Handwriting Reveals Visual Memory Perceptual Changes Through Whole-Brain Accelerated Learning Activation

Jan Kuyper Erland

The Special Education Advisor October 2010 award article follows this summary

Abstract: This report documents rapid visual perceptual change that occurred after just ten, twenty, and twenty-four hours of daily, intensive, accelerated learning intervention applying prosodic choral speaking with puppet models over a period of years, beginning in 1981. Early, then routinely administered, versions of the Detroit Tests of Learning Aptitude, (versions 1 & 2) were the instrument measures. A series of standardized test measurement's written answers depicted higher mental organization revealed through handwriting samples.

This report documents visual perceptual changes with individuals of various ages, and at what incremental intervention points they occurred following intensive Accelerated Learning (AL) instruction. It is important to stress that penmanship, as such, was not being taught, but rather focus, visual patterning, visual-auditory sequential memory, and attentional modeling through Bandura's (1977) Social Learning Theory and Accelerated Learning practice (Lozanov, 1978, 1971).

The seven exhibits are a combination of assessment samples from The Detroit Tests of Leaning Aptitude-1 and -2, (DTLA,-1, Baker and Leland, 1935, 1967; revised, DTLA-2, Hammill, 1985) They were outcome measures of verbal and written samples of the DTLA-1 Verbal Opposites/Antonyms #4 subtest (exhibit written samples #s 1 & 4), and the DTLA-2 Visual Memory for Fragments #10 subtest (exhibit written samples #s 3, 5, & 7). Exhibit samples #s 2 & 4 are class spelling written examples and letter sequences.

DTLA-1 subtest #4 (Verbal Opposites/Antonyms) was used as a testing instrument from 1981-1985, and the DTLA-2, with #10, (Visual Memory for Fragments) was used from the early research years 1981 to 2006. To maintain consistency with the on-going data base, the DTLA-2 tests were continued in application even as subsequent DTLA versions were developed.

The DTLA-1 subtest #4 Verbal Opposites/Antonyms was one of nine subtests measured and reported in mental age, then used to calculate intelligence up until the 1985 revision by Hammill. When the DTLA-2 #10 Visual Closure subtest became available, the DTLA-1 subtest Verbal Opposites subtest #4 was eliminated, as it was no longer included with the nationally standardized DTLA-2 cognitive skills battery.

Exhibit 1 is a 1983 referenced notation of the DTLA-1 scores converted to mental ages (M.A.), an early popular measure of age normed performance on an intelligence test (Fencher, 1990). The revised DTLA-2 measured performance on the subtests by standard scores, which was more reliable than converting to mental age scores used in the DTLA-1. Raw scores are transferred to standard scores that establish a common subtest mean score with a standard deviation. Because standard scores provide equivalent indices for each subtest, they are comparable. (Hammill, 1985, p. 50).

Instead of nine DTLA-1 subtests needing to be administered to obtain an intelligence profile, only four DTLA-2 subtests were now required to obtain an intelligence quotient (IQ). Subsequently, these four aptitude subtests were selected and administered at all research sites for all demographic and age groups, as they covered all four of the primary clinical domains recommended for clinical research: Linguistic, Cognitive, Attentional, and Motoric.: Word Fragments (#10), Memory for Auditory Words (#6), Visual Memory for Letters (#16) and Oral Directions (#18). Intelligence and subtest notations regarding these tests are itemized on exhibits 5 and 6.

The Word Fragments (#10) subtest is a representation of mutilated words, or by which visual elements are missing. Since simple words easily become over-learned, the person should automatically recognize them if parts are missing, a visual closure function, or the ability to see the right-brain figure against the background. A deficiency in this cognitive ability area is conducive to reading difficulties.

The student is asked to repeat them individually and privately aloud after the samples are presented, but in this research instance, they additionally wrote them on paper to create documenting hard copy of their verbal responses and the overt changes that were taking place.

The answers were never disclosed or rehearsed at any time from pre-to posttest. Following the accelerated learning prosody and puppets training, there was consistent marked improvement in the students' ability to see and understand the right-brain detail and closure on the mutilated words. What they had not been able to read before, now they could.

It is important to document that these changes were occurring with the first original 1980s training sets, thereby indicating the original choral speaking and modeling paradigm methodology could be creating the outcome. This hypothesis was later verified by Erland's (1999) research report whereby a 7th grade gifted experimental classroom utilized the practice worksheets and written materials, but eliminated the video-tape puppets and rehearsal choral speaking, and outcome results were not obtained. An experimental average ability sixth grade class implementing the methodology correctly, received twice the academic achievement scores, over the gifted classroom.

The perceptual changes on the written auxiliary Visual Word Fragments (#10) subtests were immediately apparent, and came by surprise when the updated DTLA-2 testing was begun in 1985. Although visual memory cognitive skills improvement pre- to posttest changes appeared in nearly every case, the handwriting changes appeared intermittingly, yet often enough to motivate this researcher to continue applying and measuring this unique methodology. Interestingly, early mental reorganization changes appeared soon in the treatment phases, after just ten- to-twenty hours of consistent intensive application.

