



# IMPACT OF VISION THERAPY AND PRIMITIVE REFLEX INTEGRATION ON VISUAL AND COGNITIVE OUTCOMES IN A CHILD WITH ADHD AND VISUAL DYSLEXIA – A CASE REPORT

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## Introduction

Attention-deficit/hyperactivity disorder (ADHD) is a prevalent neurodevelopmental disorder characterized by persistent inattention, hyperactivity, and impulsivity that significantly interfere with academic and social functioning. Affecting approximately 5% of children worldwide, ADHD frequently coexists with learning disorders, including reading disabilities [1,2]. Beyond behavioral symptoms, children with ADHD commonly exhibit executive dysfunction, impaired visual attention, and oculomotor instability, all of which may compromise reading fluency and visual information processing [2].

Visual dyslexia has been proposed as a subtype of developmental dyslexia in which visuospatial and subperceptual deficits predominate over phonological impairment. Representing approximately 4–16% of dyslexic cases [3,4], it is clinically characterized by letter reversals, mirror confusions, spatial transpositions, and excessive whole-word substitutions. Early observations associated these errors with incomplete cerebral dominance and mixed laterality [5], while subsequent research identified unstable binocular control, inconsistent ocular dominance, and abnormal eye movement patterns—including prolonged fixations and increased regressive saccades—despite normal visual acuity [6–8]. Such findings suggest that oculomotor and visuospatial instability contribute significantly to reading inefficiency.

Primitive reflexes, normally integrated during early development, play a foundational role in postural control and sensorimotor maturation. Persistence of reflexes such as ATNR, STNR, Moro, and TLR may interfere with fixation stability, convergence, tracking, and vestibular–ocular coordination—skills essential for efficient reading and writing. The coexistence of ADHD and visual dyslexia may therefore compound deficits in attention, binocular stability, and cognitive control. Within a functional vision framework, understanding these interacting mechanisms provides a rationale for therapeutic approaches combining vision therapy and primitive reflex integration to optimize visual and academic outcomes.

## Case summary & Methodology

### CHIEF COMPLAINT

A 7-year-old boy presented with persistent academic difficulties including difficulty in reading, comprehension, phonics, spelling retention, copying from the board, and inability to read or write independently without guidance. Despite poor academic performance, the child demonstrated good intellectual potential and responded better verbally than in written tasks. Difficulty in directionality and laterality was also reported.

### VISUAL SYMPTOMS

Avoids reading and writing tasks, difficulty in copying from the board, poor reading fluency and comprehension, confusion in directionality and laterality, and excessive head and body movements during visual tasks.

### BIRTH HISTORY AND DEVELOPMENTAL HISTORY

The child was born preterm at eight months of gestation by LSCS with a birth weight of 1.6 kg. Antenatal history was significant for maternal eclampsia. The child required NICU admission for one day with ventilatory support. Developmental history revealed delayed motor milestones and speech delay.

### OCULAR HISTORY

Previously evaluated at a tertiary eye hospital. Refractive error was +0.50 / -1.25 × 180 in the right eye and +0.50 / -2.00 × 180 in the left eye. The child was compliant with spectacle wear.

### INITIAL EXAMINATION

Best-corrected visual acuity was 6/6 in both eyes with near vision of N6. Subjective Refraction remained unchanged. Near point of convergence was receded (15–20 cm), suggestive of convergence insufficiency. Oculomotor evaluation revealed poor saccades and pursuits with excessive head and body movements, indicating reduced fixation stability. TVPS-R showed delayed visual perceptual skills, particularly sequential and spatial visual memory. Beery VMI revealed delayed visual-motor integration. Primitive reflex assessment showed retention of the palmar reflex, Babinski reflex, Tonic Labyrinthine Reflex (TLR), along with LHRR and OHRR.

### Phase 1 of the Treatment

A personalized vision therapy program was initiated focusing on monocular and binocular saccadic training, pursuit exercises, convergence and accommodation therapy, visual perceptual training, and initiation of palmar and Babinski reflex integration.

### Phase 2 of the Treatment

Therapy progressed to bilateral integration and gross motor activities to improve midline crossing, postural stability, and integration of the Tonic Labyrinthine Reflex (TLR).

### Phase 3 of the Treatment

Advanced visual skill development, including fine saccadic control, complex tracking, and higher-level visual–motor integration for board copying. Continued ATNR integration and reinforcement of previously inhibited reflexes were included to support bilateral coordination and postural stability.

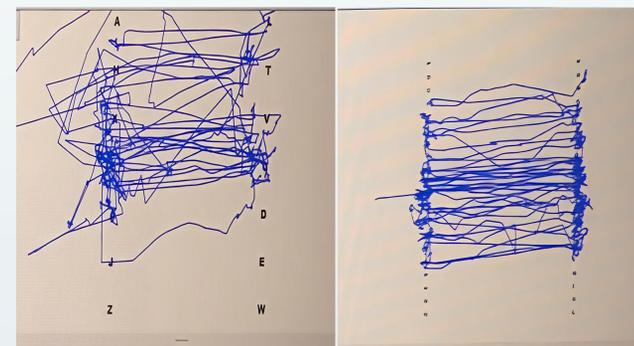
Directionality training was incorporated using the CPT pegboard, geoboard, and parquetry blocks to strengthen left–right awareness and spatial orientation. Tasks required rotating shapes (e.g., 90° right or left) and accurately reproducing the final pattern. Multi-tasking activities were added such as, the child memorized five items (e.g., flower names) before the task and recalled them afterward, targeting working memory and divided attention.

