In perspective

Leonard J. Press, O.D., F.C.O.V.D., F.A.A.O.

The dichotomy of vision and learning in optometric practice: implications for delivery of care

Background

The visual system operates on multiple levels, gathering information at the pre-retinal level (cornea, pupil, and lens), and computationally processing information in retinal and extra-retinal pathways. Though the parallel and concurrent processes of vision are distributed throughout the brain, clinical assessment of vision can be divided into *tests of efficiency*, involving input and output measures, and *information processing*, involving perceptual or cognitively mediated responses. Remediation of efficiency problems shares common ground with orthoptics, whereas processing therapy is more educational in nature. These distinctions help account for differing opinions about the interrelationship of vision and learning. Differentiating orthoptic from processing therapy will reduce confusion about these issues. The dissociation of orthoptics from the balance of optometric vision therapy will also serve to limit expectations of third-party payment for services, which have significant impact, but are not medically necessary.

It would seem intuitive that vision is integral to the learning process.[1] Nevertheless, the extent to which vision plays a role in learning remains elusive to some professionals.[2] A view of the eye and visual pathways that dissociates the eye from the brain may serve useful for defining how a professional envisions his or her role. However, it defies neurobiological fact and camouflages the exquisite neurocomputational interplay between vision and learning.

Pablo Picasso was once asked in a train compartment by a fellow passenger why he did not paint people "the way they really are." Picasso asked what the man meant by the expression. The man pulled a snapshot of his wife out of his wallet and said, "That's my wife." Picasso responded, "Isn't she rather small and flat?"[3] It is little wonder that simplistic, stick-figure accounts of vision disavow any meaningful relationship between vision and learning.[4]

In contrast, numerous optometric organizations have come forward to reaffirm the fact that vision,—beyond considerations of eye health and visual acuity—can influence one's ability to learn effectively and efficiently.[5] Unfortunately, it is typically the patient who is caught in the crossfire of professional disagreements that ensue, and is left with some confusion as to the role of the eye care practitioner in detection and management of learning-related vision problems.[6]

The purpose of this article is to examine the factors that have contributed to the current state of affairs, and to provide a framework for the delivery of orthoptics and learning-related vision care services in optometric practice. The role of vision in learning is sufficiently complex that no single source can address all of the issues involved. However, the trend toward specialization in optometry, the shift toward a medical model of care, and the influence of third parties invite a closer look at the applicability of vision and vision therapy to the learning process and the delivery of these services in optometric practice.

The dichotomy of vision and learning

We learn to see. Although sight is mediated by the eye, visual learning occurs in the brain. The paradoxical divide between vision and learning is not unique to philosophical differences between eye care practitioners. As noted by Zeki,[7] the genesis and lineage of the idea of a separation between seeing and understanding—the former a passive and the latter an active process—can be found in differences of opinion among neurologists—and even within Kant's philosophical distinction between sensing and understanding. However, before suggesting a model to resolve the differences of opinion about the role of vision therapy services in learning, and implications for reimbursement, it will be helpful to review historical perspectives.

In the first half of the twentieth century, there were signs of agreement among eye care practitioners on the relationship between seeing and understanding. Read the following statement, then consider the source:

> "For some time it has been growingly apparent to those who have to deal with the eyes and their functions that optics, and even physiology, are only preliminary and preparatory phases of vision; that, ultimately, vision and visual reactions are an affair of the mind, and an exceedingly complex psychological affair, at that. It is not, in the end, the image that is registered on the retinae or in the occipital cortices, but the image which emerges from all the associative and organizing processes of the mind, some innate and some acquired, that shapes and determines the visual reactions... From a clinical standpoint, the psychological factors of perception, attention, interest, emotions even, play a determining role in those neuromuscular reactions and coordinations which nowadays form so important a field of visual investigation and training. They must be reckoned with in our test methods, in the interpretation of our findings, and in the devices we employ for re-education."[8]

It may surprise you to learn that this passage was written by the ophthalmologist, Thomas Atkinson, as an introduction to a book on Psychological Optics in 1938. Atkinson also was not far from the mainstream, having authored both an encyclopedic dictionary on vision[9] and a text on the analysis and management of visual problems.[10] One would imagine that at the end of the twentieth century, many of Atkinson's colleagues might find his use of the term "re-education" puzzling in the context of ophthalmic practice.

