Article

Diagnosing and Treating Visual Perceptual Issues in Gifted Children

Linda Kreger Silverman, PhD

The Gifted Development Center has been in operation since June of 1979. We have assessed over 4,000 children in the last 22 years. In the early 1980s, I noticed that several children had large discrepancies in their performance on items presented visually and items presented auditorally. Because of my background in special education, the first question that came to mind concerned modality strength. In some cases, the child's highest performance was on visually presented items. In other cases, the reverse was true. I sought out audiologists and vision specialists in the Denver area to refer clients with auditory or visual weaknesses. I cannot remember when and how I first began sending clients to Lynn Fishman Hellerstein, OD, FCOVD, FAAO. It is likely that a parent recommended her to me as a good referral source for children with visually-based weaknesses. I only recall her asking me to have lunch one day so that we could discuss some of the cases I was referring to her. We have enjoyed a wonderful working relationship ever since, and I have learned much of what I know about the value of vision therapy from Lynn.

I first became extremely interested in children who exhibited visual strengths and auditory weaknesses. This eventually led to the following observations: (a) gifted underachievers often had a high incidence of otitis media (recurrent ear infections),[1] particularly during the first few years of life; (b) many of these same children also displayed allergies and food sensitivities, especially to milk products;[2] (c) although otitis media did not depress IQ scores in the average range, it had a pronounced effect on IQ scores in the gifted range—the higher the IQ, the greater the impact;[3] (d) gifted children with a marked history of otitis usually had good auditory acuity, but impaired central auditory processing, often accompanied by attention deficits and poor handwriting; (e) many children whose auditory channel was blocked by infections during the first few years of life became *visual-spatial learners,*[4] a term I coined in 1982 to describe children who thought in images rather than in words.

In addition to referring these children to audiologists for the Central Auditory Processing Battery (developed by J. Willeford in Fort Collins, Colorado), I also referred numerous "otitis kids" to Lynn Hellerstein in Denver and Roger Dowis, OD, FCOVD, in Boulder, for vision evaluations. I made these referrals even when the auditory modality was significantly weaker than the visual modality, because (a) so many of the children suffered from visual-motor integration difficulties; and (b) I felt it was critical to their success to **shore up their stronger modality** to help them compensate for their auditory processing weaknesses.

We have also seen an increasing number of gifted children at our Center with sensory-

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Correspondence regarding this article should be addressed to Linda Kreger Silverman, Gifted Development Center, a service of I.S.A.D., 1452 Marion Street, Denver, Colorado 80218. gifted@gifteddevelopment.com

motor integration deficits.[5] And a leading occupational therapist in our area has noticed that a large percentage of the children she sees are gifted.[6] We suspect birthing issues, as gifted children often have excessively large heads that are difficult to get through the birth canal. Some children respond to the visual-motor interventions that are traditionally a part of vision therapy, whereas more severe cases with tactile/vestibular problems (e.g., difficulty tolerating textures or being touched; dislike or fear of movement; need for constant movement and stimulation, etc.) need to be referred to an occupational therapist trained in sensory integration. It is ideal to send our clients to a collaborative optometric and occupational therapy center that provides combined visual and sensory-motor processing evaluation and treatment.

Several years ago, I began referring clients to Rebecca Hutchins, OD, FCOVD. Becky's reaction to my first referral was classic. When she conducted her evaluation, she was disconcerted that the profoundly gifted girl I sent to her did not show obvious deficits or appear in need of vision therapy. Not wanting me to look bad to the parents, she called to discuss the case with me. I explained that the girl hated to do jigsaw puzzles, she had a relatively low score on Block Design on the Wechsler scale compared to her other scores, and these were red flags to me that her visual processing could be strengthened. I asked Becky to initiate vision therapy with the child. Tentatively, Becky agreed, wondering if this was at all appropriate. But short-term vision therapy made a difference in this child's comfort with visual activities. With gifted children, the diagnostic indicators of visual processing weaknesses are subtle, and even children with above average visual skills may experience frustration if their eyes or hands cannot keep up with their minds.

I was delighted to see that the COVD logo had a three-pronged focus on *prevention, rehabilitation,* and *enhancement.* The goal of therapy for the gifted may need to be thought of in terms of ***enhancement*** rather than rehabilitation. Rehabilitation conveys the feeling that we're fixing something that is broken. It is hard to look at average or above average tests scores and believe that something needs to be fixed. These "relative" weaknesses in the gifted certainly do not look problematic when compared with children whose visual processing is well below average. However, when children's intellectual ability is extremely high, but they struggle with reading or writing, even a relative visual and sensory-motor weakness prevents them from fulfilling their potential.

When I think of enhancement, sports vision usually comes to mind. I tell somewhat reluctant or skeptical children that even professional athletes do these visual activities to help them hit and catch a ball with greater precision and that vision therapy teaches athletes to visualize more clearly. Most boys that I refer for vision therapy like the idea that it might help them become better athletes. That has more motivational power than the promise of becoming a better reader or writer. Improvement of visual skills makes a difference in the quality of a child's life, even if it is not immediately apparent from the test scores that such improvement is necessary. If we take the goal of enhancement seriously, it gives us a frame of reference for working effectively with gifted children.

Today, 60% of our clients are from out-of-state (thanks to internet), and we refer them to optometrists all over the country. We are constantly on the phone with Lynn, asking her to check the directory for an optometrist who does vision therapy in this locale or that. The response of our clients to vision therapy has been overwhelmingly positive. Many talk about it having changed their lives, being the most important recommendation we made, making all the difference in the world. (See the section "What Do Parents Say About Vision Therapy?") We are sold. In fact, my daughter has recently become a vision therapist working with Becky Hutchins!

TESTING INTELLIGENCE IN GIFTED CHILDREN

From 1916 until the 1970s, the *Stanford-Binet Intelligence Scale* was considered the golden standard of psychological assessments, against which all other cognitive measures were compared. This scale is still unparalleled in its ability to differentiate children within both extremes of intelligence: the developmen-

tally advanced and the developmentally delayed. However, over the last 30 years, the *Wechsler Intelligence Scale for Children (WISC)* gradually has supplanted the Stanford-Binet in popularity in the schools, primarily because (1) it is easier to administer; (2) half of the subtests measure nonverbal reasoning, so it is considered more culturally fair; and (3) the test provides subtest and factor scores, rather than simply a global IQ score, making it easier to diagnose, compare, and research specific stengths and weaknesses. Most of our school-aged clients were assessed on one of these two instruments, and sometimes both.

For the first 10 years we primarily used the *Stanford-Binet Intelligence Scale, Form L-M (SBL-M),* for assessing intelligence. Until 1986, it was fairly typical to use the SBL-M in clinical practice, even though Wechsler scales were more popular in schools. We also experimented with the *Kaufman Assessment Battery for Children (K-ABC),* the *Wechsler Preschool and Primary Scale of Intelligence-Revised (WPPSI-R),* a test designed for children from 3 to 6, and the *Wechsler Intelligence Scale for Children-Revised (WISC-R).* But the low ceilings on these tests truncated the scores at the high end, making it impossible to differentiate levels within the gifted range, as well as failing to identify truly gifted children who would have qualified for placement in special schools or programs on the SBL-M. These other scales only go up to 160, with very few children obtaining scores above 150 (See Tables 1, 2). It is sort of like measuring 6-foot tall people with 5-foot rulers. The SBL-M, by comparison, has a very high ceiling, well into the adult range, and there is no limit to the IQ score that can be generated.

Everything changed in 1986, when the fourth edition of the *Stanford-Binet Intelligence Scale (SB-IV)* was released. We were probably the first ones on the block to buy it, gleefully assuming that it would correct all the problems of the L-M without losing its power. However, there were so few gifted children in the normative sample that the test constructors originally planned for the test to go only as high as 148, the third standard deviation. Eventually, they were persuaded (by psychologists like me, I'm embarrassed to admit) to extrapolate scores to 164, but that was like a bus stop that the bus only went to on very rare occasions. Essentially, the new Binet was only useful within 3 standard deviations, like most of the other IQ tests. The problem was that it rendered the old Binet, the SBL-M, obsolete so that we lost the only tool available for assessing children at the extremes of intelligence. Most school districts ignored the new Stanford-Binet in 1986, and continued to use the WISC-R. We felt justified in ignoring it as well, and continued to use the SBL-M, but gradually felt the pressure from schools to switch to the WISC-R. The main complaint leveled at us was that the SBL-M had "outdated norms," being normed in 1972, but the WISC-R, normed in 1974, was not much newer so we did not see what all the fuss was about.

You may be wondering why it would be important for tests to go higher than 148 or 160. It is critical to us because 16% of our clients, 636 children, test beyond 159. Let me give you one example. I tested a 6-year-old boy this year who had attained the highest possible score (19) on every single subtest of the WPPSI-R when he was 3 years, 2 months of age. His Verbal IQ, Performance IQ, and Full Scale IQ scores were all 160. I assessed

TABLE 1. Comparison of Stanford-Binet (L-M) With WISC-III Scores

SBL-M IQ	Differences	WISC-III FS IQ	Verbal IQ	Perf. IQ
191	(–60)	131	139	116
190	(–40)	150	151	141
190	(–49)	141	142	132
188	(–54)	134	144	117
187	(–49)	138	142	127
185	(–45)	140	141	119
183	(–42)	141	135	141
181	(–45)	136	145	120
175	(–37)	138	138	132
175	(–40)	135	146	117
174	(–38)	136	155	111
171	(–25)	146	147	136
167	(–42)	125	138	106
164	(–48)	116	128	99
162	(–14)	148	144	144
159	(–28)	131	148	106
155	(–22)	133	145	113
154	(–36)	118	127	104
152	(–36)	116	118	112
151	(–20)	131	137	116
141	(–1)	140	126	148
126	(–19)	107	112	102

Linda Silverman and David Atkinson, Gifted Child Development Center. N = 22; 10 girls; 12 boys.

TABLE 2. Comparison of Stanford-Binet (L-M) With WPPSI-R Scores

SBL-M IQ	Differences	WPPSI-R FS IQ	Verbal IQ	Perf. IQ.
160	(–12)	148	148	131
160	(–12)	148	145	134
158	(+2)	160	159	143
158	(–18)	140	145	122
158	(–30)	128	143	105
158	(–34)	124	159	149
153	(–11)	142	151	118
153	(–21)	132	128	115
144	(–31)	113	135	90
142	(+5)	147	140	138
140	(–14)	126	118	127
139	(+10)	149	140	143
138	(–7)	131	145	108
137	(–8)	129	135	113
132	(–1)	131	128	124
127	(+9)	136	126	134
124	(–5)	119	119	113
122	(–11)	111	127	94
121	(–6)	115	110	118
120	(+20)	140	140	127
115	(–4)	111	116	104
99	(–4)	95	103	87

N = 22; 8 girls; 14 boys.

him on the Stanford-Binet L-M because of its much higher ceiling, and he achieved an IQ score of 298+, answering correctly all but one question at the highest level of the test. Had he been able to remember two more clauses from a lengthy passage he was asked to repeat, his IQ score would have been 352+! Unimaginable, but true. His score was actually depressed by the fact that he suffers from central auditory processing dysfunction, word retrieval and articulation difficulties, visual perception and visual-motor issues, and attention deficit. In addition, he only slept 1 hour the night before, and was not feeling well during the test; he came down with a fever and an ear infection the next day. That he exists is important, because he may represent an evolution in intelligence on this planet. More relevant to our discussion is the fact that he is not only brilliant, he is also disabled. Compared with average children, however, he seemed fine, and so failed to qualify for any services. In his case, "average" scores are 150 points below his ability level! But he desperately needs therapeutic interventions to actualize his potential.

