Mel Levine

Professor of Pediatrics
Director of the Clinical Center for the Study of Development and Learning
University of North Carolina School of Medicine

Nominated by

Lucy F. Smith

Dr. Mel Levine
Professor of Pediatrics
Director of the Clinical Center for the Study of Development and Learning
University of North Carolina School of Medicine
Chapel Hill, North Carolina

Dr. Mel Levine is the founder of "All Kinds of Minds", a non-profit institute for the study of differences in learning. He initiated and is currently collaborating in "Schools Attuned", a national project designed to enhance the abilities of teachers to deal with children and adolescents having academic difficulties. He also has been instrumental in establishing diagnostic and follow-up programs, called Student Success Centers designed to offer precise assessment and management plans for students with learning difficulties.

The Oklahoma legislature first funded "Schools Attuned in 2001 by allocating $1,314,000 for training of teachers in public schools. The funding has continued to the present with an average of $903,760 per year. As of 2006, two-thousand-seven-hundred-thirty-three Oklahoma teachers have been trained in understanding brain development and how to use the educational approaches that support struggling leaders. The training consists of a 35 hour intensive course and 10 hours of follow-up.

The McAlester school district began its participation in the program in 2002 with 5 teachers attending the training. We now have 76 teachers in our district who have studied the way the human brain develops and works. They are learning to understand how children process information and how they can adapt to those differences in the classroom. For the first time, classroom teachers believe that they are able to connect brain science to teaching individual students in their classrooms.

According to Mrs. Mary Shannon, Deputy Superintendent of McAlester Public Schools, "This program provides the foundation that teachers need to offer individualized instruction and has decreased the number of referrals and placements of children in special education in our district. Parents and students are always relieved when they learn that there are solutions for students who learn in different ways."

Over 30,000 educators have participated in the "Schools Attuned" program since it began in 1987, and it is estimated that over three-quarters of a million students have been reached with the professional development program for educators. State initiatives exist in North Carolina, Oklahoma, and New York City, and there are trained teachers in every state in the union. The expansion of "Schools Attuned" services and programs include new parent outreach programs with Parent Fair and Educational Care Program released last year.

"To treat everyone the same is to treat them unequally. We are making a plea for greater flexibility in education and parenting, so that every child can find success in his or her own way."
Dr. Mel Levine

Submitted by:
Lucy F. Smith
Superintendent of Schools
McAlester, Oklahoma

Brief Biographical Sketch

Dr. Mel Levine

Professor of Pediatrics and Director of the Clinical Center for the Study of Development and Learning
University of North Carolina School of Medicine
Chapel Hill, North Carolina
M.D. Harvard Medical School

Dr. Mel Levine is a Professor of Pediatrics and Director of the Clinical Center for the Study of Development and Learning at the University of North Carolina School of Medicine in Chapel Hill, North Carolina. Dr. Levine is also the founder of All Kinds of Minds, a non-profit institute for the study of differences in learning. He serves as Co-Chairman of the Board of this Institute along with Charles Schwab. Dr. Levine is responsible for conducting research and training programs in the field of developmental disabilities. He also directs clinical programs for the evaluation of children and young adults with problematic learning, development, and/or behavioral adjustment.

Dr. Levine graduated summa cum laude from Brown University and was a Rhodes Scholar at Oxford in England. He later graduated from Harvard Medical School and completed his pediatric training at The Children's Hospital in Boston. For fourteen years Dr. Levine served as Chief of the Division of Ambulatory Pediatrics at The Children's Hospital in Boston at which time he was an Associate Professor of Pediatrics at The Harvard Medical School.

Dr. Levine was the Medical Director of the Brookline Early Education Project and the Principal Investigator in the Middle Childhood Project, a research program to elucidate problems with academic productivity among older elementary and junior high school students. He initiated and is currently collaborating in SCHOOLS ATTUNED a national project designed to enhance the abilities of teachers to deal with children and adolescents having academic difficulties.

Dr. Levine is the author of numerous books and articles. These include volumes entitled A Pediatric Approach to Learning Disorders; Developmental-Behavioral Pediatrics; Developmental Variation and Learning Disorders; Keeping A Head In School; All Kinds Of Minds; Jarvis Clutch – Social Spy; A Mind at a Time; and The Myth of Laziness. His latest book, Ready or Not, Here Comes Life, is about individuals with what he calls "work life unreadiness" and how we can prepare children to become productive and gratified adults.

Dr. Levine's major research interests are focused on learning processes and the specific dysfunctions that impede the education of many children and adolescents. He advocates a non-labeling approach, one that pinpoints and manages students' specific breakdown points, strengths and affinities without stigmatizing or oversimplifying them. Throughout his career Dr. Levine has been actively involved in the design and validation of new diagnostic instruments and training programs that integrate neurological, behavioral, developmental, and health findings in children with learning difficulties.