Orthoptics—which was the precursor of vision therapy—was once widely referred to as *visual re-education*.[11] In considering orthoptics to be re-educative, the implication is that normal visual development is a learned process and therefore subject to change. It also implies that orthoptics involves education or learning principles—at least as they relate to the areas of visual change or improvement attainable through orthoptics.

At about the same time that Atkinson was encouraging the clinical applicability of psychological optics in ophthalmology, Skeffington et al.[12] were independently developing clinical regimens based (in part) on Renshaw's work in psychological optics. Whereas the applications of developmental psychology to vision and learning ultimately propelled Optometry toward greater involvement in education, Ophthalmology progressively lost interest in the rigors of vision re-education (formal orthoptic programs), and virtually disavowed any relationship between vision and learning.[13,14]

While the influence of a medical model of vision can partially account for differences in the approach to learning-related vision probems, it has not been the only factor. As reviewed by Scheiman and Gallaway,[15] models of perceptual motor development and their influence on vision and learning have been useful for some optometric clinicians, but unappealing for those who prefer standardized or normative data to sophisticated, qualitative observation. Many doctors found themselves with inadequate time to devote to first-hand observations, and found tests that could be delegated to assistants—or scored at a later time—more cost effectively. In addition, normative tests provided a more universal language through which results could be communicated to parents and other professionals.

The work by Groffman and Solan[16] was a substantial contribution to the field in bridging these two approaches, and served to integrate more contemporary views of cognitive processing into motoric models. At the present time, Scheiman's model of learning-related vision problems is widely used to differentiate the clinical conditions involved in vision and learning (*see* Box 1). A recent joint policy statement of the American Academy of Optometry and the American Optometric Association is supportive of this model.[17] I have therefore adopted Scheiman's approach as a framework to re-configure the presentation of vision and learning services.

Visual efficiency and processing

Beyond considerations of eye health, learning-related vision problems can be divided into two major areas: *visual efficiency* and *visual information processing*.[18] *Visual efficiency skills* include the components of amplitude, accuracy, facility,

Differentiation of efficiency and processing

Efficiency disorders

Condition	Potential symptoms
Refraction	Blur
Binocular vision	Asthenopia
	Intermittent diplopia
	Instability of print
Accommodation	Variable blur
	Asthenopia
	Pseudo attention deficit
Saccadic eye movements	Inaccurate tracking when reading

Processing disorders

Condition	Potential symptoms
Laterality/directionality	Reversals/transpositions
Visual form perception	Letter knowledge/reproduction
	Inconsistent word recognition
Visual memory	Difficulty visualizing learned knowledge
	Poor spelling/sequencing/chunking
Visual motor integration	Difficulty spacing letters
	Difficulty copying from board

Box 1

and stamina in the interrelated systems of eye movements, accommodation, vergence, and sensory fusion.[19] *Visual information processing* generally refers to perceptual, motor, and cognitive abilities, with clinical testing centering on laterality and directionality, form perception, visual memory, and visual motor integration.[20,21] Clinical observations may also include the patient's visual processing styles—such as central versus peripheral—or reflective versus impulsive, as reviewed by Birnbaum.[22]

Many educational activities (such as reading) are complicated aspects of broader information-processing functions, including perception and higher cognitive processes.[23] The information-processing model is a major paradigm in cognitive psychology that lends itself to aspects of visual processing that occur in stages.[24] Although somewhat simplistic, it is generally accepted that visual functions such as motion, resolution, color vision, and reflex actions reflect lower or earlier levels of vision, and that recognition and consciousness itself reflect later or higher levels of visual processing.[25,26] Recognizing different levels of visual processing opens the door to a broader understanding of differences in opinion about the role of vision in learning.[27]

If we accept hierarchical levels of vision as indicative of various stages of processing, an analogy between computer software and hardware is useful.[28-31] Visual efficiency relates more to the hardware of the system traditionally probed in eye examinations, such as refractive status, binocular status and range, accommodative amplitude and accuracy, and ocular motility. These are items that are driven by stimulus input, and that we can directly inspect or measure. They are considered relatively early or low-level aspects of visual processing. In contrast, visual processing involves high-level function, including activation of stored information about the properties of objects and events. High-level processes affect all cortical visual input, including extraretinal sources of information.[31-35] Given the deep and pervasive effects of high-level processing during perception, it is no wonder that clinical tests oriented toward processing involve considerably more time and are more difficult to plan and execute.[36,37]