Procedure Area	Tool / Module	Clinical Purpose
Saccades	SVI – Saccades Module	Enhances saccadic accuracy, fixation stability, peripheral awareness, and reaction time
	Hart Chart (Distance / Near–Far)	Improves speed and precision of fixation shifts
	Saccadic Workbook & Strips	Develops voluntary saccadic control and reduces regressions
	Eye Bab – Eye Jump	Trains rapid gaze shifts and saccadic timing
	Infinity Pattern Tracking	Strengthens directional control and sequencing
Pursuits	Perceptual Visual Tracking (PVT)	Structured training for saccadic and pursuit accuracy
	SVI Rotator & Tracking Module	Improves smooth pursuit accuracy and sequencing control
	Infinity Tracking	Promotes sustained and controlled ocular tracking
	Eye Bab – Eye Motion	Enhances gaze stability and pursuit endurance
	Marsden Ball (Follow & Tap)	Improves dynamic tracking and eye–hand coordination
Vergence	Petrosyan Manual Tracking	Develops pursuit precision and visual stamina
	Perceptual Visual Tracking (PVT)	Reinforces structured pursuit control
	VTS 4	Computerized vergence and fusional training
	Jump Duction (Base–Out)	Increases convergence flexibility and fusional reserves
	Brock String	Improves convergence accuracy and suppression awareness
Accommodation	Aperture Ruler	Enhances near point of convergence
	Tranaglyphs	Expands vergence ranges and supports binocular stability
	Bernell Eye Port	Stimulates vergence and ocular motility responses
	Loose Lens Rock	Improves accommodative amplitude
	Flippers (±2.00 DS)	Enhances accommodative facility
Visual Perception	Near–Far Hart Chart	Trains accommodative rock and focus shifts
	CPT – Visual Memory / Sequential Memory / Directionality / Closure	Develops higher-order visual processing skills
	CPT – Visual–Motor Integration (VMI)	Strengthens perception–motor integration
	Parquetry Blocks (Indirect Copy)	Enhances visual–spatial construction skills
	Multi Matrix – Figure Ground	Improves visual discrimination in complex backgrounds
Visual–Motor Coordination	VMC (Bat) with Marsden Ball	Improves bilateral coordination and visual–motor timing
Reflex Integration & Gross Motor	Vestibular Activities (Balance Board)	Integrates visual tasks with postural control
	TLR & ATNR Integration Exercises	Reduces primitive reflex interference affecting visual–motor performance

## Result

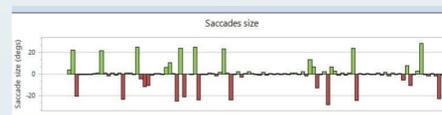
After 12 months of structured vision therapy, the patient demonstrated significant improvements in visual efficiency skills, accompanied by enhanced perceptual performance on the TVPS-R and measurable gains in visual–motor integration as evidenced by improved Berry–VMI scores

SUBTEST	PRE VISION-THERAPY	PERCENTILE RANK	POST VISION THERAPY	PERCENTILE RANK
	TVPS-R 1st Visit RAW SCORE		TVPS-R (Post Weeks of VT) RAW SCORE	
VISUAL DISCRIMINATION	7	2	14	79
VISUAL MEMORY	7	1	12	53
VISUAL SPATIAL RELATIONSHIP	NA	NA	15	87
FORM CONSTANCY	7	8	14	90
SEQUENTIAL MEMORY	NA	NA	8	16
FIGURE GROUND	7	6	14	90
VISUAL CLOSURE	7	9	12	70



TVPS-R Results Pre and Post VT sessions

Letter Saccades Results Pre and Post VT sessions



Saccadic eye-movement results pre- and post-VT sessions

## Discussion

Children with ADHD often exhibit binocular vision and oculomotor difficulties that interfere with efficient reading. Convergence insufficiency, reduced fixation stability, inaccurate saccades, increased regressions, and poor smooth pursuit control are commonly observed [7–9]. These abnormalities contribute to line skipping, slower reading speed, visual fatigue, and reduced comprehension, particularly during sustained near tasks.

Visual dyslexia is primarily associated with deficits in visual information processing and perceptual organization. Magnocellular dysfunction may impair temporal processing and visual stability, reducing visual span and sequential letter recognition [4]. Visuospatial attention and perceptual encoding difficulties contribute to letter reversals, mirror confusions, and spatial transpositions [5,6], along with unstable binocular control and abnormal eye movement patterns during reading [7–9]. When ADHD and visual dyslexia coexist, oculomotor instability may compound perceptual processing deficits, increasing reading demand. Persistent primitive reflexes (ATNR, STNR, Moro, TLR) may further disrupt binocular coordination and vestibular–ocular stability. In our report, similar mechanisms are discussed, supporting the role of vision therapy and reflex integration in improving visual efficiency and functional academic performance.

## Conclusion

This case report emphasizes the role of a comprehensive, vision-based approach in managing visual and cognitive difficulties in a child with visual dyslexia and ADHD. Vision therapy, when combined with primitive reflex integration techniques, demonstrated meaningful improvements in visual efficiency, oculomotor control, and functional visual performance related to academic tasks. Addressing retained primitive reflexes alongside visual deficits supports better sensorimotor organization and visual–motor integration. These findings reinforce the importance of considering developmental vision care as part of a multidisciplinary management strategy for children presenting with complex learning and attention-related challenges. Further studies with larger sample sizes are recommended to establish long-term outcomes and strengthen clinical protocols integrating vision therapy and reflex integration.

## References

<https://docs.google.com/document/d/12kr8-LASOads0l9UeChVykBn5TICJem0qhjfxDfdIBI/edit?usp=sharing>