Works of Dr. Mel Levine

CURRICULUM VITAE

Melvin David Levine

PERSONAL DATA

Date of Birth and Place: January 20, 1940; New York, New York

EDUCATION

1961	A.B., summa cum laude, Brown University, Providence, Rhode Island
1961-1963	Rhodes Scholar, Magdalen College, Oxford University, Oxford, England
1966	M.D., Harvard Medical School, Boston, Massachusetts
1966-1967	Medical Intern, The Children's Hospital, Boston, Massachusetts
1967-1967	Resident in Medicine, The Children's Hospital, Boston, Massachusetts

EXPERIENCE

1969-1971	Captain, USAF Medical Corps, Clark Air Force Base, The Philippines
1971-1975	Instructor in Pediatrics, Harvard Medical School
1971-1975	Pediatric Director, Macy Program for Nurse Practitioner Education
1971-1977	Associate in Medicine, The Children's Hospital, Boston, Massachusetts
1979-1984	Co-Director and Clinical Coordinator, Harvard Interfaculty Program in Medical Ethics, Harvard University
1972-1975	Associate Director, Community Child Health Division, the Children's Hospital, Boston, Massachusetts
1972-1976	Director, Medical Outpatient Department, The Children's Hospital, Boston, Massachusetts
1972-1984	Member of the Rhodes Scholarship Selection Committee for Massachusetts
1972-1983	Pediatric Director, Brookline Early Education Project, Brookline, Massachusetts
1975-1985	Director, Community Services Program, the Children's Hospital, Boston, Massachusetts
1979-1985	Member, Society for Pediatric Research
1979-1982	Board of Directors, Ambulatory Pediatric Association
1979-1983	Editorial Board, Pediatrics in Review
1979-1981	Panel Member, National Academy of Sciences Panel on Outcome Measurement in Early Childhood Programs
1980-1985	Associate Professor of Pediatrics, Harvard Medical School
1981-1985	Editorial Board, Journal of Developmental and Behavioral Pediatrics
1981	Member, American Pediatric Society

1983-1985	Chairman, Committee on Developmental and Behavioral Dysfunction, Massachusetts Chapter, American Academy of Pediatrics
1983-1985	Council Member and Director of Publications, Society for Behavioral Pediatrics
1985	Professor of Pediatrics, University of North Carolina School of Medicine, Chapel Hill, North Carolina
1985 - Present	Director, Clinical Center for the Study of Development and Learning, University of North Carolina School of Medicine, Chapel Hill, North Carolina
1985- 1994	Chairman, The Advisory Council, Elementary School Center, New York, New York
1985-1992	Editorial Board Pediatrician, International Journal of Child and Adolescent Health
1985-1995	Member, Scientific Advisory Board, National Center for Learning Disabilities
1990	Rhodes Scholarship Selection Committee, North Carolina
1987-1989	Editorial Board Pediatrics in Review
1988	Editorial Board Devereux Review
1989	Editorial Board Exceptionality
1989-1991	Executive Committee Member. Section of Developmental-Behavioral Pediatrics, American Academy of Pediatrics
1989-1990	President, Society for Behavioral Pediatrics
1990	Editorial Board, Comprehensive Mental Health Care
1989	National Advisory board, Association of Educational Therapists
1990-1994	National Executive board Member, CHADD (Children With Attention Deficit Disorders)
1990	Editorial Board Journal of Developmental and Behavioral Pediatrics
1995	Co-Chairman of the Board, All Kinds of Minds, A Non-Profit Institute for the Understanding of Differences in Learning

LICENSES

North Carolina #29321

HONORS

1960	Jr. Phi Beta Kappa, Brown University Francis Wayland Scholarship, Brown University James Manning Scholarship, Brown University
1971	The Meritorious Service Medal, United States Air Force
1992	Orton Dyslexia Society. Outstanding Author Award.
1994	Razor Walker Award
1995	Star Foundation Award
1995	Aldrich Award of the American Academy of Pediatrics
1996	CHADD Hall of Fame Induction
1997	Children's Champion Award, Los Angeles, California
2002	Milton J. E. Senn Award for School Health, American Academy of Pediatrics

CERTIFICATION

1971	American Board of Pediatrics
1971	Fellow, American Academy of Pediatrics

SCHOOLS ATTUNED

by Carl W. Swartz, Melvin D. Levine, Thomas Watson, and Martha S. Reed

A PROGRAM TO HELP TEACHERS EDUCATE STUDENTS WITH LEARNING DISORDERS IN THE MAINSTREAM

The Schools Attuned *program is being implemented in eight school districts across the United States. It is designed to improve the current status and educational outlook for early adolescents with learning disabilities in the mainstream. It is thought that neurodevelopmental dysfunctions functionally undermine early adolescents' academic achievement and their relationships with peers and adults.*

We believe that the catalysts for improving the outlook for students who harbor neurodevelopmental dysfunctions are classroom teachers. Thus the project is designed to increase classroom teachers':

- understanding of the variations and deviations of early adolescent cognitive and social development,
- ability to observe and analyze students' performance and error patterns, and
- ability to discuss and collaborate with students and parents in formulating educational management plans that modify instructional processes and educational materials to bypass or ameliorate students' neurodevelopmental dysfunctions.