The investigative work encompassed a variety of ages from children age ten, to teens and adults. Four classrooms' of written samples of the DTLA-2 #10 Memory for Word Fragments

subtests formed a book of assessment outcome examples, which included three fourth grades and a fifth grade classroom plus some of these early individual samples.

The intervention included daily intensive rehearsal right- and left-brain verbal and visualization rehearsal (Bell, 1991; Erland, 1989, Paivio, 1986) with a variety of models (Bandura, 1977, 1971; Erland, 1989). Each exercise shifted multiple times from right to left to whole brain activity, which included rhythmic choral speaking and self-talk (Bandura, 1981, Erland, 1989, Meichenbaum, 1979). Without twenty-four hours of intensive training with this methodology, these changes would be most unlikely to occur, and have not been seen in other research studies. (see figure 1. Erland, 1986, 1988)

Not only visual closure improved, but visual memory for letter sequencing shows marked change in ten-twelve- to- twenty hours' time in both the 15- and 48-day formats. The following seven examples are a small sampling of those in a wide data base.

Baker, H. J. and Leland, B. (1965, 1935). The Detroit Tests of Learning Aptitude-1. Indianapolis, IN. Bobbs-Merrill.

Bandura, A. (1977, 1971). Social Learning Theory. Palo Alto, CA: Stanford University Press.

Bell, N. (1991). Visualization and verbalization for language comprehension. Paso Robles, CA: NBI Pub.

Erland, J. (Fall 1999). Brain-based accelerated learning and cognitive skills training using interactive media expedites high academic achievement. Journal of Accelerative Learning and Teaching, 24, (3 & 4). 1-100

Erland, J. (Spring 1989) Retraining cognitive abilities: A report on thinking and memory improvement combining Suggestopedia with Cognitive Behavior Modification (CBM) for ages 10-55. The Journal of Accelerative Learning and Teaching. 14, (1). 3-42.

Erland, J. (1986). Step-by-step teacher's right and left-brain instructions, based upon the Memory Retainer. Lawrence, Kansas. Copyrighted February 22, 1988, Txu 319-625.

Fencher, R. (1990). Pioneers of Psychology. New York: Norton.

Hammill, D. D. (1985, 1998). Detroit Tests of Learning Aptitude-2. Austin, TX: Pro-Ed.

Lozanov, G. (1978, 1971) Suggestology and outlines of Suggestopedy. New York: Gordon & Breach.

Meichenbaum, D. (1991, 1978). Cognitive behavior modification: An integrative approach. New York: Plenum Press.

Paivio, A. (1986). Mental representations: A dual coding approach. New York: Oxford University Press.

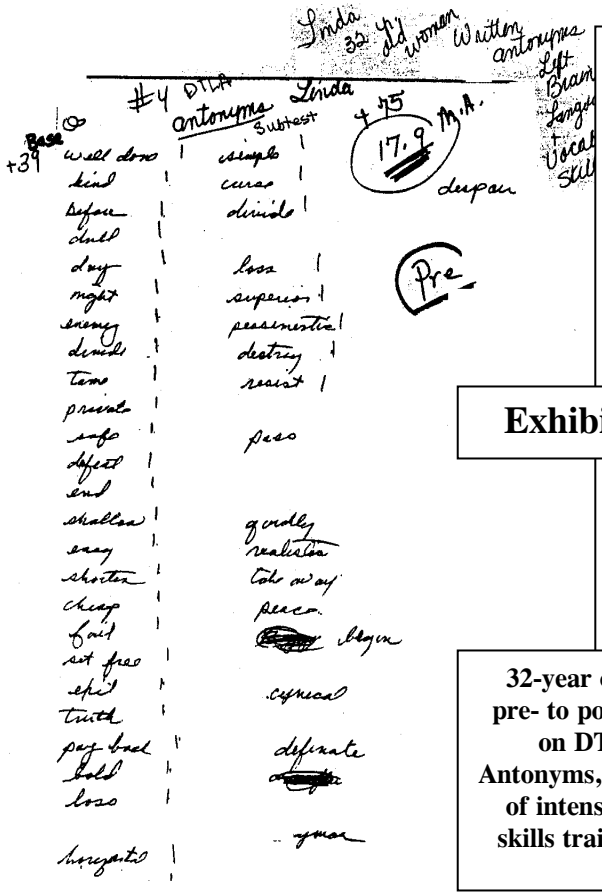
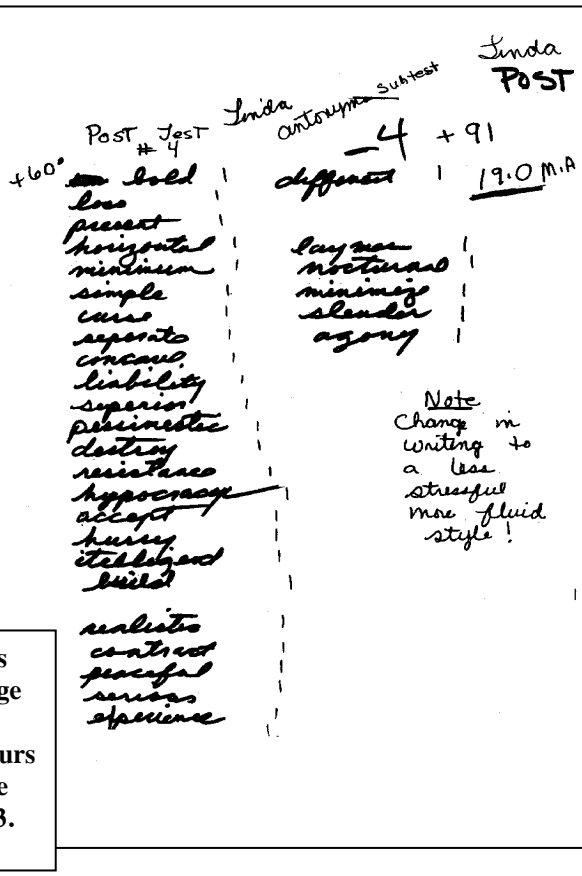