At least one-sixth of the clients who come to the Center for assessment of giftedness have hidden disabilities,[1] often revealed in the testing. In one study, Karen Rogers and I found that 40 of the fathers of 241 children in the 160+ IQ range suffered from dyslexia or other learning difficulties.[7] This is particularly notable, given the fact that the primary purpose for seeking testing given by 82% of this group was for educational placement decisions, not for assessing learning problems. We have several private schools for the gifted in the Denver area that require IQ testing for admission. The children in the study ranged in age from 2½ to 12½, and the mean age was 6½. The higher the IQ, the greater the asynchrony (unevenness) and the more masked learning disabilities are likely to be.

THE WECHSLER INTELLIGENCE SCALE FOR CHILDREN, THIRD EDITION (WISC-III)

In 1991, the WISC-III was released and, at that point, we felt we had no choice but to switch to the new scale, to maintain credibility with the schools. Though we still preferred the SBL-M for assessing gifted children, it had to be relegated to a supplementary test used when a child had topped out on the WISC-III or any other current test. However, we noticed some disturbing trends with the WISC-III. The test definitely identified fewer gifted children than its predecessor, the WISC-R. School systems observed this as well, but most were unconcerned with this state of affairs, because it costs more to serve an identified exceptional child.

We discovered that it was the Performance section that was lowering the IQ scores so that the child did not qualify for placement in gifted programs (See Table 1). The Performance section of the WISC-III and the WPPSI-R are both heavily timed, much more so than their predecessors. Why? Because they were in a rush to publish the tests and increasing the bonus points for speed artificially inflated the test-retest reliability. So many truly gifted children are referred to you whose IQ scores are not in the gifted range, and even those who are gifted may be considerably brighter than their IQ scores. We will look at some of these profiles a bit later.

Alan Kaufman,[8] author of *Intelligent Testing with the WISC-III,* an authority on the

Wechsler tests who worked closely with David Wechsler, wrote:

> Giving bonus points for speed to preschool children [on the WPPSI-R] seems silly from every developmental and common-sense perspective (p. 156).
>
> Individuals who solve every Performance item correctly but who fail to earn any bonus points will—by age 12—earn scaled scores below 10 on each subtest (p. 157). [This would generate a Performance IQ below 100 on the WISC-III.]
>
> The WISC-III allots three bonus points for solving one Block Design item in one to five seconds, and does the same for a Picture Arrangement item. I have only one label for a person who responds to a problem in five or fewer seconds: foolish (p. 157).
>
> The biggest negatives for gifted assessment are the new emphasis on problem-solving speed on the WPPSI-R; the substantially increased stress on performance time in the WISC-III compared to the WISC-R; and the low stability coefficients for a majority of WPPSI-R and WISC-III subtests. The speed factor will penalize gifted children who are as reflective as they are bright, or who tend to go slow for other non-cognitive reasons such as a mild coordination problem (p. 158).

The good news is that the *Woodcock-Johnson Cognitive Battery, Third Edition,* and *the Woodcock-Johnson Achievement Battery, Third Edition (WJ-III),* released in November, 2000, have liberal time limits and generate scores above 200 (primarily because of the discovery of the child described above and 31 others in the 200+ IQ range that we have identified at our Center). *The Stanford-Binet Intelligence Scale, Fifth Edition (SB-V),* due out in 2003, will also be untimed, like the SBL-M, and have a much higher ceiling than current tests. Who knows, perhaps the Wechsler tests will follow suit, eliminate the emphasis on speed, and raise their ceilings as well. Meanwhile, the WISC-IV is not due out until 2004, so the WISC-III is likely to continue to be the test of choice in the schools for the next several years. Therefore, we will examine this test more closely.

WISC-III SUBTESTS

The Wechsler scales are all organized in a similar fashion, yielding a Verbal (V) IQ, a Performance (P) IQ, and a Full Scale (FS) IQ—a combination of V and P, weighted toward the higher of the two scores. The mean on all IQ tests is 100, and the standard deviation (s.d.) on most of them, including the Wechsler scales, is 15. (The Binet scales traditionally employed a standard deviation of 16 points.) Roughly two-thirds of the population falls between 85 and 115 IQ. The WPPSI-R is used for children under 6, the WISC-III for children from 6 to 16, and the *Wechsler Adult Intelligence Scale, Third Edition (WAIS-III)* is employed with individuals 16 and over. There are a few variations in the subtests of the other Wechsler scales, but we will limit our discussion to the WISC-III.

The WISC-III consists of 13 subtests. Five Verbal subtests are used to calculate the Verbal IQ, and one optional test, Digit Span, is given for diagnostic purposes. Most psychologists administer Digit Span, because it is such an important diagnostic tool for assessing working memory. The Verbal subtests are all administered orally, untimed, with the exception of part of the Arithmetic subtest. Five Performance subtests are used to calculate the Performance IQ, with two optional tests, Symbol Search and Mazes, all of which are timed. The scale is administered alternating between a Performance subtest and a Verbal subtest.

The Verbal subtests include Information, Similarities, Arithmetic, Vocabulary, Comprehension, and Digit Span. The Performance subtests include Picture Completion, Coding, Picture Arrangement, Block Design, Object Assembly, Symbol Search, and Mazes. I will discuss each of the Performance subtests below. I discuss the Verbal subtests in a more cursory fashion, as they are not as relevant in diagnosing visual information processing issues. There are also Index Scores derived from different combinations of subtests. The *Verbal Comprehension Index* consists of Information, Similarities, Vocabulary, and Comprehension. The *Freedom from Distractibility Index* is composed of Arithmetic and Digit Span. The *Perceptual Organization Index* is made up of Picture Completion, Picture Arrangement, Block Design, and Object Assembly. The *Processing Speed Index* is an average of the Coding and Symbol Search scores. Mazes is not involved in any Index because it is the weakest subtest

in many respects, so many psychologists skip it, but it is an enjoyable way to end the test and yields useful information about visual skills, visual-motor ability, and impulsivity. When Digit Span and Symbol Search are left out due to time constraints of the tester, only the Verbal Comprehension Index and the Perceptual Organization Index can be generated.

The scaled scores range from 1 to 19 on each subtest, with a mean of 10 and a standard deviation of 3 points. Scores from 8 to 11 are in the average range, 12 and 13 are high average, 14 and 15 superior, 16 to 18 gifted, and 19, highly gifted. Scores of 6 and 7 are low average, 4 and 5 borderline, and 1, 2, and 3 disabling. Some of these designations are in the process of being renamed. Table 3 compares IQ scores, scaled scores, percentiles and ranges. Examining this chart, you may notice that the average range is very broad. A score at the 9th percentile is still in the average range. This makes it difficult to establish learning disabilities in gifted children. You have to be at the bottom 1 percentile to be considered "disabled" and at the ceiling of the test to be highly gifted. While there are exceptionally (160–174) and profoundly gifted (175+) children, there are no scores on the WISC-III to reflect these higher ranges.

TABLE 3. Relation of IQs and Scaled Scores to Percentile Ranks and Ranges

V, P & FS IQ	Scaled Score	Percentile Rank	Range
145	19	99.9	highly gifted (ceiling)
140	18	99.6	gifted
135	17	99	gifted
130	16	98	gifted
125	15	95	superior
120	14	91	superior
115	13	84	high average
110	12	75	high average
105	11	63	average
100	10	50	average
95	9	37	average
90	8	25	average
85	7	16	low average
80	6	9	low average
75	5	5	borderline
70	4	2	borderline
65	3	1	disabling
60	2	0.4	disabling
55	1	0.1	disabling

adapted from Wechsler, D. *Manual for the WISC-R* (p. 25). San Antonio, TX: Psychological Corporation; 1974.[9]

TABLE 4. Cognitive Abilities Measured by WISC-III Subtests

Subtests	Cognitive Abilities Measured
Verbal	
Information	Fund of accumulated general knowledge
Similarities	Abstract verbal reasoning and categorization
Arithmetic	Facility with numbers, short-term auditory memory and attention
Vocabulary	Ability to define words, verbal concept formation
Comprehension	Social reasoning, understanding of moral and political concepts
Digit Span	Short-term auditory memory for nonmeaningful information
Performance	
Picture Completion	Attention to visual detail, visual perception
Coding	Visual-motor coordination and speed, short-term visual memory
Picture Arrangement	Visual-sequential social reasoning, attention to visual detail
Block Design	Visual-spatial perception, abstract visual reasoning
Object Assembly	Part-whole reasoning, visual perception, and visual reasoning
Symbol Search	Visual scanning, visual discrimination, visual processing speed
Mazes	Visual-motor planning and reasoning, impulsivity

The main cognitive abilities associated with each of the WISC-III subtests are shown in Table 4. However, there are nuances to their interpretation, individually and in clusters, which one learns from clinical experience rather than from the textbooks. And there are also expected patterns associated with giftedness, as well as interaction effects between giftedness and performance on each of the subtests. Some of my interpretations are idiosyncratic, but they appear to accurately reflect the child's strengths and weaknesses.

INTERPRETING SUBTEST SCORES AND CLUSTERS

Most gifted children attain high scores on the subtests most richly loaded on general intelligence (g). Scholars who study intelligence

generally agree that its primary component is abstract reasoning.[10] The chart below places the subtests in order of g loadings.[11] The first five subtests listed in Table 5 are the best measures of giftedness.

Viewing Table 5, we can see why the Verbal Comprehension Index score, composed of three of the "good" measures—Vocabulary, Information, and Similarities, and one that is not far behind, Comprehension, would be an excellent indicator of the child's giftedness. The combination of high Arithmetic and high Block Design scores usually indicates mathematical talent. High Block Design and Object Assembly scores, combined with low Arithmetic and Digit Span, usually indicates a visual-spatial learning style with auditory-sequential weaknesses (like the brilliant physicist who cannot calculate). Notice that Block Design plays a critical role in diagnosis, and that it ranks with the other "good" measures of abstract reasoning (g). Therefore, I expect children with gifted scores in Verbal Comprehension to have an equally gifted score in Block Design. This is one of those idiosyncratic interpretations that comes from having assessed so many gifted children over the years. When Block Design is a standard deviation (3 points) below the mean of these Verbal measures, I begin to wonder about visual issues.