Schools Attuned gives classroom teachers sufficient knowledge, skills and learning experiences to be considered "Early Adolescent Developmental Specialists" who can effectively educate a group of learners with subtle yet potentially damaging learning problems.

RATIONALE FOR SCHOOLS ATTUNED

Public pressure to ensure an equitable education for all exceptional students culminated with the passage of The Education for All Handicapped Act (Public Law 94-142). Since the passage of P.L. 94-142 in 1975, almost eight million children have received educational services in public schools through a process of what has been called "progressive inclusion." This notion reflects the ideal that students should be placed in the least restrictive environment within the public school setting. In general, the *least restrictive environment* has been defined as the environment within which a student can function given modifications to the curriculum, teaching techniques, and classroom environment.

The placement of exceptional children in the least restrictive environment often requires their being mainstreamed into classrooms comprised of learners representative of a wide range of aptitudes and abilities. Inclusion of mainstreamed exceptional students in regular classrooms increases the diversity of already heterogeneous classrooms. Presently, the number and percentage of students being mainstreamed are rapidly increasing. The needs of learning disabled students can only be met if regular classroom teachers have the requisite knowledge, skills and expectations.

Research results suggest that the academic achievement of exceptional students in the classroom is more a function of the amount and quality of the instruction they receive than the nature of the classroom to which they are assigned. Clearly, successful mainstreaming requires classroom teachers to possess effective classroom management techniques and instructional methods, provide close supervision and frequent instructional feedback, and possibly individualized learning tasks to a group of problem learners in an already complex and dynamic environment.

CLAIRE YAFFA

These results suggest that teachers who possess an *understanding* of the characteristics of exceptional children, regardless of label, may make appropriate modifications to the structure, sequence and pace of academic activities and the general classroom climate (competitive vs. cooperative learning activities) so as to accommodate individual differences. Good and Brophy stated in their book, *Looking Into Classrooms:*

> "Most mainstreamed students will adjust well to regular classrooms if they receive acceptance and support from their teachers and peers. Teacher attitudes and expectations are critical. It is important that teachers think of mainstreamed students as their own and bonafide members of the class, not as visitors on loan from the special education teachers. Conditions should be arranged to allow students to participate as fully and equally in classroom activities as possible, and these students should be treated primarily in terms of what they can accomplish (or learn to accomplish with help) rather than with emphasis on what they cannot do because of their handicapping conditions." (p. 412)

The problem for professional educators at the university level is to translate knowledge generated through research (basic and applied) for classroom teachers so they can provide developmentally appropriate instruction. In other words, instruction is aligned with a student's developmental level, which is ascertained through a process of student observation, recording of performance, interpretation of evidence, leading to modification of the learning environment.

Schools Attuned attempts to provide teachers with a theoretical foundation in early adolescent cognitive and social development

and descriptions of how students can vary and deviate from normal development. The theoretical foundation of *Schools Attuned* is balanced by a strong emphasis on developing teachers' observational skills, planning and selection of appropriate instructional techniques.

THE CONTENT OF SCHOOLS ATTUNED

The content of the *Schools Attuned* curriculum is based upon current theories of cognitive and social development. Experimental and clinical insights on the subject of learning disorders and their implications for the wide developmental themes are explored during a series of lectures, seminars, and case discussions. The topics of the lectures include: *attention, memory, language, motor skills, higher-order thinking abilities, social function and behavior.*

The *Schools Attuned* curriculum is delivered by a series of videotapes, produced by the North Carolina Center for Public Television, given by Dr. Melvin Levine to a group of practicing teachers. The videotaped lectures are supplemented by seminars using the case study method to explore the reasons for a particular student's performance shortcomings and possible educational management plans that could be deployed to modify a student's instructional program.

Case study seminars are conducted by trained personnel, or project coordinators, from participating school districts. The project coordinators receive their education during a seven day *Schools Attuned* Summer Institute conducted by faculty from the Clinical Center for the Study of Development and Learning at the University of North Carolina at Chapel Hill. The Summer Institute develops the project coordinators' skills pertaining to conducting seminars, using the *Views Attuned* observation system, and consultative skills for collaborating with teachers, parents and students.