Third-party payment for vision and learning services

The ability to draw lines between clinical services that address visual efficiency and visual-processing functions is of more than philosophical interest. Many families come to optometric practices anticipating that some or all of their expenses will be covered by a third party.[38] Insurance reimbursement for optometric vision therapy can be anticipated if it is classified as a medical service.[39] The limiting factor in this premise is that insurance reimbursement is linked with the CPT (Current Procedural Terminology) codes, and there is no code for optometric vision therapy. The most apt descriptor for services provided in vision therapy is CPT code no. 92065, which is defined as orthoptic and/or pleoptic training, with continuing medical direction and evaluation (*see* Box 2).[40]

Although there is no dispute that optometric vision therapy incorporates orthoptics, it has evolved well beyond the current orthoptic milieu.[41,42] Orthoptic authorities and ophthalmologists have emphasized that

orthoptics does not extend beyond the training of binocular fusion abilities, and certainly does not incorporate eye tracking or perceptual therapy.[43-47] Considering the limited scope of contemporary orthoptics, vision therapy is comparatively educational in nature, and is periodically classified as educational by medical claims reviewers.

In the past, when insurance plans were liberal in equating optometric vision therapy to orthoptics, it was in the best interests of the patient for the doctor to adopt an equally broad interpretation of orthoptics. Before the proliferation of managed care plans, doctors and patients could anticipate vision therapy being classified as a medically necessary service. More recently, third-party plans have begun to challenge the extent to which services performed during vision therapy sessions meet the criteria of orthoptics. Rarely is the patient cognizant that the individual reviewing claims for vision therapy is usually a nurse or physician unacquainted with the issues involved (*see* Box 3).

In addition to differentiating vision therapy from orthoptics, there has been a recent trend among carriers to limit the number of orthoptic sessions, adopting the position that much of orthoptics can be done at home, with no need for regular office visits. Unfortunately, in an era of reimbursement expectations, patients become increasingly reluctant to pay for care they view as elective or nonessential. They tend to adopt the stance that if a significant number of office sessions were necessary, the insurance carrier would extend coverage.

Attributes of orthoptics

- Clarity
- Binocular vision
- Facility and stamina
- Stereopsis
- Eye movements

Attributes of visual processing

- Visual attention
- Processing speed
- Simultaneous/sequential processing
- Auditory–visual recognition
- Cognitive/motor planning
- Visual thinking/integration

Box 2

Contrasting orthoptics and visual-processing case types

Primary orthoptic case types

Amblyopia
Strabismus
Accommodative dysfunction
Nonstrabismic vergence dysfunction
Eye movement abnormalities*

Primary visual-processing case types

Visual attention deficits
Letter reversals or transpositions
Visual disorganizaton/sequencing
Graphomotor abnormalities
Limited visualization/visual memory

* Eye movement abnormalities are a swing category between orthoptics and processing. The ICD-9-CM classifications of eye movement disorders includes a wide variety of binocular abnormalities, nystagmus, saccadic deficits (OKN), smooth-pursuit abnormalities, and irregularities such as opsoclonus.

Box 3

To address these conflicts of interest, one possible approach is to "opt out" specialty services from a more general relationship with a third-party provider.[48] My personal experience has been that third parties are reluctant to modify contracts on an individual basis. Another alternative is to avoid participation in third-party plans that limit the provider's ability to prescribe treatment plans according to what is in the patient's best interests. As an example, some carriers will not reimburse for vision therapy services when the doctor is a participating provider, but will reimburse the patient directly when going to a nonparticipating provider. The nonparticipating provider can serve as an advocate for the patient, assisting the patient in obtaining reimbursement to which they are entitled. In due time, balance may be restored to the primary obligation of the doctor to deliver optimal care, and the patient's primary obligations to participate in and pay for that care.[49]

Vision therapy reimbursement

Orthoptic therapy	Visual-processing therapy
CPT code no. 92065	No CPT Code
Insurance reimbursable	No insurance reimbursement
Medical	Quasi-educational
Improves visual efficiency	Improves learning

CPT, Current Procedural Terminology.