Exhibit 1



32-year old woman's pre- to posttest change on DTLA-1 #4, Antonyms, after 30 hours of intensive cognitive skills training in 1983.

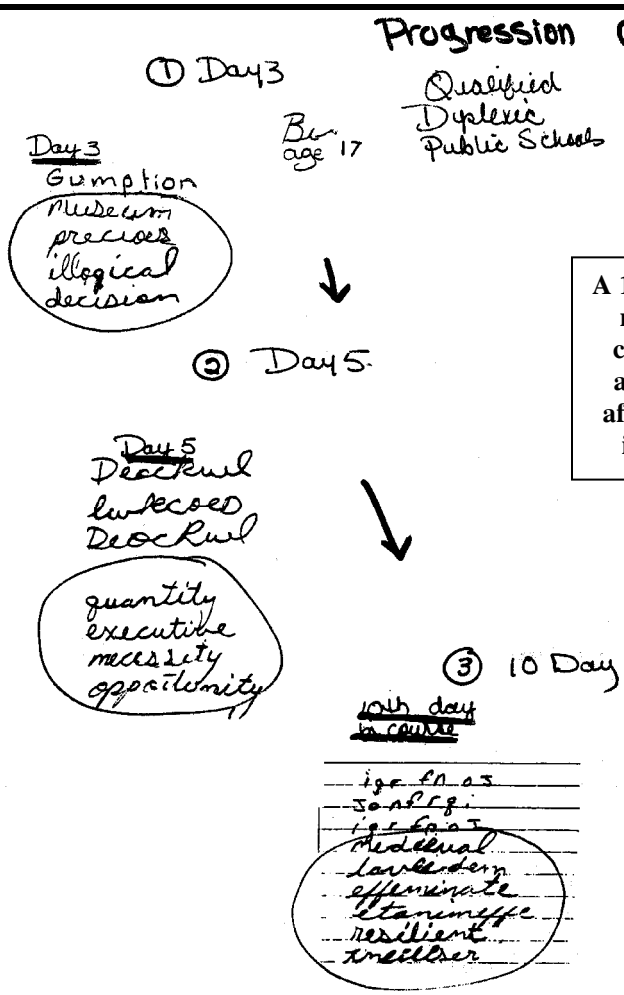


Exhibit 2, Days 3, 5 & 10

A 17-year old Dyslexic male's perceptual change with letters and spelling words after 20 hours of AL intensive training

Exhibit 3

Pre

Pre-test D.H.

1. stop
2. the
3. why
4. there
5. around
6. people
7. always
8. every
9. high
10. play
11. today
12. little
13. morning
14. to
15. night
16. some
17. what
18. sex sir
19. while
20. sure
21. door
22. should
23. of
24. or be
25. funny
26. no
27. good
29. and
29. no we
30. did
31. something
32. together
33. which
34. laugh
35. do
36. because
37. yellow
38. pretty
39. in

DTLA #10 Word fragments subtest

39 − 3 = 36

16-year old male, 24-hours of intensive drilling creates fluid left-brain sequencing ability on the DTLA-2 #10 Word Fragments subtest

Post

D.H.