IMPLEMENTATION OF SCHOOLS ATTUNED INTO THE CLASSROOM

During the seminars teachers are trained in the use of a new and innovative observational system that parallels the content of the curriculum. The complete observational system is called *Views Attuned* and is comprised of three assessment instruments. The *Teacher's View* is used by teachers to record dimensions of the status of each neurodevelopmental function in relation to their actual classroom performance (Figure 1). The *Student's View* is a self-report instrument similar to the *Teacher's View* that students complete to record judgments as to their own academic and behavioral performance in the classroom (Figure 2). The *Parent's View* is completed by parents, enabling them to offer their perspectives on key areas of their child's present state of neurodevelopment and developmental history during the ages of 3 to 6 (Figure 3).

One or more teachers can use the *Teacher's View* to observe children about whom they have concerns. Students and parents complete their respective instruments and teachers integrate the information from the three "Views." Teachers' examination of students' academic performance through their analysis of their error patterns on academic tasks provides supplemental evidence to the *Views Attuned* concerning students' potential underlying neurodevelopmental functioning.

Once the "Views" are integrated and a vivid description of the patterns of neurodevelopment and other variables affecting performance has been compiled, the information is shared with students and, if possible, parents. *Schools Attuned* calls this process of explication *demystification*, a term used to denote a process in which a child's strengths, weaknesses, and affinities are described so that it contains as little myth, fantasy and mystery as possible.

Students' weaknesses and strengths are described in concrete terms with as little use of technical terminology, diagnostic jargon, or labeling as possible. Demystification should help alleviate guilt, dispel fantasies and minimize blame. It should also serve to convince children and parents of their ability to affect future outcomes. Teachers, parents and students work in collaboration to develop, implement and evaluate the effectiveness of educational management plans designed to meet the child's cognitive and social needs.

If necessary, teachers can ask for a project coordinator's aid in the integration of the *Views Attuned*, interpretation of the error analysis, and conferring

with students and parents. Teachers and personnel from the Center for Development and Learning have worked in collaboration to develop a manual describing alternative strategies for instruction and evaluation of targeted students.

DOES SCHOOLS ATTUNED WORK?

Schools Attuned has been implemented in two pilot study sites in North Carolina. As part of the evaluation, the project has collected extensive evidence of the effectiveness of the professional development program. Preliminary results suggest that teachers who participated in *Schools Attuned* generally improved their ability to identify students with attention, memory and social problems when compared to teachers from comparison schools. Furthermore, teachers who participated in *Schools Attuned* reported more confidence in their ability to manage the education of students with neurodevelopmental dysfunctions when compared to the confidence ratings of teachers who did not participate in *Schools Attuned.*

Preliminary results of the student evaluation suggest that students of *Schools Attuned* teachers, when compared to students of teachers not participating in *Schools Attuned,* reported significantly higher academic self-concept, and appropriate attributions of academic success and failure. Furthermore, preliminary analysis of the data indicates that students of *Schools Attuned* teachers improved both their behavior and grades compared to the grades and behavior for students of teachers not participating in *Schools Attuned.*

SUMMARY

The program is timely because classroom teachers are providing an education to more students with mild and subtle learning problems (identified and unidentified). Clearly classroom teachers need and can increase their knowledge of and skills required to work successfully with developmentally varied students. In turn, students' achievement and self-concept may improve when their teachers utilize their knowledge and skills to make appropriate educational modifications based on a descriptive-prescriptive approach to education.

Editor's Note: *This article is an adaptation of a paper by Swartz, Levine, Watson and Reed titled* Schools Attuned to Developmental Variation in Early Adolescence: An Educational Program to Help Teachers Educate Students With Learning Disorders. *The original paper with full references and citations may be obtained by writing the first author at the Center for Development and Learning, CB#7255-BDRC, University of North Carolina, Chapel Hill, NC 27599-7255.*

Carl W. Swartz, Melvin D. Levine, Thomas Watson, and Martha S. Reed are associated with the Clinical Center for the Study of Development and Learning, School of Medicine, University of North Carolina at Chapel Hill. *Funds supporting* Schools Attuned to Developmental Variation in Early Adolescence, *and the production of this article are provided by the Geraldine R. Dodge Foundation.*

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Figure 1: The Teacher's View