Block Design

Block Design is the reproduction of pictorial designs of graduating difficulty with 4 blocks for the first items, or 9 blocks for the more challenging items. Each block displays red, white, and red and white diagonal surfaces. I pay very close attention to the child's performance on Block Design. While the books suggest that it measures visual-motor coordination, I do not see that very much. Most gifted children can coordinate blocks, even when they falter with other visual-motor tasks. That may be more true of children who are lower functioning, as scores on Block Design can be severely affected by brain damage. With gifted children, Block Design measures visual-spatial abilities, abstract reasoning (g), and the ability to create a visual whole from its parts, an important visual information processing skill. How do I use this information diagnostically?

TABLE 5. Factor Loadings of General Intelligence on the WISC-III

Good Measures of g	
Vocabulary	(.80)
Information	(.78)
Similarities	(.76)
Arithmetic	(.76)
Block Design	(.71)
Fair Measures of g	
Comprehension	(.68)
Object Assembly	(.61)
Picture Completion	(.60)
Symbol Search	(.56)
Picture Arrangement	(.53)
Poor Measures of g	
Digit Span	(.47)
Coding	(.41)
Very Poor Measure of g	
Mazes	(.30)

Kaufman, AS. *Intelligent testing with the WISC-III.* New York: John Wiley; 1994.[11]

Suppose that a child has the following set of scores: Information, 16; Similarities, 19; Vocabulary, 18; Comprehension, 15; and Block Design, 13. The above average score in Block Design does not seem worrisome. But the mean of the first four tests is 17, at the 99th percentile, and Block Design is 4 points lower than I would have expected, at the 84th percentile. Why? The verbal subtests listed in the "good" measures of g are high, so I know that his abstract reasoning is excellent. And the child is a Legomaniac. so I know that his visual-spatial abilities are not the problem. That leaves visual information processing—your department.

We use the more expensive record booklets for the WISC-III, which enables the examiner to record exactly what the design looked like that the child created. Is it rotated? Examiners at our office ask, "Does that look right to you?" when the child completes an item. Children are allowed to take as much time as they need to complete an item, even if it goes beyond the time limits allotted. The examiner only gives credit toward the IQ score if it is within the time limits, but it is diagnostically important to know if the child is capable of completing the design if given extra time. Some children give up in frustration but, because the task involves abstract reasoning—their strong suit, many gifted children keep struggling with a difficult item and feel a sense of completion and accomplishment if they can do it, regardless of how much time it takes.

We also notice that the last Block Design item is easier for the gifted than the second last one, so we often give children the opportunity to try that last item, even when they have been unsuccessful on the previous few. This is one of the unique issues in assessing gifted children with learning disabilities. They often can do the more difficult items while struggling with the easier ones, so the discontinue rules may have to be ignored to test the limits of the child's capabilities. Discontinue rules were developed for lower functioning children who get frustrated when presented with items beyond their level of capability. The assumption is made that if they cannot pass 3 items in a row (or 6 in a row, or whatever) they certainly would not be able to do the harder items, and you have tested the limits of their ability. Not so with twice exceptional children (gifted children with learning disabilities). The harder, more complex items may be simple for them, after they have failed several easier items. It takes longer to test the gifted, and one has to use more clinical judgment about whether or not you have actually reached the ceiling of the child's abilities in an area. Discontinue rules help speed up the testing, but they may not provide the full picture of a gifted child. Astute clinicians develop their own rules about discontinuing a task, based on close observation of the child's abilities and frustration level.

We also pay very close attention to how the child approaches the task, making copious notations in the margins of the test about the child's behavior. Does he study the blocks and then create a gestalt? Is she aware that all the blocks are alike? Does he place all the blocks on an angle while creating the design and then shift them into the correct orientation at the end? Does she methodically go from the top to the bottom placing in one block at a time or does she make the design in sections and connect the sections? Is he unaware when he gets a block in the right position, moving it out of that position? Does she talk her way through the task, or move her lips, indicating covert verbal mediation? Does he become angry at the task, saying it's "impossible"? Does she feel embarrassed, saying continuously. "I'm not good at stuff like this"? Does he reverse the white and red on designs with angles? Does she realize that each design must create a square? (Some children miss the overall shape of the design.) All of these observations are diagnostic clues of visual issues that we can obtain from this one subtest.

Object Assembly

Object Assembly involves putting together puzzles of increasing difficulty, without the benefit of seeing a picture of the finished product. We also pay close attention to how the child assembles the puzzles. Does she miss subtle visual clues, such as the hands or feet being reversed on the girl or the car door being upside down? (The pieces do not fit together as well or look quite right that way). Does he have an idea of what the puzzle is supposed to look like? Does she place pieces together correctly and then pull them apart, unaware that she has been on the right track? Does he rely primarily on shapes, ignoring the surface designs? Our examiners usually ask, "Does that look right to you?" when the children finish, to see if they can self-correct when necessary.

Object Assembly and Block Design are highly correlated, as they both measure Perceptual Organization. When Block Design is 3 points higher (1 s.d.) than Object Assembly, I become suspicious that the child may have a visual perception weakness. I review the Characteristics of Giftedness Scale and the Developmental Questionnaire for other clues. "Good at Jigsaw Puzzles" is one of the 25 characteristics of giftedness on our scale. And the Developmental Questionnaire asks, "Is your child interested in books? puzzles? mazes? drawing? numbers? computers? how things work? people?" If Object Assembly is relatively lower than subtests scores that measure abstract reasoning and the child fits nearly all the characteristics of giftedness except for "good at jigsaw puzzles," and loves books, numbers, and computers, but not puzzles, mazes, or drawing, we are on the phone with Lynn for a referral to an optometrist.

Object Assembly is also a neurologically sensitive test. Some children put the face puzzle together in very strange ways, placing the lips above the nose, for example. This can indicate a number of neuropsychological issues, such as Asperger's Syndrome (high functioning autism) and right hemispheric disor-

ders, such as prosopagnosia (the inability to recognize faces).

Coding

Coding requires the child to quickly reproduce a sequence of symbols. It is a visual-motor task that requires the child to look up at the top of the page and back down to the spot he or she is writing in rapid succession. The only way to avoid this is to memorize the symbols, which some children do. Coding is a clerical task, involving nonmeaningful information (which translates as boring), so it is typical for gifted children to have somewhat lower scores in Coding.[1] It obviously does not measure very much in the way of abstract reasoning according to the g loadings, so it is a shame that it is calculated into the IQ score when decisions are made about placement in gifted programs. The question becomes. "When is the dip in Coding a red alert?" When the child has illegible handwriting or resists handwriting tasks, then the Coding score is probably telling us something important about visual-motor functioning. A weakness or lack of upper extremity strength and control may also be affecting visual-motor functioning.

Symbol Search

Symbol Search is a new subtest in the WISC-III, designed to measure processing speed without a motor component. All the child is required to do is see if a particular symbol appears in a set of symbols and mark "Yes" or "No." It indicates the child's skill at visual discrimination, as the symbols are fairly small. It also allows us to observe horizontal scanning, a skill needed in reading. Children who lose their place in the Symbol Search task often lose their place in reading. Coding allows us to observe vertical scanning, a skill necessary to copy off the board. The combination of Coding and Symbol Search yields the Processing Speed Index. If the child makes no errors on either subtest but responds quite slowly, that usually indicates slow processing speed. Both tests are vulnerable to attention, concentration, depression, and anxiety, so other factors may also lower scores. When Symbol Search is high, and Coding is low, mental processing speed is usually fine, but handwriting speed is compromised. The combination of a high Coding score and a low Symbol Search score is rare in gifted children, as Symbol Search apparently involves somewhat more abstract reasoning, and seems to be more interesting to the children than Coding.

Picture Completion

A set of pictures of familiar objects is shown, and the child must tell what is missing in the picture. It is permissible to point or say "this thing" if there are word retrieval problems. Children who have attention deficits or difficulties putting together a whole from parts may do very well on this subtest and poorly on all the other Performance items, which require more mental effort and visualization skill. A few of the pictures are very busy and visually intricate (like a "Where's Waldo" picture). Children with visual information processing issues become visually confused with these items. Combined with Block Design and Object Assembly, Picture Completion offers an appraisal of Perceptual Organization. Picture Arrangement is part of this group as well, but I think it does not add much information to that factor.

Picture Arrangement

This task involves putting cartoon pictures in the correct sequence to tell a story (not the creative story the child dreams up, but the one the test constructor had in mind). Picture Arrangement measures visual sequencing, cause and effect, understanding of social relations, attention to visual detail, and Perceptual Organization. Children who are low in Picture Arrangement may have difficulty picking up social cues in relating to agemates or adults. (Children with sensory integration dysfunction also miss social cues.) The subtest correlates with Comprehension, which measures social, moral, and political awareness. So if Comprehension is high and Picture Arrangement is low, I wonder about visual issues. Children with low scores in both Comprehension and Picture Arrangement may have poor understanding of the consequences of their actions.

There is a great deal more detail in the colored cartoons of the Picture Arrangement subtest on the WISC-III than there was in the black and white cartoons in the WISC-R. And

the child often has to follow two sets of visual details at once, such as the sky and ground, to put the cards in the correct order. So there is a high correlation with Picture Completion as well. If a child has difficulty attending to the details in Picture Completion, chances are that Picture Arrangement will also be affected. The other subtests that make up Perceptual Organization are nonsequential, which makes Picture Arrangement unique in that group. It seems to fit better with other sequential tasks, such as Digit Span, Coding, and Arithmetic, but these four subtests do not constitute a specific factor. Children who have problems sequencing may have difficulty with all four subtests.

This subtest is at the bottom of the "fair" measures of g, the fourth lowest in the entire list, so when gifted children do poorly in Picture Arrangement, we do not lose sleep over it. Some highly creative children can make up an interesting story with just about any arrangement of the cards, and some children play a game where they draw a set of picture cards out of a deck and have to make up a story to go with whatever cards they get. To see if childrens' performance on the task is influenced by high levels of creativity, we ask them to tell us the story that their arrangement of the cards suggests to them. Their answers are often fascinating, much more interesting than the stories intended by the test constructors.

Mazes

Despite its abysmal relation to general intelligence, and the fact that scores are inflated whenever children practice mazes at home as a hobby, I like Mazes. It is a fun way to end the experience (certainly better than repeating a set of random numbers forwards and backwards) and it is often quite revealing. The child must start in the middle of the Maze, not at the end, and must not pick up his or her pencil or cross any lines. If a child turns the corner into a blind alley, it is counted as an error. Children suspected of having AD/HD by their teachers when they are in a group setting may be perfectly controlled with a tester who is giving them undivided attention and interesting, mentally stimulating activities. But Mazes is often the giveaway. Impulsive children let their pencils do the walking instead of their eyes and inevitably go to the ends of blind alleys. They may start out in the simpler mazes with beautiful motor control, but the last few mazes usually are a disaster. Children with sensory integration dysfunction often exhibit similar behaviors. They may be impulsive, constantly moving, and need stimulating activities, but tend to be easily overstimulated. Differential diagnosis is complex.

