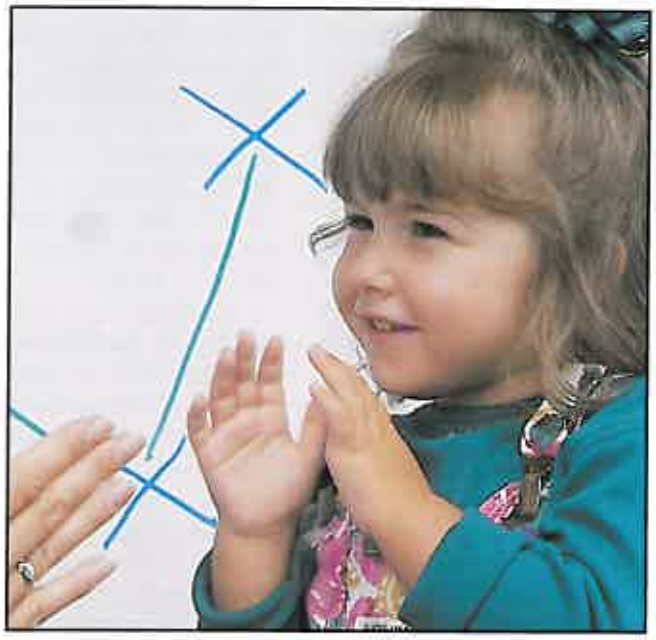
THINKING GOES TO VISION THERAPY



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Abstract

Piagetian concepts were applied to cognitive educational tasks by Furth and Wachs. These same tasks can also be applied to vision therapy objectives. Five example procedures are discussed with specific reference to visual perceptual skills being trained.

Key Words

cognitive skills, Piaget, training procedures, visual perception, vision therapy

The Piagetian-based text, "Thinking Goes to School," applies cognitive theory to classroom activities. This was an important contribution for clinical practitioners, as it related cognitive processing to the educational setting which, in turn, can be applied to optometric vision therapy. We believe there is a relation between cognitive learning tasks and specific visual perceptual skills. Furth and Wachs[1] described 179 "games" that can be used in a child's classroom to promote thinking, rather than rote learning. Most, if not all, of these activities can also be applied to vision therapy for either in-office or home training. We arbitrarily selected five of these, games numbered 103 (Clap Patterns), 114 (Form Board), 121 (Hare and Hound), 125 (Electro Trace) and 130 (Classifications), to illustrate how they can apply to visual-perceptual skills training. For the purpose of this article, we consider only the optometric perceptual applications to therapy and not the cognitive learning strategies advocated by Furth and Wachs. Table 1 lists the exemplary visual and perceptual skills that can be trained with each of the five procedures.

Table 1.
Vision Therapy Procedures and Skills Being Trained

PROCEDURE	Visual and Perceptual Skills Trained
Clap Patterns	1,3,2
Form Board	13,12,9
Hare and Hound	11,10,6
Electro Trace (Modified)	5,4,6
Classifications	7,8,6

Key:

1. Auditory discrimination
2. Auditory sequential memory
3. Auditory-visual integration
4. Depth perception awareness
5. Eye-hand coordination
6. Eye tracking
7. Visual discrimination
8. Visual figure-ground
9. Visual memory
10. Visual-motor precision
11. Visual-motor speed
12. Visual spatial relationships
13. Visualization

Clap Patterns

This therapy procedure can be used to improve auditory discrimination, auditory-visual integration, and auditory sequential memory. These functions must be addressed because we believe a thorough visual perceptual evaluation includes testing of auditory processing. According to Furth and Wachs,[1] "Clap Pattern games develop prerequisite skills vital to the reading process." This game works well with children in Piaget's preoperational stage of development (2-7 years).

Auditory discrimination is the ability of the child to discern subtle differences between stimuli presented solely in an auditory fashion. This auditory processing skill is crucial to cognitive development because it enables the child to discriminate between words with phonemically similar consonants, cognates, or vowel differences.[2] Further, the development of intersensory or intermodal equivalences, especially auditory-visual integration, is vital in reading and learning.[3] Auditory sequential memory is the ability to remember dictated stimuli presented in serial order. The stimuli can be digits, letters, words, etc.

Auditory discrimination is being trained by having the patient listen (without looking) to various clap patterns produced by the therapist. For example, with clap-clap-pause-clap and clap-pause-clap-clap patterns, the child is asked whether they are the same or different. Visualization may be taking place to some degree. After successful performance, the next phase involves the child looking at the therapist during clapping. The child is asked to watch, listen, and replicate the clapping pattern of the therapist. Lengthening the clap pattern increases the demand. This task requires both *auditory visual integration* and *auditory sequential memory*. Further cognitive "loading" can be accomplished by asking the child to spell a word while repeating the pattern (one letter for each clap).

Form Board

This device can be used to improve visualization, visual spatial relationships, and visual memory. Commonly used Form Boards are the three-piece, six-piece, and split-piece sets. Figure 1 illustrates the six-piece form board with the pieces removed and placed on the other side of an opaque partition. The procedures involve Piagetian concepts of conservation which apply to children in the concrete operational stage (7-11 years).

The ability to organize and manipulate visual space allows judgments to be made on the relative maturity of the child's visual system,[4] and is referred to here as visual spatial relationships. These optometric assessments can be enhanced by applying Piaget's operations that evolve within "representational space."[5] Similarly, visual memory involves the immediate recall of all the characteristics of a form.[6] The faculty of visualization allows for more complex manipulation of visual space by "forming a mental visual image of an object not present to the eyes, or the image itself."[7]

Initially, the child familiarizes himself/herself with the forms and placement of the pieces in their appropriate spaces. After sufficient practice, the pieces are placed out of view of the patient, behind a partition. The patient then reaches around the partition to pick up a single piece. Through tactual and kinesthetic perception, the child describes the form being held. *Visualization* is required in this procedure. The child brings the piece into view for visual verification, then places it into its appropriate space on the form board, which is on his or her side of the partition. The procedure is repeated for the other pieces.