Attention

ELEMENTS	INDICATION(S) OF DYSFUNCTION	RATING OF STUDENT'S TYPICAL PERFORMANCE	INDICATION(S) OF STRENGTH
Selectivity	Stares into space, tunes out, doesn't take in important stimuli; easily distracted	1 2 3 4 5	Seldom misses important information conveyed in class; is not distractible
Mental Effort	Yawns, stretches, generally appears tired; burns out quickly	1 2 3 4 5	Never appears fatigued; looks alert; can focus on detail effectively
Planning and Tempo Control	Rushes through work quickly; doesn't stop to plan before and while working	1 2 3 4 5	Appears to plan and organize before and while working; places himself/herself effectively
Self-Monitoring	Seldom or never checks over work	1 2 3 4 5	Can be seen checking over work
Consistency	Is extremely variable, unpredictable with work	1 2 3 4 5	Performs at a steady level; quality of work is predictable from day to day
Activity Level	Is fidgety, has trouble sitting still in seat	1 2 3 4 5	Is able to sit still and listen without excessive or unusual movement of feet, hands, or whole body

Memory

ELEMENTS	INDICATION(S) OF DYSFUNCTION	RATING OF STUDENT'S TYPICAL PERFORMANCE	INDICATION(S) OF STRENGTH
Registration in Memory	Requires repetition; misses key inputs	1 2 3 4 5	Seems to remember things right after hearing/seeing them
Strategy Use in Memory	Does not use techniques such as subvocalization, self-testing	1 2 3 4 5	Uses memorization techniques, such as subvocalization, self-testing
Active Working Memory	Loses key parts of tasks while working on them	1 2 3 4 5	Seems able to retain task components while working or writing during classroom activities
Rapid Recall	Is slow to recall known facts	1 2 3 4 5	Is quick to recall facts from long term memory during a test or class discussion
Simultaneous Recall	Has trouble recalling multiple things at once that are known individually	1 2 3 4 5	Is able to recall skills and facts simultaneously with ease and efficiency (as in writing)
Activation of Prior Knowledge	Seems slow or poor at activating prior knowledge	1 2 3 4 5	Is quick to associate new information with prior knowledge
Automatization of Basic Skills	Shows slow/laborious recall of basic skills	1 2 3 4 5	Can recall basic skills effortlessly

Language

ELEMENTS	INDICATION(S) OF DYSFUNCTION	RATING OF STUDENT'S TYPICAL PERFORMANCE	INDICATION(S) OF STRENGTH
Comprehension	Needs more repetition and/or clarification than other students	1 2 3 4 5	Seems to have no trouble understanding directions or explanations
Vocabulary	Shows limited spoken vocabulary and/or does poorly on direct tests of basic skills	1 2 3 4 5	Understands and uses sophisticated vocabulary for his/her age
Word Finding	Pauses between words; often uses circumlocutions ("watchamacallit")	1 2 3 4 5	Does not seem to hesitate or substitute definitions or imprecise language for specific words
Oral Sentence Structure	Uses incomplete, overly ungrammatical or simple sentences	1 2 3 4 5	Speaks in complex sentences (using conjunctions and subordinate clauses)
Narrative Fluency	Has hesitant speech, lack of cohesive ties and/or free association of ideas	1 2 3 4 5	Can describe or summarize with a smooth flow of ideas
Elaboration	Uses short, non-elaborated verbal responses	1 2 3 4 5	Extends and enriches ideas very well verbally

Figure 2: The Student's View

INSTRUCTIONS: The following statements have been said by other students to describe themselves at school. Please read each item and circle the letter that best describes how often the statement is true of you.
SCALE: A = All of the time B = Almost all of the time C = Sometimes D = Hardly ever E = Never

ATTENTION	Please circle the letter that is most true of you. A,B,C,D, or E
1. I keep listening to and/or looking at unimportant things during classes.	A B C D E 1 2 3 4 5
2. It's easy for me to finish school work once I start it.	A B C D E 1 2 3 4 5
3. In school, I work too fast without thinking or planning enough.	A B C D E 1 2 3 4 5
4. My mind wanders a lot in school; I keep thinking about other things.	A B C D E 1 2 3 4 5
5. It's hard for me to sit still in class.	A B C D E 1 2 3 4 5
6. I get tired when I have to sit and listen in school.	A B C D E 1 2 3 4 5
7. I can concentrate well in school, and other times I can't concentrate at all.	A B C D E 1 2 3 4 5
8. I hate to have to check over my work.	A B C D E 1 2 3 4 5
9. I look out the window too much in school.	A B C D E 1 2 3 4 5
10. I'm fidgety; I need to keep doing things with my hands and feet.	A B C D E 1 2 3 4 5
If there is anything else you want to say about your attention, please write it below:	*Do not write in this space.*
	Total: _____