Mazes provides a good measure of motor planning. Mazes and Coding are the only two paper and pencil tasks on the WISC-III, so they present our only opportunities on this instrument to observe the children's fine motor ability, how comfortable they are with writing tasks, how they hold their pencils, how they orient the paper, how (if?) they keep the paper from moving while they are drawing on it, how they form lines and letter-like symbols, how close they place their faces to the paper, etc. These observations are often invaluable diagnostically, even if the numbers are not very reliable. Mazes would actually be my nomination as the fourth subtest in Perceptual Organization, rather than Picture Arrangement, as it measures spatial reasoning and is also nonsequential. Too bad the subtest is too weak statistically to be included in that factor.

As the mazes become more and more complex, some children become visually confused and frustrated. They do fine with the easier mazes, but get lost with the more difficult ones. This behavior may signify visual tracking problems. Some children who show this pattern were early readers who suddenly stopped reading. I recommend that the parents try large print books, even the class-size books designed for teachers to read to an entire group. Vision therapy is particularly helpful for these children.

Digit Span and Arithmetic

Digit Span involves having the child repeat unrelated digits presented one second apart in longer and longer sequences, either forward or backward. This test measures auditory short-term memory for nonmeaningful material, like phone numbers and it correlates with spelling. Digits Forward is more likely than Digits Backward to measure auditory short-term memory. Good visualizers often do better at Digits Backward than Forward, because they picture the numbers on the white-

board in their minds and just read them in their picture. Digits Forward can also be remembered this way; we just see it less frequently. Gifted learning-disabled children will often have much lower scores in Digit Span (even 2 s.d.) than in their other Verbal scores. Children with low Digit Span scores often have low Coding scores as well. Both involve nonmeaningful material, so their high abstract reasoning is not much help to them. Both are highly sequential, and can be affected by AD/HD, test anxiety, and depression, as well as boredom.

All of this is true of Arithmetic as well, which measures some of the same areas as Digit Span along with facility with numbers. Arithmetic involves word problems that must be solved mentally. It is the only Verbal subtest that is partially timed. Digit Span and Arithmetic make up the Freedom from Distractibility Factor (which also included Coding in the WISC-R). It was only a "fair" measure of g on the WISC-R, but moved up to the "good" list in the WISC-III. Visualization is useful in solving the Arithmetic problems, and a child with poor visualization abilities is likely to have a lower score on this subtest.

Other Patterns

There are some classic patterns associated with learning disabilities (LD). We used to talk about the "**ACID** test of LD": ***A***rithmetic, ***C***oding, ***I***nformation, and ***D***igit Span. This is a better litmus test for average children with learning disabilities than for the gifted, because gifted children, even with learning disabilities, often have high scores on Information.[12] Occasionally I will run into a gifted child who is low on all four subtests. Often, these children are physically present in school, but not mentally present, so they are not picking up the information. Or they have both auditory and visual information processing deficits that prevent them from acquiring knowledge commensurate with their level of abstract reasoning.

Low scores in Arithmetic, Digit Span, and Comprehension may indicate central auditory processing dysfunction. Vocabulary can also be affected, as well as Information and Similarities. Other signs would include mishearing information, mispronouncing words, and asking for repetitions. In gifted children, these scores may be only slightly depressed, because often they can use abstract reasoning to assist them in filling in the gaps in the auditory information. They may also compensate by reading lips expertly. There are many other patterns, but these are the ones of most relevance to the optometric field.

VERBAL-PERFORMANCE DISCREPANCIES

In the previous section, I discussed in order of importance the subtests that tell us the most about visual functioning and guide me in referring clients for vision evaluations. The Verbal tests primarily require auditory processing (although visualization skills are helpful) and the Performance tests require visual information processing (although children with poor visual perception may use verbal abstract reasoning to assist them). That is why the discrepancy between Verbal IQ and Performance IQ is diagnostically important in referring children for vision evaluations. V-P differences of at least 12 points are considered statistically significant at the .05 level.[13] However, V-P discrepancies on the WISC-III are not necessarily attributable to vision issues. We cannot overlook the dramatic impact of the bonus points for speed on gifted children's performance. The WISC-III and the WPPSI-R have both become speed tests instead of power tests, seriously depressing scores in the Performance section.[8,14]

In Table 1, 13 of the 22 children who had been tested on both instruments showed V-P discrepancies of 15 points or greater (15–44 points). Only 2 had higher Performance scores and 1 attained the same score on both. The mean difference was 17.68, considerably beyond the significance level. In Table 2, 10 of the 22 children showed V-P discrepancies of 15 points or greater (15–45 points) and 13 had discrepancies 12 points or greater. Four had higher Performance than Verbal scores. The mean difference was 14.68, also beyond the significance level. Does this mean that more than half of the gifted children who come for assessment need vision therapy? Unlikely. Undoubtedly some do, but how does one determine which ones, when nearly 60% of our gifted clients have statistically significant V-P discrepancies?

This is not an easy question to answer. We certainly cannot rely solely on the Verbal/Performance discrepancy of the heavily timed WISC-III. Even reflective children with no visual issues will be penalized on the WISC-III and the WPPSI-R, and many gifted children are introverted and reflective. It is necessary to analyze individual subtest scores and clusters in the manner described in this paper, to observe the child carefully during the assessment for symptoms of visual stress, and to look for real-life indicators, such as difficulties with reading, writing, athletics, and the ability to read and understand facial expressions and body language.

These tables also reveal startling differences in gifted range IQ scores on Wechsler and Binet scales. Untimed tests like the SBL-M, or tests with liberal time limits like the Woodcock-Johnson tests, are more likely to reflect the true level of a gifted child's abilities. Discrepancies between the WISC-III and the SBL-M ranged from 14 to 60 points, with a mean difference of 37 points (>2 s.d.). No child scored above 150 on the WISC-III.

GUIDELINES FOR ASSESSING GIFTED CHILDREN WITH LEARNING DISABILITIES

Twice exceptional children are frequently misdiagnosed because:

- Their scores are averaged, masking both their strengths and weaknesses
- They are compared to the norms for average children instead of to their own strengths
- Their lower scores may not be significantly below the norm
- Their ability to compensate often inflates their lower scores
- The magnitude of the disparities between their strengths and weaknesses is not fully taken into account

Diagnosticians in all the helping professions are trained to look at test scores from a normative perspective. The diagnostic question we usually attempt to answer is: "How does this child's performance compare to the norm?" If the child scores within the average range, no disability is detected. To understand gifted children with learning disabilities, it is necessary to ask an entirely different question: ***"To what extent does the discrepancy between this child's strengths and weaknesses cause frustration and interfere with the full development of the child's abilities?"*** This is an intrapersonal rather than normative view of test interpretation; it recognizes the importance of diagnosing the degree of asynchrony in the child's profile.

Let us examine a typical scatter profile of a twice-exceptional child and see the problems inherent in interpreting such a profile (Figure 1). Similarities, Vocabulary, Comprehension, Information, and Block Design are high, and Arithmetic, Digit Span, and Coding are low. The first four subtests measure verbal abstract reasoning abilities and the fifth measures visual-spatial reasoning. The lowest scores are highly sequential. The high subtest score in Similarities is offset by the low subtest score in Arithmetic. The high subtest score in Block Design is cancelled out by the low subtest score in Coding. When these disparate scores are averaged to produce a Verbal

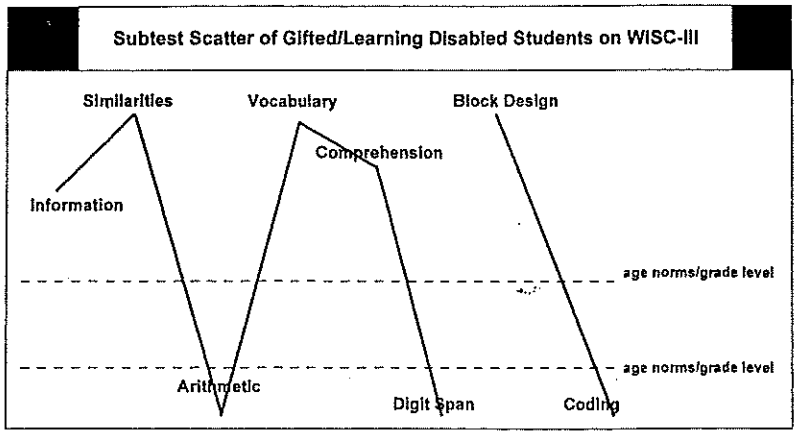


Fig. 1. This profile shows significant scatter for children in the average range of intelligence (top dotted line). Children with the same degree of scatter who are higher functioning (bottom dotted line) are overlooked.[1]

IQ, a Performance IQ, and a Full Scale IQ, the child appears less gifted than she really is and less disabled than she really is. She may be perceived and treated as "average." Gifted children with learning disabilities often narrowly miss the cut-off score for acceptance into gifted programs because their learning disabilities depress their Full Scale IQ scores. Cases A, B, and C, discussed below, illustrate this problem.

A child of average abilities who demonstrates the degree of scatter represented in the composite profile would qualify for special education services in school and be recognized by diagnosticians as needing therapeutic intervention. In Figure 1, the average child's subtest scatter is represented by the higher dotted line. However, if this same degree of scatter shifts higher on the subtest map (using the lower dotted line), no therapeutic interventions appear warranted.

Suppose the child's highest score was 13 and his lowest score was 4. With a 9-point discrepancy (3 s.d.), we would realize immediately that he needs remedial assistance. According to Kaufman,[11] 9-point disparities on the WISC-III are indicative of learning disabilities. In the norm sample, a 4-point scatter was significant at the .05 level.[13] Now let's suppose that the child had some scores in the ceiling range of the test, at or above the 99th percentile (17, 18, or 19) and others in the average range (8 to 11). Clearly, this is the same degree of scatter, resulting in the same degree of frustration—perhaps even more intense because the twice-exceptional child expects herself to be able to perform at the level of her mental capabilities. But she does *not* qualify for special services, even with a 9-point discrepancy between strengths and weaknesses (twice the level of significance) because her lowest scores are "in the average range." Most diagnosticians interpret her functioning similarly, judging her skills in visual information processing, visual-motor production, and auditory processing as "adequate." She is perceived as having moderate abilities, coupled with some unusual strengths. Instead, her strengths should be recognized as the approximate level of her actual abilities and the low scores should be interpreted as significant weaknesses, possibly improvable through therapeutic intervention, such as vision therapy.

In *The Diagnostic and Statistical Manual of Mental Disorders, Fourth Edition* (DSM-IV),[15] the Bible of the mental health profession, there is a caveat about averaging very discrepant scores:

> When there is *significant scatter* in the subtest scores, the profile of strengths and weaknesses, rather than the mathematically derived full-scale IQ. will more accurately reflect the person's learning abilities. When there is a marked discrepancy across verbal and performance scores, averaging to obtain a full-scale IQ score can be misleading. (APA, 1994, p. 40)

Although this paragraph appears in the section on retardation, it is equally applicable to the interpretation of scores for the gifted.