DTLA #10 subtest Word fragments Visual closure

39 − 2 = 37

1. stop
2. the
3. why
4. there
5. around
6. people
7. always
8. every
9. high
10. play
11. today
12. little
13. morning
14. to
15. night
16. some
17. what
18. sex ✓ six
19. while
20. sure
21. door
22. some
23. of
24. or ✓ be
25. funny
26. no
27. good
28. and
29. are
30. did
31. something
32. together
33. which
34. laugh
35. do
36. because
37. yellow
38. pretty
39. in

Exhibit 4

Pre

Page 1

DTLA-1 #4 subtest Antonyms Pre +65 - 66 16.6 age 27.8

Dan pre

+34 bare

ugly	after ✓
Fresh	Shallow
Brunet sp	easy
Vacant ✓	Lengthen Short
different	Cheap
cooked	Freedom ✓
good	exit
before	truthful
dull	borrow
day ✓	agressive
Eniny sp	
devide sp	
tame	
privit sp	Horsontal sp
passave sp ✓	minium sp
Failer sp ✓	Simple

A 27-year old male college student after 15 days of intensive training, 1984, on the DTLA-1, #4, Antonyms subtest.

POST #4 antonyms +84 18.6 M.A. age 27.8

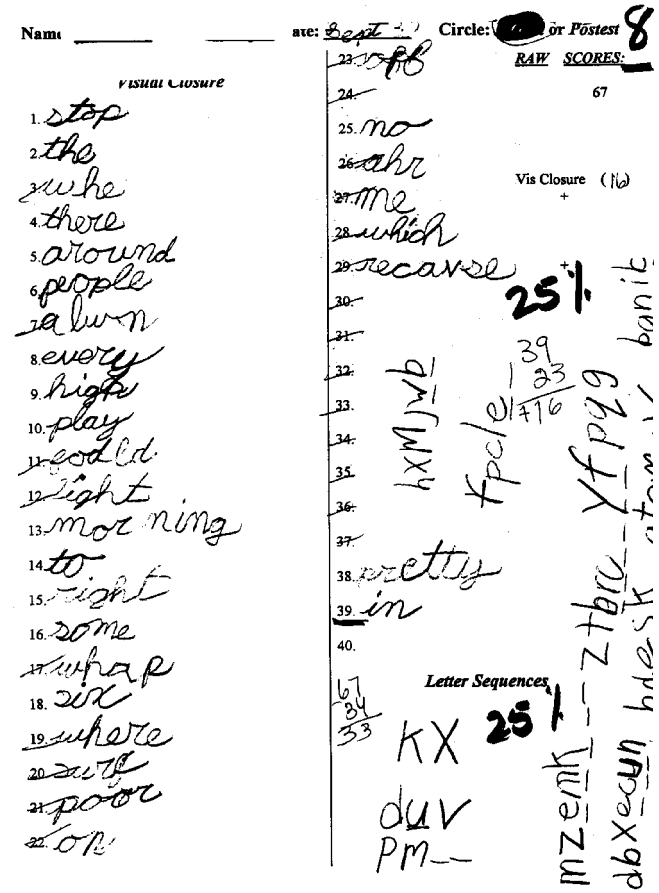
Dan

Post

true	passive	simple
hate	failure sp	curse
forget	end	Peperate sp
ugly	shallow	Concave
freash sp	easy	falter sp
Brunette	shorter	superior
Pleasant sp	cheap sp	pestimistic sp
different	fail	Destroy
cooked	free	oppressive
sad	exit	Sutacory sp ✓
before	truthful	except sp
dull	borrow	morning
morning	aggressive	
enimy sp	Loss	
divide	present	
tame	Horizontal sp	
Animate sp		

A 10-year old 4th grade male student after 12 days of intensive training. Note below: +33 IQ pts. improvement on the DTLA-2, #10 Word Fragments subtest. Pretest = 92; posttest = 125.