Figure 3: The Parent's View

INSTRUCTIONS: The following items have to do with paying attention and controlling activity. **The first 7 items** have to do with **how your child is *now*.** The **last 3 items** have to do with **how he/she was from age 3 to 6.** Please read each item and circle the response that best describes your child. Feel free to write any other comments about your child's attention at the bottom of the page.
SCALE: 1 = A serious weakness 2 = A mild weakness 3 = Normal for age 4 = A strength 5 = A great strength

ATTENTION This Year:	Please circle the number which best describes your observations of your child. 1, 2, 3, 4, or 5
1. Concentrating well on important things that aren't too interesting or exciting to him/her	1 2 3 4 5
2. Staying "tuned in" to important details without getting distracted	1 2 3 4 5
3. Controlling his/her activity level (not being too "hyper")	1 2 3 4 5
4. Thinking about it before saying or doing things	1 2 3 4 5
5. Noticing mistakes when he/she makes them.	1 2 3 4 5
6. Being consistent in behavior (not changing too much from day to day)	1 2 3 4 5
7. Finishing chores or responsibilities at home	1 2 3 4 5
Ages 3–6:	
8. Controlling his/her activity level (*not* being too "hyper")	1 2 3 4 5
9. Feeling satisfied or content (not wanting things all the time)	1 2 3 4 5
10. Sleeping well at night	1 2 3 4 5
	Do not write in this space:
Comments:	
	Total: _____

THE #1 *NEW YORK TIMES* BESTSELLER

A MIND AT A TIME

AMERICA'S TOP LEARNING EXPERT SHOWS HOW EVERY CHILD CAN SUCCEED

MEL LEVINE, M.D.

Author of *The Myth of Laziness*

FOUNDER, ALL KINDS OF MINDS INSTITUTE, AND DIRECTOR, CENTER FOR DEVELOPMENT AND LEARNING

1

A Mind at a Time

Introduction

Mind, *n.* **A mysterious form of matter secreted by the brain. Its chief activity consists in the endeavor to ascertain its own nature, the futility of the attempt being due to the fact that it has nothing but itself to know itself with.**

Ambrose Bierce, *The Devil's Dictionary*

Time is that wherein there is opportunity, and opportunity is that wherein there is no great time. . . . Healing is a matter of time, but it is also a matter of opportunity.

Hippocrates, *Epidemics*

Planet earth is inhabited by all kinds of people who have all kinds of minds. The brain of each human is unique. Some minds are wired to create symphonies and sonnets, while others are fitted out to build bridges, highways, and computers; design airplanes and road systems; drive trucks and taxicabs; or seek cures for breast cancer and hypertension. The growth of our society and the progress of the world are dependent on our commitment to fostering in our children, and among ourselves, the coexistence and mutual respect of these many different kinds of minds. Parents have a special responsibility and joy as they get to know well and to cultivate their children's individual minds. Tragic results are seen when we misconstrue and possibly even misuse a child's kind of mind! And that happens all the time.

I'm a pediatrician with a mission. I'm obsessed with helping children find

success. Over the years, working in all sorts of settings, I have been struck by the despairing flocks of boys and girls out there trying to make a go of it but faltering badly and disappointing their teachers, their families, and, worst of all, themselves. It has to be hard, very hard, to be a disappointment. I have come to the conclusion that helping such children find their way is as much a part of pediatric care as curing asthma attacks and ear infections.

Kids who can't seem to operate their minds to meet expectations feel terrible about themselves, while their perplexed parents understandably lose sleep over their child who reads with little understanding or has trouble making friends or is out of focus in school. Teachers may feel exasperated and sometimes incompetent as they witness a student's inexplicable downward spiral.

Some children end up paying an exorbitant price for having the kind of mind they were born with. Through no fault of their own, they are the owners of brains that somehow don't quite mesh with the demands they come up against, requirements like the need to spell accurately, write legibly, read quickly, work efficiently, or recall multiplication facts automatically. When they grow up, they will be able to practice their brain's specialties; in childhood they will be evaluated ruthlessly on how well they do everything. Having seen so often the agony of those who taste failure at an early age, I have developed a fervent commitment to such kids and to their parents and teachers. All are well-meaning, innocent victims of a child's particular neurological circuitry.

On countless evenings I have driven home from work feeling emotionally depleted, dejected after listening to the sad tales of children who have come to equate education with humiliation. Many of them have been forced to accept labels for themselves, labels that mark them as somehow permanently deviant or dysfunctional, labels like ADD (attention deficit disorder) or LD (learning disability). Others have been placed willy-nilly on several drugs to somehow settle or sedate or soothe their kinds of minds. Adding to the torturous trails they navigate, many struggling students have been seriously wounded by the current testing mania in our society. Their intellectual identity has been shrunken down to a list of examination scores that will determine their destinies while shedding little light on their true strengths, weaknesses, and educational needs.