The profile of strengths and weaknesses, the subtest scatter, and the discrepancy between Verbal and Performance measures all tell us much more about a child's learning abilities than the averages represented by Full Scale IQ scores. Strengths give us a window into the child's abilities. This is the lens through which we should look at any child, but it is imperative in discovering twice exceptional children.[16] The child's giftedness is documented by subtest scores in the superior range; his or her disabilities are detected by analyzing the weakest subtest scores *in relation to the strongest.* This would be true in vision assessment as well as psychological assessment. The greater the discrepancies between strengths and weaknesses, the greater the potential for frustration.

A high Verbal IQ combined with a Performance IQ that is 20 points lower should signal the need for an optometric evaluation. Low scores on Arithmetic, Digit Span and, sometimes, Comprehension (coupled with a child asking to have items repeated or mishearing words) call for a Central Auditory Processing Battery. Low scores on Coding and Mazes suggest the need for a visual-motor assessment, and possibly a sensory-integration evaluation. Scores in the "adequate" range in visual-motor abilities may be inadequate for a boy with an IQ of 140 whose mind is racing way ahead of his hands. He may start with slight difficulties with cutting and coloring and end up refusing (unable) to do written assignments. Average scores may be inflated (compensated) by high

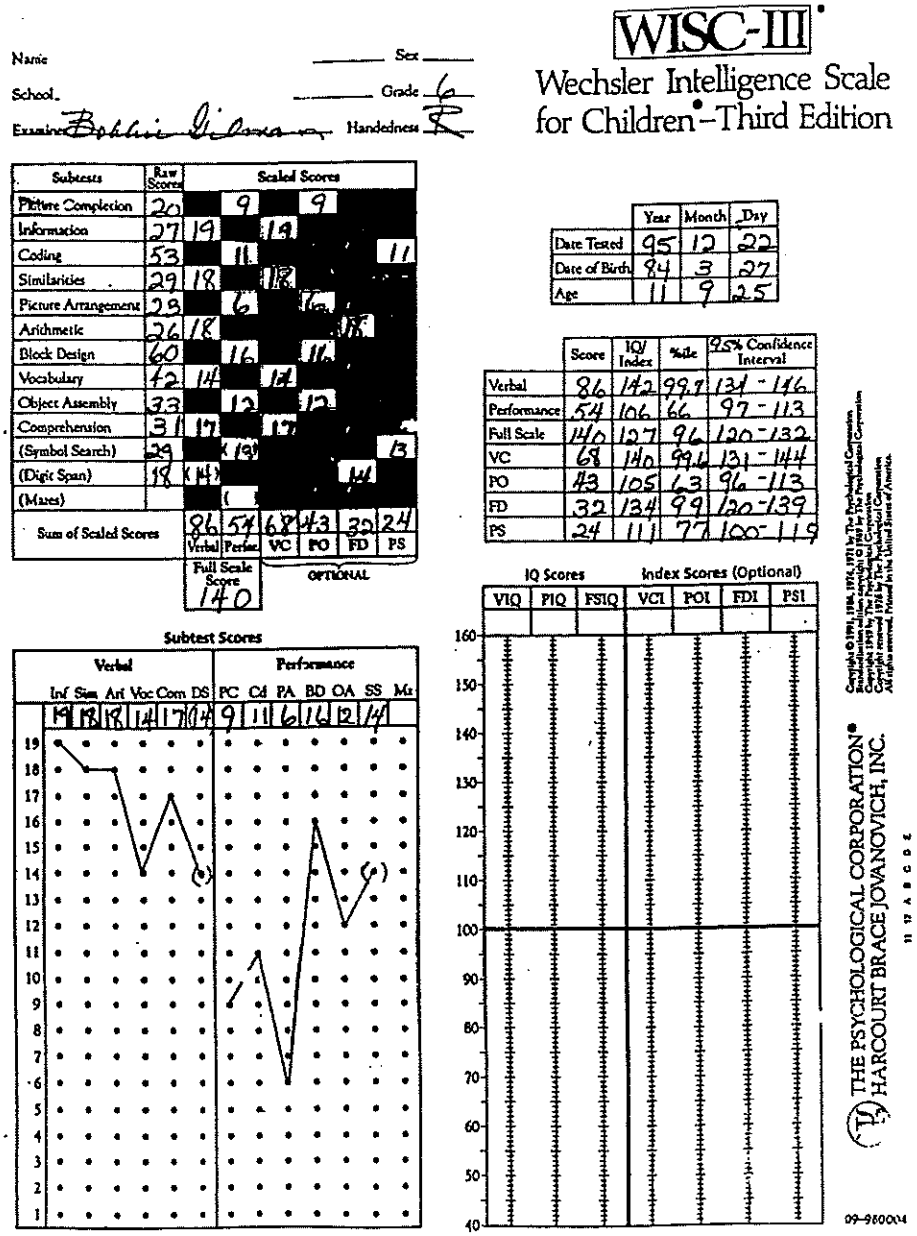


Fig. 2. WISC-III profile of Child A.

intelligence and actually represent disabilities.

Gifted children with learning disabilities have much more erratic scores over time than other children. Some twice-exceptional children achieve higher scores as they get older, some have lower scores, and some have scores that vary dramatically in unpredictable directions on different tests. Many factors affect their performance. They tend to do poorer on timed tests and on tasks that require handwriting. And their ability to demonstrate the true level of their strengths will be vastly different on "good days," when their compensation mechanisms work effectively, and "bad days," when they literally "cannot see straight."[5]

This reminds me of something that happened to me several years ago. Right before I went to Roger Dowis for an annual vision examination, I got in a heated argument with a colleague. I raced down the mountain to my appointment, so preoccupied that I forgot to be afraid of the curve where I had rolled my Jeep a year earlier. Until then, I had been petrified of returning to the scene of the accident, and drove very slowly when I came to that spot in the road. After that day, I was fine. When Roger examined my eyes, I had lost most of my depth perception and I seemed to need a much

stronger prescription for my glasses. When the new glasses arrived a couple weeks later, they were so strong that I felt I could watch my nails grow and I was afraid of my purse. Driving with the new glasses was completely out of the question. We tried to figure out what had happened. Then it dawned on me that there probably was some basis to the expression, "So mad I couldn't see straight." Moral of the story: Never examine a patient who is angry!

All diagnosticians who work with the gifted—optometrists, occupational therapists, audiologists, etc.—need to be aware of compensatory behaviors in the gifted and notice how the child's weaker areas compare with their stronger ones. Otherwise, when a child scores within the normal range on their assessments, they will fail to detect correctable deficits. And the therapeutic goals must also be revised. Instead of aiming for "adequate" functioning within the average range for the child's age, higher visual functioning is needed to support higher mental functioning.

ILLUSTRATIVE CASES OF GIFTED CHILDREN IN NEED OF VISION THERAPY

The following cases were all referred for vision evaluation and, potentially, vision therapy. I do not have information on whether they followed this recommendation, but it may be instructive to see the different types of profiles of children we refer to optometrists.

Child A (in Figure 2) has a Verbal IQ of 142, a Performance IQ of 106, and a Full Scale IQ of 127. Notice that she has a very low score in Picture Arrangement, coupled with a low score in Picture Completion, which depressed her IQ score. Both of these subtests rely heavily on attention to visual detail. Her highest subtest score is 19 in Information and her lowest subtest score is 6 in Picture Arrangement. This is a 13-point discrepancy (>4 s.d.). There is an enormous disparity between the Verbal IQ of 142 and the Performance IQ of 106: 36 points (>2 s.d.). Visual information processing issues are evident in this profile; yet, in spite of this, her Block Design score is in the gifted range, indicating very advanced visual-spatial abilities and abstract visual reasoning.

Child B (in Figure 3) has a Verbal IQ of 137, a Performance IQ of 98, and a Full Scale IQ of 121. This profile looks like bad news in the stock market! Like Child A, Child B has a gifted Verbal IQ and an average Performance IQ, with a discrepancy of nearly 40 points. His score on Object Assembly is extremely low, indicating severe visual perception issues and difficulties creating a visual gestalt from its parts. In addition, the two tests of visual-motor planning, Coding and Mazes, are lower than his other scores with Picture Arrangement (visual sequencing) and Symbol Search (visual discrimination) trailing not far behind. All the visually presented subtests are depressed with the exception of Picture Completion (attention to visual detail). Block Design is the second highest Performance score, but it too is depressed by visual issues that mask his spatial abilities. Similarities (verbal abstract reasoning) is at the ceiling of the scale, at 19 (99.9^{th} %), while Object Assembly (puzzles) is 4, (2^{nd} %), representing a disparity of 15 points—5 standard deviations. (This would be equivalent to the difference between an IQ of 130 and an IQ of 55.)

Child C (in Figure 4) has a Verbal IQ of 131, a Performance IQ of 94, and a Full Scale IQ of 114. Like Child A and Child B, he also has a very large discrepancy between his gifted Verbal IQ and his average Performance IQ: 37 points. Yet, the pattern of his weaknesses differs from the other two cases. He is severely disabled in visual-motor performance and moderately deficient in visual sequencing, visual discrimination, and visual perception. He is at the 3^{rd} percentile for processing speed, but at the 99^{th} percentile for verbal comprehension. There is also a relative weakness in auditory processing, as evidenced by his lower scores in Arithmetic and Digit Span compared to his other Verbal scores. But notice how, similar to Child B, Picture Completion and Block Design appear as peaks on the Performance side. Picture Completion does not require the child to create a whole from parts, and Block Design can be solved by the child's abstract reasoning abilities.

In all three cases, there are very significant discrepancies between Verbal and Performance scores, as well as between highest subtest and lowest subtest scores. All three children would fail to qualify for gifted programs that use a 130 Full Scale IQ cut-off score. And all would profit from vision therapy.