Day 1 at left



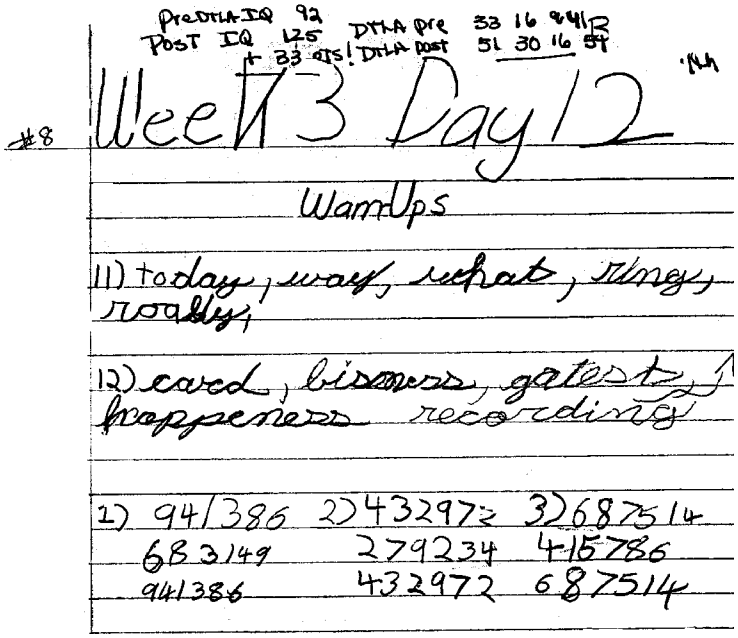
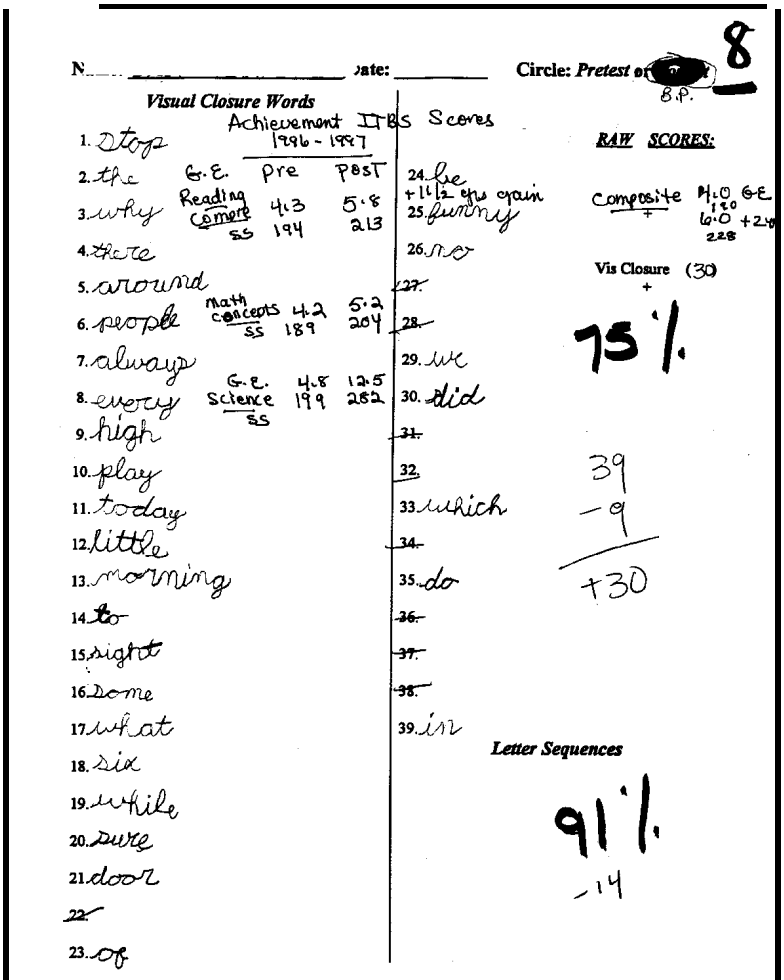


Exhibit 5, progression, Days 1, 12, 46



The same 4th grade male student's academic achievement pre- and posttest standard and G. E. scores after 24 hours of intensive training. Note science improvement from 4.8 to 12.5 G.E. in one semester's time. Two year's improvement shows on the composite.

Exhibit 6, Day 1

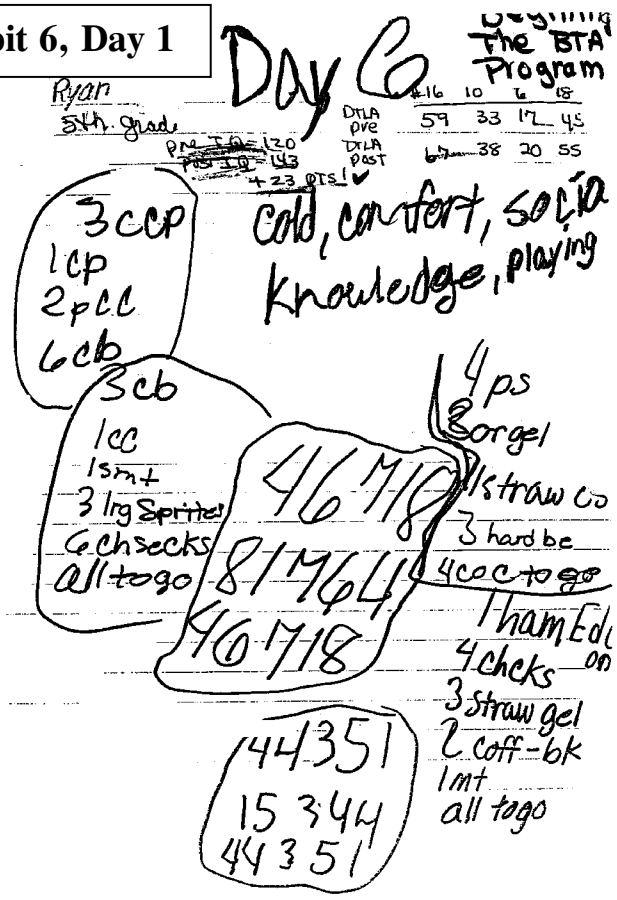
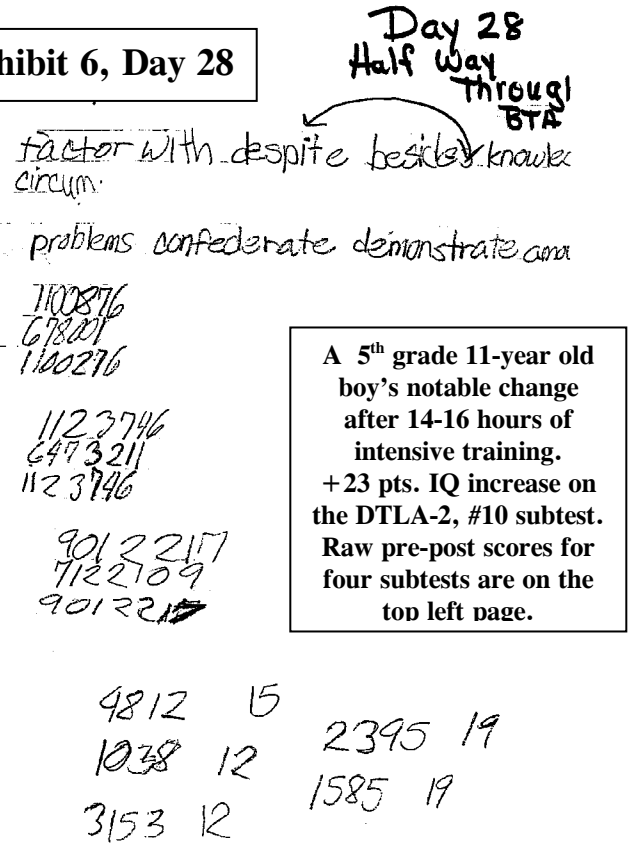