I have not been willing to stand by while these children suffer a battering of their self-esteem. Too many of them are misread, oversimplified, maltreated, or else falsely accused by the adult world. And you have to worry about what these innocent victims of their own wiring think of themselves. As one child lamented in a letter to me, "I can't do nothing rite. My mom

and my teachers keep hollerin at me all the time. I feel like I'm the dumbest kid in my class. I guess I was boren to loose." No one should have to grow up feeling that way. And given all that recent research has revealed about differences in learning, no one needs to anymore.

The scenario is universal. Not every child is severely traumatized by a mismatching of his brain's wiring to current demands, but all of us sooner or later come up against expectations that cause us frustration and lead to some panicky feelings of inadequacy. No one is exempt. We can all recall times in our lives when we felt close to worthless compared to others. Luckily, most of us are reasonably resilient and so can bounce back from such feelings of inferiority. Some people, however, never recover from their failures.

Just think of the tragedy in the making when a child goes through life listening to such caustic refrains as "We know you can do better" or "He'll start succeeding when he makes up his mind to do so" or "She's got an attitude problem" when such statements are just plain untrue. They suggest that a child is somehow academically immoral, guilty in the first degree of his or her own undoing! Yes, they all can do better, but if and only if they are better understood by adults and then helped to succeed. There is much that parents and teachers can do to redeem such kids, all of whom possess remarkable strengths waiting to be tapped. That is what energizes me the most as I participate in their evolving biographies. They all can be helped once we identify the strengths of their minds as well as the potholes that get in the way of their success or mastery. We can cultivate their minds by addressing the weaknesses and strengthening the strengths.

A Mind at a Time sets out to accomplish multiple goals. In the course of describing the struggles of unsuccessful children, I will shed light on the brain's challenges that we all endure and see in our children over the years. Additionally, this book is intended to provide a road map for parents and teachers, enabling them to observe as children develop and mature through their school years the unfolding of important mind functions that play a leading role in school performance (and in career success). As such, this book might well be read by all parents and educators committed to the earliest possible detection of breakdowns in learning as well as the prompt identification of a child's assets. This is a book that could not have been written decades ago. It is only in recent years that, fortified with a wealth of research into learning, brain function, and school failure, we have been able to develop approaches to the understanding of children's minds.

A Mind at a Time is also a call to arms. I am beckoning parents, teachers, and policy makers to recognize how many kinds of young minds there are and to realize we need to meet their learning needs and strengthen their strengths and in so doing preserve their hopes for the future.

In writing this book, I decided to rely heavily on my own thirty years of experience as a pediatrician working in clinical programs and in schools of all types, from kindergarten through twelfth grade (with occasional forays into the early post–high school years). Over the course of these three decades I have been a collector and chronicler of case vignettes as well as direct quotations, the actual stories and words of real children's struggles. For me these kids have been like textbooks on learning and mind development. I can learn more about a child by getting to know her well than by reading a list of computer-generated test scores. In fact, whenever I participate in the clinical evaluation of a child, I see some facets of brain function that I have never before seen. In this book I want to share what I have learned from the students, their parents, and their teachers. Although I follow the research in the field very closely, I think it appropriate to write this book based purely on objective clinical observation, a volume in which children and their families and teachers tell most of the story (the names and identifying details all changed, of course).

To set the tone, before venturing any further, I would like to offer several illustrative examples of some of these clinical encounters. All were the children of good parents who were feeling desperate and seeking help from my colleagues and me. I start with Caleb.

Caleb, a boy living just outside of Boston, enters preschool at the age of nearly four. Over the next two years of his education, he is expected to relate amiably and cooperatively with his little classmates and accept the routines, rules, and other requirements of daily life at Happy Mountain Preschool and Kindergarten. His parents feel justifiably pleased and proud. At this age Caleb must show that he is acquiring a set of much needed early academic pre-skills, as they are often called. That means he is using a scissors with good results, forming letters legibly, counting beads, understanding adventure stories, and acting upon verbal directions. Caleb keeps up with the motor demands, but he is slow to follow directions and uninterested during storytelling. His parents become concerned because Caleb is starting to say that he hates school. He makes believe his belly is aching on many a school day. They worry about him but can't really pinpoint any kind of learning problem.

In first and second grades, Caleb is supposed to pick up some very basic math skills, which seem to come easily to him. He also must get his mind fully attuned to the sounds of the English language, so that he can tell them apart (like the difference between "bowl" and "ball") readily, and start matching sounds with symbols. The latter is the basis for reading. Out of the blue, Caleb announces one night at supper, "School stinks, and I hate it. I can't stand school. It's dumb and I'm the stupidest kid in my room." He flees

to his bed in tears. Caleb is stumbling and beginning to fail academically because of his mind's language weaknesses, which include trouble appreciating distinctly the sounds that make up words. He looks around and sees his classmates cracking the language code for reading, and he feels terrible and panic-stricken. His mother and father wonder if he needs tutoring or testing but are told by their pediatrician that Caleb is bright and no doubt will outgrow his problem. In third and fourth grades the language requirements intensify with the call for rapid growth of vocabulary and the understanding and use of challenging grammar. Caleb falls further behind.