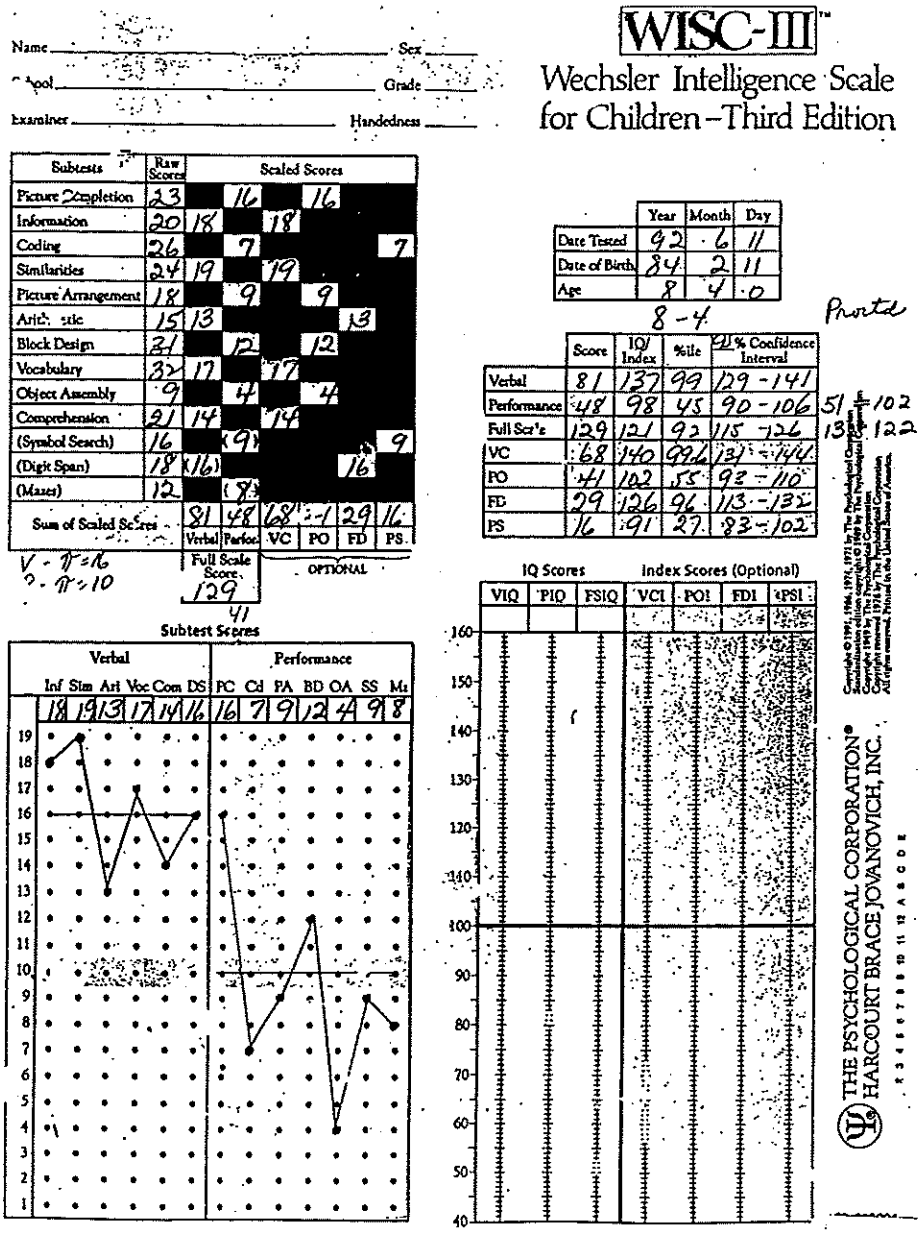


Fig. 3. WISC-III profile of Child B.

THE IMPACT OF VISION THERAPY

When visual processing issues are apparent in either children or adults, we recommend an evaluation by a behavioral optometrist to determine if vision therapy is appropriate. We have seen enormous improvement in reading, Performance IQ, self-concept, even social skills, when vision therapy activities are practiced faithfully at home. Although we have tracked only a few of these cases with before and after testing, the results have been quite remarkable.

Figure 5 is an example of a highly gifted boy with both verbal abstract and visual-spatial strengths, whose visual information processing deficits significantly lowered his IQ score. Adam had a Verbal IQ of 154, a Performance IQ of 111, and a Full Scale IQ of 138 (See Figure 5). Note the 43-point disparity between Adam's Verbal and Performance IQ scores on the WISC-R at the age of 7. The only peak on the Performance side is in Block Design, which is in the gifted range, despite his visual weaknesses. Adam went through two sets of vision therapy with Roger Dowis, each for six months in duration. He was retested on the WISC-III six years later, and dramatic improvements were seen in all subtests except Coding (Figure 6). At the age of 13, Adam

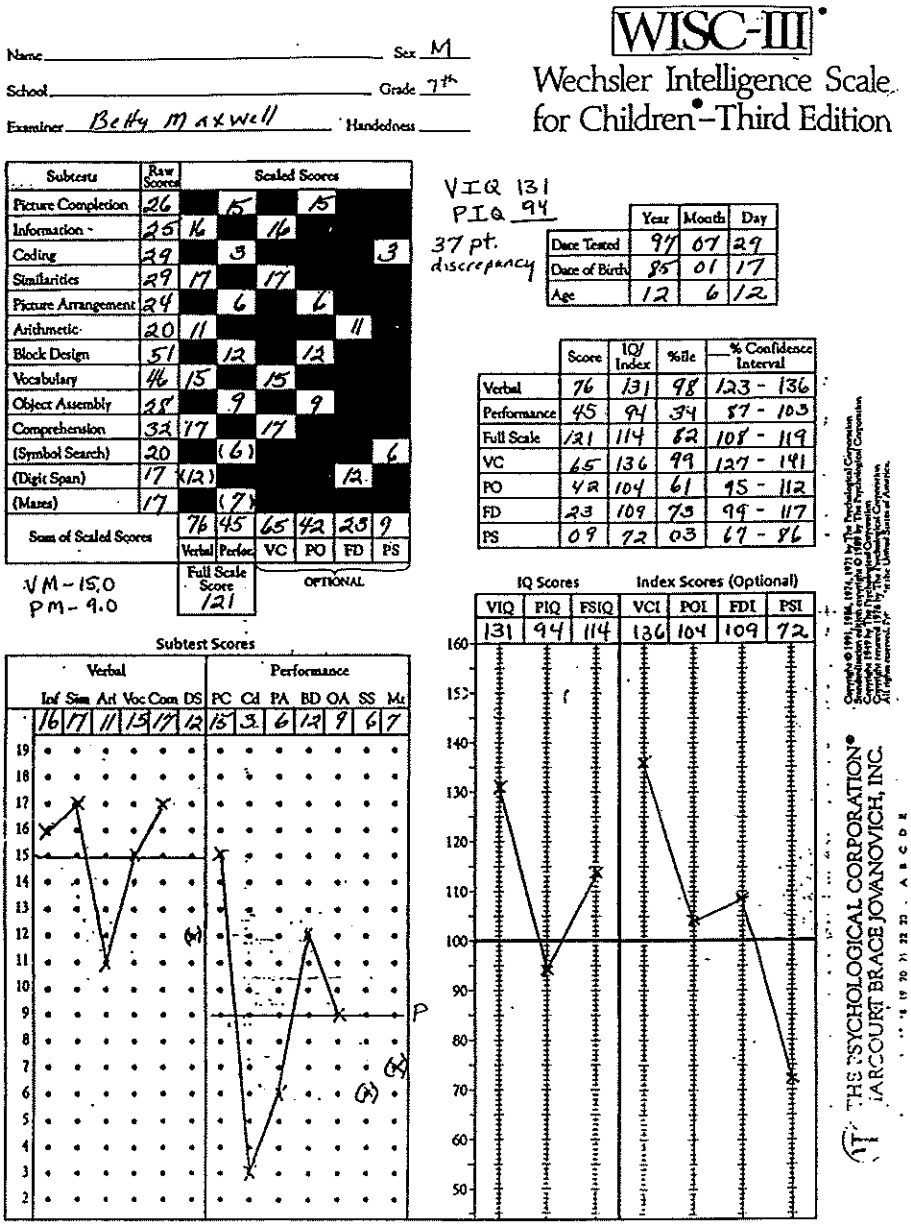
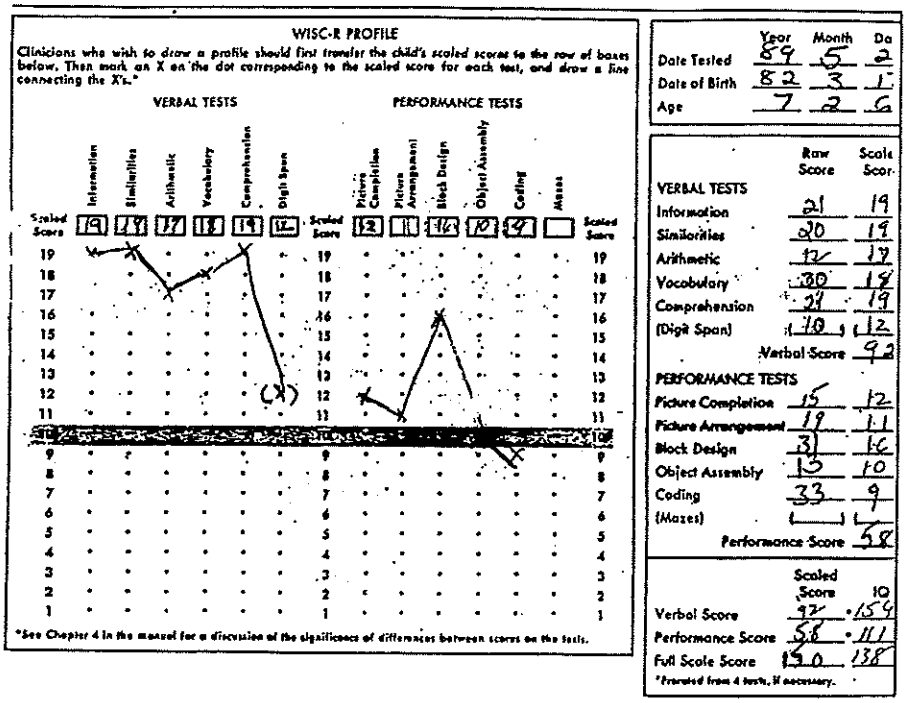


Fig. 4. WISC-III profile of Child C.

scored as follows on the WISC-III: Verbal IQ, 141; Performance IQ, 134; and Full Scale IQ, 144.

Adam's Performance IQ increased 23 points and the difference between his Verbal and Performance IQ scores is now only 7 points. The lower Verbal IQ score is not significant because the WISC-III generates lower scores than the WISC-R. But the gains in the visual subtests are even more remarkable, given the fact that Performance subtest scores on the WISC-III are usually considerably lower than WISC-R scores, due to the increased bonus points for speed. Adam's Picture Completion score jumped from 12 to 18 (2 s.d.); his Picture Arrangement score went from 11 to 17 (2 s.d.); his Object Assembly went from 10 to 16 (2 s.d.); and his Block Design went from 16 to 19, the highest possible score (1 s.d.). He also obtained a highly gifted score on Symbol Search, a new test of visual discrimination.

It is possible that the improvement in scores is a function of maturity alone, "late blooming," but most children do not show such dramatic and consistent gains without intervention. The WISC-III provides a truer reflection of Adam's abilities than his previous WISC-R. Adam's score in Coding (9) did not improve at all, and fine motor coordination re-


WISC-R RECORD FORM

Wechsler Intelligence Scale for Children—Revised

WISC-R PROFILE

Clinicians who wish to draw a profile should first transfer the child's scaled scores to the row of boxes below. Then mark an X on the dot corresponding to the scaled score for each test, and draw a line connecting the X's.*

VERBAL TESTS: Information, Similarities, Arithmetic, Vocabulary, Comprehension, Digit Span

PERFORMANCE TESTS: Picture Completion, Picture Arrangement, Block Design, Object Assembly, Coding, Mazes

Scaled Score: 19 | 19 | 17 | 18 | 19 | 12 | Scaled Score: 12 | 11 | 16 | 10 | 9 | | Scaled Score

*See Chapter 4 in the manual for a discussion of the significance of differences between scores on the tests.