Box 4

Differentiating learning-related and medical services

Attempting to use the orthoptic procedure code (92065) to represent all the procedures conducted during vision therapy is no longer in the patient's or doctor's best interests. It places disproportionate emphasis on expectations of reimbursement for needed care, and encourages the parties involved to search for medically necessary labels. Indeed, if the principal aim of the therapy is not directed toward fusion, but is intended to develop visual processing with maximal transfer to learning abilities, then identification of the therapy as medically necessary is potentially fraudulent.[50]

In reviewing patient care records, some carriers have begun to deny appeals for multiple office sessions by noting that it does not meet the guidelines for orthoptic care. When we forward guidelines from optometric organizations such as the AOA or COVD, which support considerably more visits, they are careful not to dispute the efficacy of multiple visits, but to dispute equating optometric vision therapy with orthoptics. For example, a typical program of orthoptic treatment for convergence insufficiency might consist of only six weekly half-hour visits with an orthoptist with 10 to 15 minutes of daily home therapy.[51]

It therefore appears timely and necessary to dissociate medically necessary orthoptic services (CPT code no. 92065) from non-medical, learning-related vision services. I accomplished this in our practice through two major changes. The first step was to establish a Vision and Learning Center as a subcomponent of the practice, which would provide the physical framework for non-orthoptic services. The second step was to implement a vision-processing program in which the emphasis was clearly on perception and cognition rather than orthoptics. I elected to use a commercially available compilation of activities because of its management structure and compatibility with the model presented,[52] though there are other useful models of cognitively based optometric programs that are complementary to these concepts.[53,54]

Parents with children who have learning problems must stop focusing on insurance coverage as the principal determining factor in pursuit of visual-processing therapy. It is as inapplicable as consideration of whether or not to use the services of a private learning consultant based on third-party payment. At present, we will only enter into a discussion about potential insurance reimbursement issues if a primary care or sensorimotor examination justifies the principal concern in therapy as an orthoptic case type. If it is apparent that the principal concern relates to visual processing, then there is no discussion about insurance (*see* Box 4).

Optometrists who adopt the approach I am suggesting should explain that visual processing therapy is not a medical service and will be classified by health insurance carriers as educational in nature. As noted by Furth and Wachs,[55] education is constantly appealing to and utilizing the various information processing systems—most notably visual and auditory. However, parents must learn to appreciate that not every relevant service that supports education should be provided by, or paid for by the schools. The percentage of students who require visual processing therapy is relatively small, and it has therefore become an outside specialty rather than having become part of special education.[56] For select children it is an important part of the discrepancy between the child's capacity to learn and current levels of performance.[57,58]

Conclusion

Optometric vision therapy is a hybrid service comprised of orthoptics and visual processing therapy. The principal relationship of orthoptics to learning is indirect, and involves remediation of eye strain. Visual-processing therapy is distinct from orthoptics, develops and enhances visual cognitive function, and relates more directly to learning-related vision problems.

Understanding this distinction helps account for differences in

opinion about the relevance of optometric therapy to the learning process. It also provides the opportunity to focus on the delivery of necessary services without the entanglement of insurance issues. Orthoptics is a medically related service predicated on disease entities (ICD-9-CM classifications), meets ophthalmology's limited definition of vision, can be dissociated from the brain and learning, and may be subject to the vagaries of third-party reimbursement.

Visual processing therapy—rooted in optometric applications of behavioral and cognitive science—helps people learn more effectively and is not classified as a medical service.

Practitioners must assist patients in understanding that visual processing therapy is a service that may be necessary, even though it is a non-medical service. As a non-medical service, it is removed from considerations of medical necessity and value judgments by physicians or third-party carriers. Educationally supportive services (such as visual-processing therapy) can have a significant impact on a child's present and future achievement, and may be warranted even though payment is solely the patient's responsibility, and not that of an insurance company or school district.

The distinctions I have made between orthoptics and other forms of vision therapy have been alluded to elsewhere.[59] It is also pertinent to note that before the prevalence of third-party payment for optometric services, optometrists effectively communicated the benefits of vision therapy to patients—along with their financial obligation to pay for services rendered. Rather than being constrained by the designations of what is medical care and what is not, providers and patients must reach back to a time when deciding what was in a child's best interests was their decision. Some things are still worth investing in.

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Corresponding author:

Leonard J. Press, O.D., F.C.O.V.D., F.A.A.O.
The Vision and Learning Center
17-10 Fair Lawn Avenue
Fair Lawn, New Jersey 07410