Exhibit 6, Day 28



A 5th grade 11-year old boy's notable change after 14-16 hours of intensive training. +23 pts. IQ increase on the DTLA-2, #10 subtest. Raw pre-post scores for four subtests are on the top left page.

Exhibit 7, pre

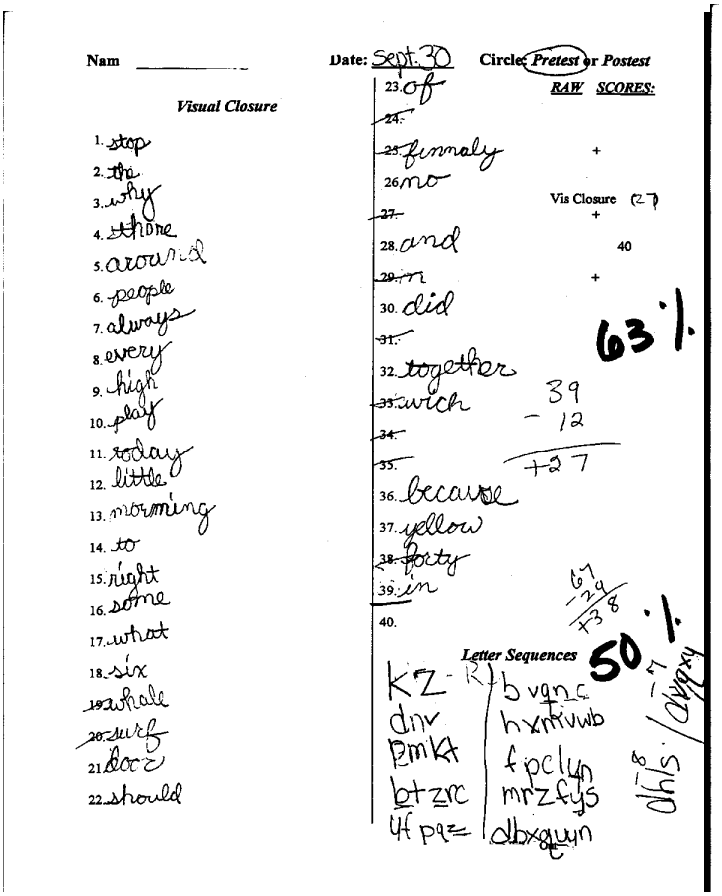
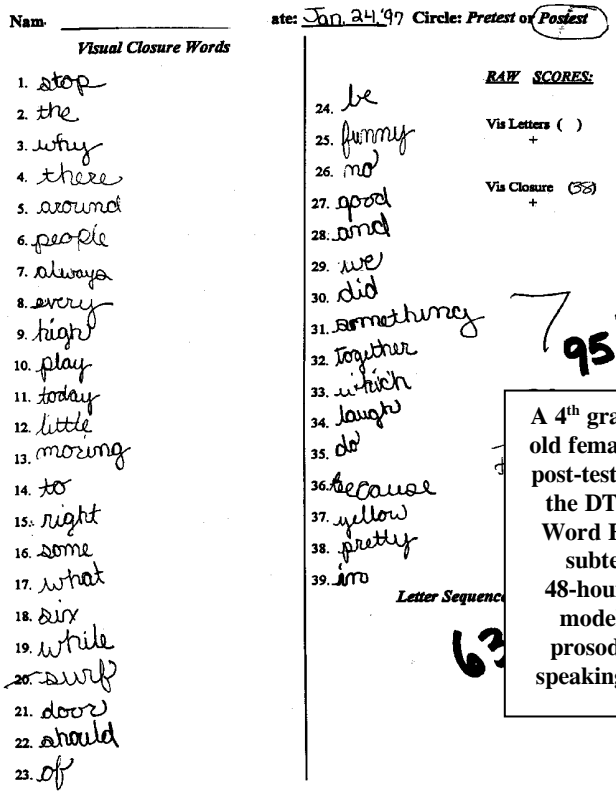