	Year	Month	Da
Date Tested	89	5	2
Date of Birth	82	3	1
Age	7	2	6

	Raw Score	Scale Scor
VERBAL TESTS		
Information	21	19
Similarities	20	19
Arithmetic	12	17
Vocabulary	30	18
Comprehension	24	19
(Digit Span)	10	12
Verbal Score		92
PERFORMANCE TESTS		
Picture Completion	15	12
Picture Arrangement	19	11
Block Design	31	16
Object Assembly	15	10
Coding	33	9
(Mazes)		
Performance Score		58

	Scaled Score	IQ
Verbal Score	92	*154
Performance Score	58	*111
Full Scale Score	150	138

*Prorated from 4 tests, if necessary.

Fig. 5. WISC-R profile of Adam prior to vision therapy.

mains a significant weakness. Adam's biggest problem in school is writing.

Bill

Bill, a 41-year-old gifted man, discovered with concern that the discrepancy between his Verbal IQ and his Performance IQ on the WAIS was 55 points. He searched exhaustively for an explanation, undergoing batteries of neuropsychological tests, writing to 150 experts in several different fields. I looked at his profile and recommended a vision evaluation and vision therapy. Apparently no one had thought of the simple explanation that he had significant visual problems. After a few months of vision therapy with Carl Gruning, OD, FCOVD, Bill wrote that Dr. Gruning had found serious difficulties with his eye focusing and teamwork, depth perception, and peripheral vision. On some assessments, he scored in the bottom 20th percentile. Here is an excerpt of his letter to me:

> For the first time in my life I have normal functional vision. For the past twenty-seven years I have worn eyeglasses when I drove a car, but now I don't need them anymore. I haven't taken the Wechsler again but it is likely that my performance scores would be significantly higher. I have had this serious vision problem for all my forty-one years so it may take some time before my overall visuospatial intelligence is back where it should be. Did my poor vision really have a major impact on my life? Although many would disagree I believe that it has, in the words of a Harvard neuropsychologist back in 1996, had a rather profound effect on my development as a person.
>
> I have noticed subtle but no less real changes in my life. My eyes are more alert and I can concentrate better on visual tasks. I am more aware of my daily surroundings. In the past I have generally acquired and evaluated information by reading and solitary reflection. By not focusing on people and visual-practical methods of dealing with the world I have definitely shortchanged myself. I hope that my

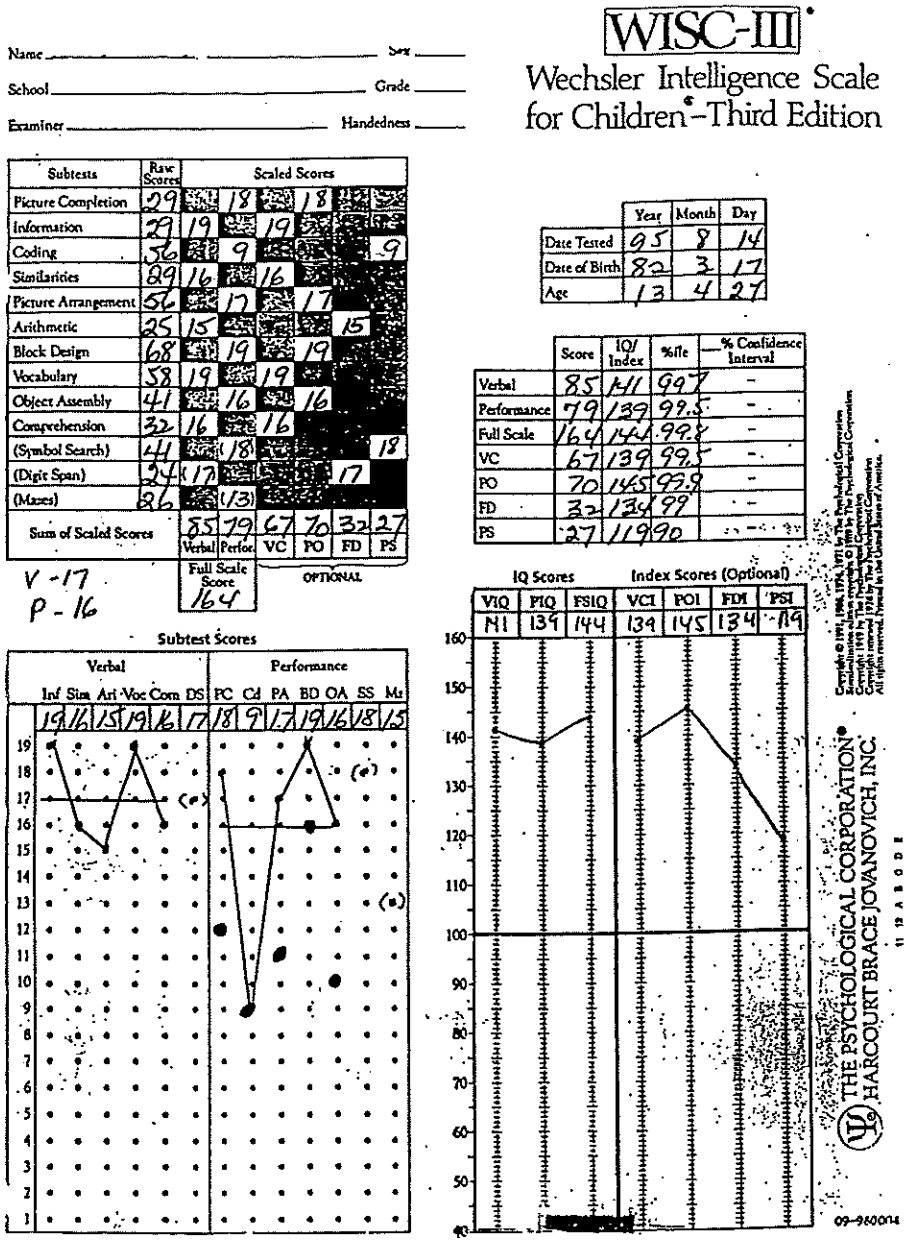


Fig. 6. WISC-III profile of Adam after two sets of vision therapy.

new found visual skills will enable me to perceive the world in a more balanced manner.

WHAT DO PARENTS SAY ABOUT VISION THERAPY?

At the National Parenting Conference the Gifted Development Center sponsored last year to celebrate our 20th anniversary, more parents came up to me and thanked me for referring them for vision therapy than for any of the other recommendations they received after the assessment. We often receive letters raving about vision therapy. Here are two I wanted to share:

Parent 1

Regarding vision therapy: I was surprised to find so little information available, and I would strongly support anything that would expand people's awareness of what vision therapy is, and what this therapy can do.

I went searching on the net, and found very little information: mostly some negative statements about vision therapy being huckster medicine. I spoke with two pediatricians, and both were somewhat skeptical saying that VT "has not shown a scientific basis for success." However, I spoke to three people who swore vision therapy worked for them. All

three went out of their way to contact me. And all three spoke with such firm conviction: vision therapy transformed not just an eye problem, but who they were in relation to the world at large. The success of vision therapy seemed to change the way they felt about themselves, especially in regards to intelligence. And past difficulties, especially with reading, was mentioned by all three. To be quite honest, I really couldn't comprehend how this could be. Eyes? Eyes and the way they work or don't work affecting so much change in a person?

Of course, not having a need for any sort of vision therapy (or even a need to wear glasses!) I was lacking, well . . . "eye empathy"! But over the last month and a half of vision therapy I am beginning to see such a profound change in my son that I am catching glimpses of HIS entire world changing!

In the last 2 weeks many positive changes have occurred in Tyler: changes that CAN be directly attributed to vision therapy. For instance, 4 weeks ago he told his teacher "I can read, but I just don't like to read. I'm just not a reader." Of course his teacher (and parents!) marked this statement up to bad attitude and laziness. Four weeks ago none of us could imagine that something as seemingly simple (and controversial?) as vision therapy would transform Tyler from "not a reader" into someone who would stay up until 11:30 PM to finish an adult level novel! And this may sound odd, but not only is Tyler reading, he is starting to see, really SEE spelling words, and remember them. Instead of continually misspelling the same words phonetically he is remembering the words as they are correctly written, e.g., he finally writes "was" instead of "wus." I'm not sure, but I suspect that his ability to copy sentences may be improving! Though I still see difficulty here.

This may sound really odd, but I think vision therapy is going to change the appearance of my son! At our most recent VT session (Tuesday) I learned that the "scowl" Tyler so often wore in class was NOT caused by a bad attitude towards school (as I had assumed), or a "mask to keep the other students away" (as his teacher had remarked!). Rather, this so-called "scowl" might be a typical look for a person who had the problems with eye convergence that my son has. It seems that Tyler was concentrating so hard on attempting to bring things into a focus that his face would automatically contort into this, uh, shall I say . . . less than pleasant look! (It really was an ugly face!) I know the look well. My mother (the retired special education teacher) remarked on "the look" also. It appeared that Tyler was glaring with disgust at people and the world! We all attributed "the look" to his feelings! Can you imagine!!!!

During our vision therapy session I watched "the look" come over Tyler's face while he was concentrating on one of his exercises. Jean Nagle, the vision therapist, simply told him to "have soft eyes" and then she gently touched the back of his head and told him to think about focusing from this area of his brain. "The look" disappeared instantly!

In the last two sessions of vision therapy we have been working with "V & V" . . . visualizing and verbalizing. (I always say "we" because our vision therapist strongly encourages parents to attend the sessions so that we can be involved with the therapy exercises at home . . . and experience just how much work these exercises really are. I, for one, would rather go to the gym and pump iron . . . IT'S EASIER!) One of the V & V exercises involves learning the names of all the U.S. Presidents, in order, starting with Washington. We use a sheet with picture clues on it, and after only 4 times through the picture clues, Tyler can now tell you who the first 20 Presidents are, without using the sheet of visual clues. He is pretty amazed that he can do this. And I can see that in the last 10 days he has started to learn how to call upon the visual images in his head. Now, let me remind you that up 'til now, Tyler could not memorize any of his multiplication tables or spelling words. In fact his V & V abilities were so weak that he could not seem to connect the names of classmates with their faces. This seems to be improving! So we are most impressed and very excited by the potential of this newfound skill.

To date, this whole process of vision therapy has been a tremendous boost to Tyler's very poor self esteem! If everybody has a vision therapist as wonderful as our Jean Nagle, I can see why they might say "vision therapy changed my life."

It is a fact that because we were able to go to your clinic and get such an accurate evaluation on Tyler he is now in vision therapy. Please note that prior to coming to you, no one else mentioned our getting an optometrist's evaluation on Tyler. The words "vision therapy" were never uttered. Not by pediatricians, and certainly not by any of the (four!) teachers that Tyler had in first and second grade. Not by the school district psychologist or resource specialist . . . not even by my

mother who had taken my brother to vision therapy 30 years ago! Zip, zero, nada, and nobody mentioned this as a possible area of need for Tyler . . . except you! And since both my husband and I knew nothing about vision therapy, I doubt that we would have sought an optometrist's evaluation had you not suggested this. So THANK YOU!

