16 (Convergence range at near)

X/18/3

(blur/break/recovery)

#17 (Divergence range at near)

X/20/12

(blur/break/recovery)

#18 (Vertical phoria at near)

Orthophoria

#20 (Positive relative accommodation)

-2.00

#21 (Negative relative accommodation)

+2.75

Monocular estimate method retinoscopy (MEM)

+1.00

Accommodative facility (binocular ± 2.00 D flipper)

10 cycles/minute

Test of Visual Motor Integration

S.S. achieved an age equivalent score of 5 years, 10 months. This put her at the 40th percentile when compared to children of her own age. She displayed an awkward pencil grip and poor arm control when drawing the figures.

Test of Visual Perceptual Skills	(non-motor)
Visual Discrimination	98th percentile
Visual Memory	50th percentile
Visual Spatial Relations	84th percentile
Visual Form Constancy	75th percentile
Visual Sequential Memory	63rd percentile
Visual Figure-Ground	99th percentile
Visual Closure	75th percentile

Getman Visual Recall

S.S. scored at a kindergarten level.

Wold Sentence Copying

S.S. was younger than the age norms on this test. However, significant observations were poor spacing and sizing of letters and no consistent strategy in copying.

Piaget Left/Right Awareness

S.S. knew left and right on herself, but could not apply these concepts to objects in space.

Motor Screening

S.S. had difficulty assuming and maintaining the flexion in supine, prone in extension, and reflex inhibiting postures. Inability to maintain these positions against gravity indicates the lack of integration of these reflexes. These reflexes are normal until a certain developmental age at which time the muscles should take control over movement and holding patterns through strength. S.S. could not maintain balance on one foot for more than five seconds. She could skip, but could not demonstrate jumping jacks or hopping sequences.

This completed the visual testing (approximately two hours in length). It was apparent from the evaluation that plus lenses at near were necessary. The findings indicated a convergence insufficiency, possibly secondary to an accommodative inefficiency, as the +1.00 OU improved the nearpoint of convergence and subjectively helped maintain accommodative sustenance at near. In addition, ocular motilities and visual motor integration performance were deficient. A consultation with the parents was initiated and the following suggestions were made.

1. Prescription lenses (+1.00 OU) for all nearpoint activities
2. Vision therapy to improve visual performance
3. Because of the performance on the motor screening, more in-depth sensorimotor testing by the occupational therapist was recommended.

Sensorimotor testing administered by the occupational therapist revealed:

Bruininks-Oseretsky Test of Motor Proficiency

S.S. scored one to two years below age level on all subsections (balance, bilateral coordination, strength, upper limb coordination and fine motor control)

By virtue of the case history, observations, and her abilities with tactile contact manipulation and her ability to describe objects of different textures, S.S. showed no apparent difficulties regarding tactile sensitivity.

A consultation between the occupational therapist, parents and optometrist focused on results of sensory motor testing and the recommendations of occupational therapy to address the significant fine and gross motor delays. At this time, a joint vision/occupational therapy program was discussed. It was recommended that S.S. have occupational therapy once a week and vision therapy once a week. The program was initiated. Progress evaluations were given every two months.

After 16 visits, S.S. completed the occupational therapy because of significant gains in all motor areas. All test scores on the Bruininks were at or above age level. S.S. could assume and maintain the flexion in supine, prone in extension and reflex inhibiting postures, demonstrating adequate integration of primitive reflexes. After 21 sessions, S.S. was released from vision therapy as visual performance was also much enhanced. Fusional convergence at near was improved, as were the quality of pursuits and fixations. Continued use of plus at near was recommended. S.S., her parents and teachers observed excellent improvement in coordination, academics and self concept. S.S. is currently performing quite well in the regular classroom.

S.S. demonstrates a typical vision therapy patient whom many optometrists evaluate and successfully treat. Even though many optometrists incorporate movement, balance and motor coordination activities in their VT programs, the occupational therapist is of great benefit in that her/his work focuses on the basic sensory processing and development of motor skills. The case is also representative of one that an occupational therapist in the school or in private practice would treat with success, but the patient would still have visual difficulties if not referred to the behavioral optometrist. The productive overlap and uniqueness of these two fields allow for the sharing of views and natural division of labor, which allows the most qualified professional to carry out the treatment. Thus, the combined treatment can be of greatest benefit to the patient.

While the previous case showed an individual receiving joint therapy, there are situations when an occupational therapist not practicing in the same office with an optometrist might want to refer for evaluation and consultation. An example of such a situation involves a 4-year-old male patient, C.K., who presented with significant developmental delays. He was already receiving physical, occupational and speech therapy. His occupational therapist noticed an occasional "eye drift" and thus referred him for a vision evaluation. Testing revealed a small angle esotropia, amblyopia and hyperopia. C.K. needed glasses full time and immediate treatment for the amblyopia and esotropia. The occupational therapist is often in the prime position to refer developmentally delayed youngsters for vision care.

CONCLUSION

Many behavioral optometrists currently have close professional ties to occupational therapists because of the commonality in philosophy and exposure to similar patient populations. The advantages of having the occupational therapist in the optometric practice are in frequent communication between both professionals and patients, and integrated planning, programming and consultation. The greatest advantage, however, is the opportunity to learn and share knowledge so that the two models of the components of human performance continue to grow and solidify and supplement each other. Our common goal in this office is to provide the integration of sensorimotor readiness and visual experience to prepare a person for success and efficiency in life.

REFERENCES

1. Birnbaum MH. The use of stress reduction concepts and techniques in vision therapy. J Behav Optom, Jan 1990; 1(1):3-7.
2. Greenburg RM. What is visual training. J Am Optom Assoc, Jan 1985; 56(1):57-58.
3. Ayres AJ. Sensory integration and the child. Los Angeles, Calif: Western Psychological Services, 1981.
4. Applebaum SA & Degangi GA. Sensory integration standardized test. Optom Extension Prog, Mar 1989; 61(6).
5. Gardner MF. Test of visual-perceptual skills (non motor). Seattle, Wash: Special Child Publications, 1982.
6. Getman G, Henderson H, Marcus S. The visual recall test. Aptos, Calif: Efficient Seeing Publications, 1976.
7. Beery KE & Buktenica NA. The developmental test of visual- motor integration. Cleveland, Ohio: Modern Curriculum Press, 1989.
8. Wold R. Screening tests to be used by the classroom teacher. Novato, Calif: Academic Therapy Publications, 1970: 13.
9. Lockavitch J & Mauser A. Test of lateral awareness and directionality. Novato, Calif: Academic Therapy Publications, 1980.
10. Wold R. Screening tests to be used by the classroom teacher. Novato, Calif: Academic Therapy Publications, 1970: 4-5.
11. Kahn D & Birch H. Development of auditory-visual integration and reading achievement: perceptual and motor skills. 1968, Vol. 27: 159-168.
12. Rosner J. Pediatric optometry. Woburn, Mass: Butterworth Publisher, 1982: 295-298.
13. Ayres AJ. Southern California sensory integration test. Los Angeles, Calif: Western Psychological Services, 1975.
14. Bruininks R. Bruininks-Oseretsky test of motor proficiency. Circle Pines, Minn: American Guidance Service, 1978.
15. Miller LJ. Miller assessment for preschoolers. Littleton, Colo: Foundation for Knowledge in Development, 1982.

Corresponding author:
Lynn Fishman Hellerstein, O.D.
6979 So. Holly Circle, Suite 105
Englewood, CO 80112

Date accepted for publication:
April 27, 1990