Exhibit 7, post



A 4th grade 10-year old female's pre- to post-test change on the DTLA-2 #10 Word Fragments subtest after 48-hours of peer modeling and prosodic choral speaking training.

INTENSIVE SENSORY INTEGRATION INSTRUCTION TRANSFORMS HANDWRITING"

By Jan Kuyper Erland

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Won "Top Ten Most Viewed Articles, 2010"

A recent Wall Street Journal article, "How Handwriting Trains the Brain" [i] could conversely be stated that "Brain Training Changes Handwriting." Technically speaking, increased and retrained brain activity can transform handwriting following twenty hours of intensive multi-sensory integration instruction.

What is Multi-Sensory Integration? Sensory integration can be defined as a successful combination of the visual, auditory, and tactile input processes to the brain. Early pioneer researcher and occupational therapist, Anna Jean Ayres, (1920–1989) [ii] wrote several books on the topic describing how deficits in sensory perception blocked informational input to the brain inhibiting motor output.

Her forward-thinking work stirred controversy for a number of years. She wrote, quoted in the 1980s, Wikipedia, [iii] "It has not been easy for the helping professions to conceive of human behavior as an express of the brain, and they are still struggling to do so." Unfortunately, these brain-learning, theory-practice amalgams remain today.

Which Cognitive Abilities are Required for Handwriting and Written Communication? Handwriting requires right-brain visual closure and spatial perceptual ability, with left-brain sequencing of letters combined with fine motor coordination.[iv] The connection of visual (seeing) and auditory (listening) learning are required for *understanding*, or the "integration of information." [v]

Was Penmanship Taught? It is important to note that penmanship was not trained in my classes; per se. Students were instructed to "Think, Say, Do," following the renowned Bandura's 1971, [vi] Social Learning Theory, and the Gillingham & Stillman early reading-phonics multi-sensory model, 1970, which later became the recognized Orton-Gillingham Dyslexia training program.[vii]

Can Visual and Auditory Abilities Be Reliably Measured through Formal and Informal Assessments? Recognized norm-referenced, valid and reliable cognitive skills test batteries readily measure these sensory processing areas, The Detroit Tests of Learning Aptitude (DTLA) v. 1, 2 Visual Closure, Letters Sequences,, Auditory Memory for Words, and Oral Directions subtests; v. 3, & 4 subtests came later., (Hammill, 1985;[viii] Baker and Leland, 1967, 1935, [ix] Pro-Ed). Additionally, Visual and auditory memory subtests from the Woodcock-Johnson Psycho-Educational Battery (1978) were also applied to obtain student baselines.[x]

When I first began testing and retraining cognitive abilities in 1980,[xi] it became an ongoing incubation project covering many years of test-teach-test-publish iterations applying my puppetry and choral speech methodology to these recognized research and practice models. The sensory integration interventions revealed pre-posttest training change on the visual closure and letter sequencing DTLA subtests, beginning in 1981 following my program instructional interventions.

Can Handwriting Change Reliably Indicate Changes in Learning Capability? Notable handwriting changes were consistently and immediately evident with a perceptual "turning point" after twenty hours of daily, intensive, multi-sensory training. Fourth and fifth grade students with additional adult pre-to-posttest handwriting and testing cumulative compilations exist, documenting perceptual and fine motor change.

With school classroom 48-Day, 24-hours of prescribed sensory integration implementation, following the same twenty hours of media-based instruction, revealed improved perception, thought, handwriting, and test-taking.

One experimental study evidenced posttest change with one-two-year marked longitudinal student improvement with two classrooms of low-achieving/low auditory processing fourth graders on the Iowa Tests of Basic Skills CogAT Quantitative (pretest 58%-posttest 71%; 2-yr. 70%) and Nonverbal (pretest 59%-posttest 72%; 2-yr. Long 76%) areas. (Iowa Tests of Basic Skills, CogAT[xii] and Erland, J. K. 2000,[xiii] p.20). The CogAT test was externally administered by the school and scored by the Princeton Educational Testing Service (ETS). These results have a high correlation with reading comprehension and mathematical learning. Individual student three-year CogAT trending is on pp. 22-23 of this published report (Erland, 2000).

Early on, it was determined through continuous, in-depth assessment and monitoring of all levels of learners and ages; children, business adults, and college students, that most individuals have information processing weaknesses or cognitive gaps ranging from mild- to- moderate- to- severe. And, unidentified, they are forced to cope with them.