Tyler is a treasure. Seeing these changes take place in him is a wonderful gift.

Parent 2

Several months ago I had a telephone consultation with Betty Maxwell (the Associate Director of the Gifted Development Center) regarding my seven-year-old son. His WISC-III results, with subtest scores ranging from 18 in Information to 7 in Coding, indicated to her a sensory integration problem, probably visual. I was referred to Bruce Wojciechowski, OD, FCOVD, behavioral optometrist in Portland, Oregon.

I want Betty to know that P's comprehensive visual evaluation was completed yesterday and the diagnoses and conclusions stunned me. This child was desperately in need of visual therapy and glasses to correct eyes that do not focus together (and also for mild farsightedness).

Among other tests, P was tested on the Visagraph immediately after receiving his glasses yesterday and then tested without glasses. Results: First grade reading efficiency without glasses; grade 4.4 reading efficiency with glasses. 83 words per minute reading rate without glasses; 298 words per minute reading rate with glasses. Of course, there are many more test results, but they all reach the same incredible conclusions. Test after test showed P, without glasses, sacrificing either speed for accuracy or accuracy for speed. This was exactly the case on the WISC-III when P completed all the Block Designs correctly but not within the time limit, so that he didn't get credit for accurate answers.

Dr. W. said that his "colleagues are going to be blown away when they see P's test results." Imagine three and one-half grade levels of reading efficiency improvement occurring in two seconds (the time it takes to put on glasses)! And we haven't even started vision therapy yet.

Amazingly, when I asked what our goals were for P's vision for the therapy, the doctor responded that rather than automatically stopping therapy as soon as P has reached norms for his age and grade, we might want to continue until he performs visually with the speed and ease that is commensurate with his intellectual ability—undoubtedly far above the norm.

It was such a pleasure to listen to my son read today. Although he has been reading very difficult material for quite a while, it was only yesterday, for the first time, I heard him read it with obvious ease, fluency and pleasure. It was a glorious day.

I wanted you to know of these results and that you were correct. Thank you very much for your consultation time and the referral to this wonderful doctor. I am sure that my son's life will be changed forever because of your insight and guidance.

A PRELIMINARY STUDY

We have undertaken a study of some of the children we recommended for vision evaluations who subsequently had vision therapy. In a few cases, parents have been curious enough about the impact of vision therapy to bring their children in for a second WISC-III a year after the first one. The results of the first three cases have been impressive. The Performance subtest scores improved by an average of 1.57 points. Perceptual Organization and Full Scale IQ Scores also increased (Figure 7). We have retested several other gifted children who have participated in vision therapy to see if they showed similar improvement on the Performance subtests.

Visual information processing evaluations by optometrists have shown improvement on *Getman Visual Recall, Wold Sentence Copy Test, Beery-Buktenica Visual-Motor Integration Test, Developmental Eye Movement Test,* and the *Gardner Test of Visual Perceptual Skills, Non-motor.* Eye movement quality and accuracy also improved.

These are preliminary findings. I believe that the study of gifted children with visual processing issues can add significantly to the existing studies of the efficacy of vision therapy. Because of the level of their abilities and the magnitude of the discrepancy between their strengths and weaknesses, gifted children have the potential to demonstrate far greater improvement than average children in visual functioning and in raised IQ scores. We are seeking funding to support a larger study.

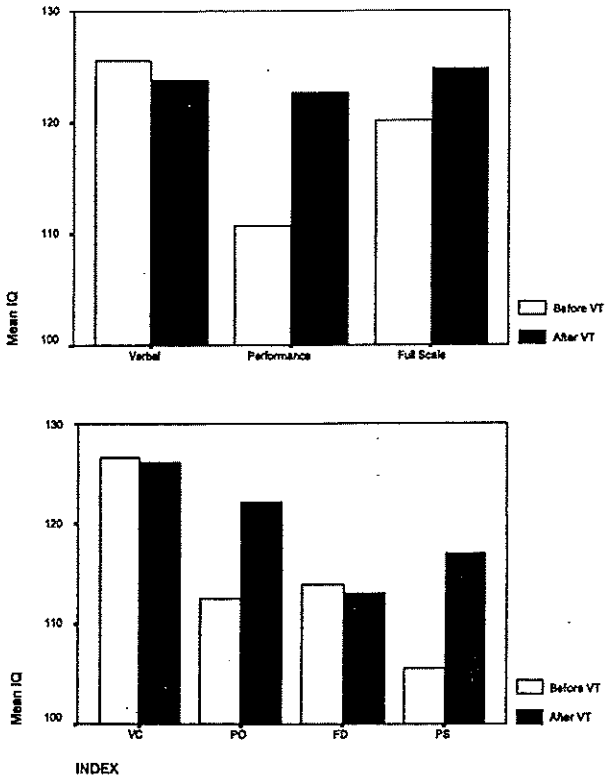


Fig. 7. WISC-III IQ and Index scores of three children before and after vision therapy.

AN OPTOMETRIST LOOKS AT GIFTED CLIENTS

Ten years ago, Lynn Hellerstein contributed an article for parents of gifted children on the types of symptoms that responded to vision therapy.[17] It seems appropriate to conclude this article with three cases excerpted from that excellent article, as well as her advice to parents and teachers. I recommend that optometrists distribute the entire article to parents to help them understand the benefits of vision therapy.

THE GIFT OF VISION
Lynn Fishman Hellerstein

To demonstrate the types of visual problems found in this population, three students, Geoff, Mark, and Lisa, are presented to show the difficulties and how each child compensated.

Geoff

Geoff was three years old when his mother brought him in for an evaluation because she saw his eyes cross occasionally. He was quite verbal, very "active," distracted, and often showed frustration. He was already reading and played the piano exceptionally well. Vision evaluation revealed a significant amount of hyperopia, amblyopia, and esotropia. So here we have a top performer despite significant visual problems. Treatment included glasses full time to compensate for the farsightedness, part-time patching (only two hours per day) for the lazy eye and vision therapy to help teach Geoff how to use his two eyes together more efficiently. Vision therapy was quite successful in that Geoff's vision in the "lazy eye" improved dramatically. In addition, his eyes were motorically aligned, but there was also improvement in sensory fusion.

Geoff's parents and my staff observed behavioral changes throughout therapy, as Geoff became less distractible and much calmer. Even at the young age of three, the frustration and tension were there.

Mark

Mark was twelve years old, attending a school for the gifted, when he was referred to this office by his teacher. He was significantly below age level in reading, spelling and writing. He complained of blurriness, intermittent double vision, words "moving" on the page, and fatigue with near work. Vision testing revealed a significant accommodative and binocular problem as well as deficiencies in visual motor integration, visual memory for symbols, and auditory discrimination. Previous psychological testing on the WISC indicated a Verbal IQ of 155 with the Performance IQ 30 points lower—a significant spread! Vision therapy was initiated to improve the deficient areas as well as to emphasize visualization strategies. After a year of treatment, Mark showed tremendous improvement in all visual areas. Focus flexibility, sustenance, eye teaming skills, and visual perceptual motor performance had all improved. He was no longer symptomatic. He made great strides in his academics. Self-esteem had greatly been enhanced as he now knew he could perform and be successful.

Lisa

Lisa was nine years old when she was referred by her teacher. She had no visual symptoms and was an excellent reader. Her main difficulty was handwriting. She had wonderful ideas for stories but would do anything to avoid paper/pencil tasks. She would dictate her stories to her mother to type, but showed much frustration if asked to write herself. Her writing was slow and laborious. Sizing and spacing of letters were variable. Vision testing revealed adequate visual skills and perceptual abilities. The only area of concern was in vi-

sual motor integration (copying shapes and forms). She scored only six months below age level, but all of her other testing was significantly above age level. The "gap" in her performance, compared to her potential, was more of a concern than the actual test score. A short-term vision therapy program was initiated to improve visual motor integration and fluency. Visualization strategies were emphasized.

At the end of four months, Lisa's handwriting had improved, but most important, she was much less frustrated by paper/pencil tasks. Eventually, a computer for word processing will still be more efficient for her as "her mind still thinks faster than her hand writes"; however, she has developed strategies to compensate for the discrepancy and now will attempt the tasks.

All three gifted youngsters demonstrated different types of visual problems, different compensatory abilities and different therapeutic solutions. However, all three benefited from glasses or vision therapy.

Learning problems are often masked in gifted children; many compensate or avoid certain tasks, thereby often showing the profile of an "average" student. Whether the child is labeled as having a learning disability often depends on the tester's ability to observe the frustration or compensatory actions. Of more concern than the actual label is whether or not there are significant gaps in abilities, which could reduce overall performance. Learning disabled gifted children can be so frustrated that they will not attempt to do the schoolwork, or they can be straight A students who have to work extremely hard to get the grade. Self-esteem is often compromised when children struggle, thereby complicating the emotional and behavioral picture. Children who are not performing to their potential should be thoroughly evaluated to determine their strengths and weaknesses. This testing should include a psychological-educational battery as well as an auditory and vision evaluation.

Dr. Mary Meeker, Director of the SOI Institute in California writes, "There are many reasons why gifted children do not or will not perform adequately, but poor vision function tops the list. There are a multitude of youngsters whose giftedness will go unnoticed, remain undeveloped or be suppressed because of undetected visual problems."[18]

Helpful Strategies

What can teachers and parents do to help gifted children with visual disorders?

- Understanding the gap in performance—the physical difficulties as well as emotional overlays—can frequently help the child reduce some of the stress surrounding the problem.
- Allowing the child to do more oral work and less written, busy work can also be beneficial.
- The computer has been a real blessing for many of these children. Even when they struggle with the keyboard, they know the end result always looks better, and that editing is not nearly such a chore, as mistakes do not mean a total rewriting of the paper.
- Visualization strategies are powerful—especially for spelling, reading comprehension, creative writing, relaxation, and preparation for sports or tests. In spelling, teaching the child to "see" the words in his or her head often helps break the "phonetic, creative" spelling pattern. With writing, give instructions such as: "Write easy," "Pretend your arm is a paint brush and paint from your shoulder," "Create a scene in your mind, full of detail, color, warmth, space, movement, etc., then write from your picture." If children get stuck on a word or lose their thought, gently remind them to look up and "see" what's up there. Remember, many of these children are already good visualizers; they just don't always realize when they can use the strategies.
- Most importantly, a referral for good vision care is necessary when symptoms and frustrations persist.

"The gift of vision is one gift all children deserve."

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VISUAL VIGNETTE

"If I were to wish for anything,
I should not wish for wealth and power,
but for the passionate sense of the potential
for the eye which, ever young and ardent,
sees the possible. Pleasure disappoints, possibility never.
And what wine is so sparkling, what so fragrant,
What so intoxicating, as possibility.

Soren Kierkegaard