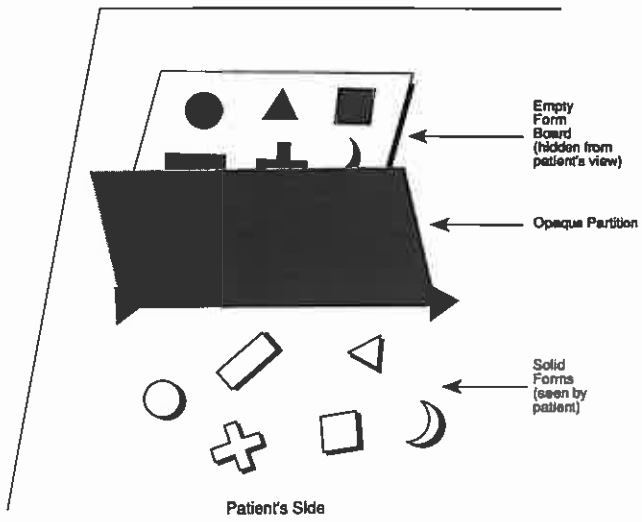

Figure 1. Six-piece Form Board.

In the next stage, both the board and the pieces are placed out of view behind the partition. The patient picks up each piece and puts it in front of the partition so it can be seen. Each piece is to be arranged so that its location and orientation correspond to the exact position on the concealed form board. Both *visual spatial relationships* and *visual memory* are required.

Hare and Hound

This chalkboard training procedure can be used to improve *visual-motor speed, visual-motor precision,* and *saccadic eye movements and fixations*, particularly in the pre-operational stage (2-7 years). Visual-motor skills pertain to the intersensory integration of visual receptive and motor expressive areas,[7] with sub-categories of quickness and accuracy. Optometric vision therapy has customarily included the precise control of eye movements because lack of control may be a factor in matching perceptual data with motor data.[3]

The therapist is initially the "hare" and the patient is the "hound." The therapist attempts to place X's on the chalkboard faster than the patient can connect them by drawing a line from X to X. When the "hound" catches the "hare," the roles are reversed.

Electro Trace

This procedure can be used to improve *eye-hand coordination, depth perception awareness*, and *pursuit and saccadic eye movements as well as fixations*. We have modified the original technique to resemble that of Robert Sanet, O.D., of Lemon Grove, California. Improvement of eye-hand coordination relates to the visual-motor skills discussed in the "Hare and the Hound." Depth perception awareness pertains to the visual appreciation of three-dimensional space, a desired skill for many areas of function. Improvement of eye movements and fixations is important, as previously stated. Electro Trace training is beneficiallater on in the pre-operational stage.

The patient holds a penlight and directs the beam through a clear plastic sheet. On the other side of the plastic sheet

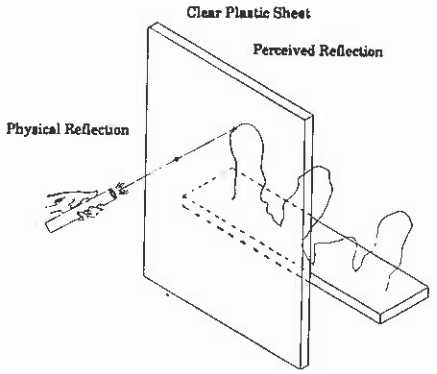

Figure 2. Modified Electro Tracer

is a flexible wire mounted at each end onto a wooden baseboard (see Figure 2). The wire is convoluted in the up, down, near, and far directions. The perceived reflection is seen behind the plastic sheet, equal to the distance between the actual penlight and the plastic sheet.

The patient attempts to move the image of the penlight from one end of the wire to the other. The goal is to keep the image of the light bulb on the wire, with stereopsis being required so that it is neither too far nor too close. Paradoxically, the patient must move the penlight closer to him- or herself for a relatively more distant portion of the wire and further when the wire is nearer.

Classifications

This logical thinking game can be used in vision therapy for improving visual discrimination, figure-ground, and eye tracking in the concrete (7-11 years) or formal operations stages (older than 11 years). The procedure involves grouping of objects that share common attributes. For example, parquetry blocks of different sizes, shapes, and colors can be used.

Visual discrimination involves the child's ability to match or determine exact characteristics of two forms when one of the forms is among similar forms.[6] To perform this game, the child must also have the ability to visually perceive the form and to find it hidden in a conglomerated ground of matter (visual figure-ground).[6]

The first step requires the patient to name a single piece by several of its attributes, e.g., large, blue, triangle. This task can be used to improve visual discrimination. The next step is for the patient to sort similarly classified objects, e.g., all large, blue triangles and put them in one pile. This also involves visual figure-ground and eye tracking skills. The task can be made more difficult, as in the following example. The therapist chooses one parquetry block, say a small red diamond. The patient is asked to select ALL objects sharing any of the three attributes. For example, all small diamonds, red diamonds, or small red blocks of any shape. Other attributes, such as thickness (using blocks of varying thickness), may be added to the task for further complexity.

Discussion

Many of the other 174 games of Furth and Wachs are applicable to vision therapy objectives as in the five examples given here. Just as Suchoff[8] applied Piagetian concepts to the optometric examination of tthe child, Furth and Wachs applied these same concepts to education. We believe that both optometric and educational skills are involved in these games. Optometric vision therapy, therefore, has the potential to help the patient develop in both of these areas. Consequently, the use of these and similar techniques can facilitate thinking going to school and to vision therapy!

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