Seeing continuous formal assessment outcome success, the ongoing research was continuously documented (1989-2000) in a scientific publication, The Journal of Accelerated Learning and Teaching. Needing a nominal reference for this research intervention, the edutainment methodology of using puppetry and choral speech was given the name: *The Bridge to Achievement*® (The BTA). The accompanying continuous formal assessment regulated that trained students were not merely "motivated', or thus transformed through positive thinking, but had outcomes of improved reading and math scores. [xiv] Yet, this overt handwriting transformation also operated as positive personal feedback and as an incentive for learners to "keep trying."

To eliminate the possible motivational contamination of using puppets as "novel stimuli," an eleven classroom experimental study was conducted using an "alternate media activity" for the control groups. [xv]

Discovering Learning Issues: Problems in these cognitive and fine motor areas show up in the early grades when basic skills are initially taught, indicating visual perceptual difficulties or directed as ADHD. While many children are formally referred and tested for Special Education from classroom observations, many are not, and subsequently fall through the cracks, missing important inter-sensory training during the critical early years.

Parents should show advocacy and watch for faulty handwriting symptoms and seek professional guidance and direction. Ignoring these critical perceptual symptoms, leads to a life-time of potential auxiliary written communication set-backs and other social-educational learning issues.

Another recent Sped Advisor article by Claire Nissenbaum, M.A., "Messy Handwriting is a Predictor of ADHD in Girls," [xvi] also indicates perceptual-penmanship red flags, because boys have spatial and coordination advantage over girls, Durden-Smith and DeSimone, 1984.[xvii] Yet, boys outnumber girls in

Special Education referrals and many parents do not want labeling stigma, "Once In, Never Out." p. 115 Turnbull, Stowe, Huerta, 2007.[xviii]

The bottom line is that perceptual and fine motor skill problems, as evidenced in handwriting samples, can be retrained through cognitive skill sensory integration instruction. Many well-known programs have existed for some time that offers this type of training in varying methodology formats and time requirements, obtaining a range of outcome results.

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[i] Bounds, G. (October 5, 2010). How handwriting trains the brain. The Wall Street Journal. Health and Wellness. D1

[ii] Ayres, J. A. (1972). Sensory integration and learning disorders. Los Angeles: Western Psychological Corporation.

[iii] Wikipedia: Anna Jean Ayres biography.

[iv] Reid, D. K., & Hresko, W. P. (1981). A cognitive approach to learning disabilities. New York: McGraw Hill.pp.16-17.

[v] Hessler, G. (1982). Use and interpretation of the Woodcock-Johnson psycho-educational battery. Hingham, MA: Teaching Resources.

[vi] Bandura, A. K. (1971). Social learning theory. Palo Alto, CA: Stanford University Press

[vii] Gillingham, A., & Stillman, B. W. (1970). Remedial training for children with specific disability in reading, spelling, and penmanship. Cambridge, MA: Educators Publishing Service, Inc.

[viii] Hammill, D. D. (1985). Detroit Tests of Learning Aptitude-2. Austin, TX: Pro-Ed.

[ix] Baker, H. & Leland, B. (1967). Detroit Tests of Learning Aptitude - 1. Indianapolis, IN: Bobbs-Merrill.

[x] Woodcock, R. W. (1978). Development and standardization of the Woodcock-Johnson psycho-educational battery. Higham, MA: Teaching Resources Corp.

[xi] Erland, J. K. (1980). Vicarious modeling using peers and puppets with learning disabled adolescents in following oral directions. Unpublished master's thesis. University of Kansas, Lawrence.

[xii] Riverside 2000. (1994). Iowa Tests of Basic Skills Integrated Assessment Program, Technical Summary I. Chicago, IL: The Riverside Publishing Co.(a subsidiary of Houghton Mifflin Harcourt)

[xiii] Erland, J. K. (Fall, 2000). Brain-Based accelerated learning longitudinal study revealed subsequent high academic achievement gain for low-achieving, low-cognitive skill fourth grade students. 25, (3&4).

[xiv] Erland, J. K. (1994). Video-taped instruction creates listening and visual memory integration for higher reading and math scores. Journal of the Society for Accelerative Learning and Teaching, 19, (2), 155-227.

[xv] Erland, J. K. (Fall, 1999). Brain-Based accelerated learning and cognitive skills training using interactive media expedites high academic achievement. Journal of Accelerative Learning and Teaching, 24, (3&4).

[xvi] Nissenbaum, C. (September 30, 2010). "Messy Handwriting is a Predictor of ADHD in Girls," Special Education Advisor; The IEP and Special Education Social Network.

[xvii] Durden-Smith and DeSimone, D. (1984) Sex and the Brain. New York: Warner Books.

[xviii] Turnbull, H.R., Stowe, M.J., and Huerta, N.E. (2007). Free Appropriate Public Education. Denver: Love Publishing.