Now he plunges into an academic nosedive. He is virtually blocked when it comes to putting his thoughts into language and then down on paper, even though he can form letters neatly. His parents, now very worried about him, have me evaluate him in North Carolina, find out that he is struggling with some critical language weaknesses, and arrange for Caleb to get intensive help. Meanwhile, Caleb's math abilities are getting stronger, and he is discovered to be a terrific artist. He also has started trumpet lessons and is doing very well musically. Caleb competes well with his peers in sports, but does not seem to be a budding athletic talent. His parents come back to see me once a year and keep in touch by fax and e-mail.

As he makes his way through the notorious obstacle course we call middle school, Caleb's reading starts to catch up to expectations. With continuing help, by the middle of eighth grade he is at grade level in reading and is beginning to write a lot more. He is getting straight As in math and keeping pace in science too. However, a lot of the abstract terminology in social studies and science confuses him due to his lingering language weaknesses. Caleb is coping effectively with the relentless peer pressure that is the guiding force of middle school life. He is also contending successfully with the heavy surge of memory demand that takes place in middle school—all those scientific facts, historical dates, math processes, and geographic places you have to file away. He also satisfies the need to be organized with homework, with deadlines, with meeting other responsibilities. His parents are pleased and relieved. They believe he is out of the woods.

Alas, during ninth grade, his first year of high school, Caleb's grades take a terrible tumble. He has lost all interest in school, feels hopelessly overwhelmed, as if he could never succeed. He is lost amid 2,800 students and the overworked, underpaid, well-intentioned teachers, all of whom seem to have all they can do to learn the names of their students, much less understand their individual learning needs. Caleb has never read for pleasure and now he finds the reading load unbearable. Even his math work, Caleb's dependably strong suit, declines.

Ninth grade amounts to an academic famine; Caleb is starved for success,

but he manages to get by. His parents are in a panic. They call me for advice, and I discuss his situation with Caleb on the phone several times. I also arrange for him to see a psychologist at the Children's Hospital in Boston. Caleb is denying he's having problems and refuses all help. "If you guys would just bug off and quit hassling me I'd do okay. Besides, I don't like any of my teachers, and none of my friends like their teachers either." His mother and father feel as if they have been on a roller-coaster ride for the last decade. His mother described Caleb as follows: "He's a doll. He's so good. He means well. He craves our respect, but he believes he doesn't deserve us. Now he feels so low, so blue all the time. And we know he's discouraged, very discouraged. So are we. We have no idea what's going on, why it is that school is defeating Caleb, and he is definitely surrendering."

When I meet with Caleb again he is belligerent. Talking to him is no fun. He won't make eye contact and insists that he's "stupid" and "lazy" and doesn't need Dr. Mel Levine to tell him that. Our assessment team proceeds to retest Caleb, who is now surprisingly cooperative—revealing that down deep in his heart, this boy desperately wants help. We are able to document some significant language problems that are still plaguing Caleb. It is evident that as the language demands of secondary school are skyrocketing, Caleb's mind is sputtering and stalling like a truck failing to make it up a steep grade. I take the time to remind Caleb of his language difficulty and how that relates to the troubles he has had in school over the years. It is miraculous to see the change overtaking his personality when I reassure him that he isn't "dumb" but has a very specific problem with the verbal parts of learning. His parents also look relieved. We then discuss ways of helping Caleb make more effective use of language, starting in subject areas that he enjoys. He loves anything connected with cars, especially racing cars. So he is encouraged to talk about cars and write about cars and read automobile magazines as much as possible. Often people like Caleb need to develop their language abilities in their areas of passion and expertise.

In tenth grade, Mr. Peters, Caleb's geometry teacher (coincidentally also the leader of the school band), takes a strong interest in him. The two form a bond; Caleb starts excelling in geometry and in the band. Mr. Peters serves as a friend and mentor to Caleb, which makes a vast difference. Mr. Peters and his wife take Caleb and some friends backpacking several times, and he loves the experience. In fact, he spends the following summer on an extended mountain trek. Caleb discovers himself. All his schoolwork gets handed in, and Caleb learns with gusto in eleventh and twelfth grades. He goes on to attend the state university as an engineering major and intellectually thrives as an undergraduate. His parents are beside themselves with pride. They're keeping their fingers crossed.

Caleb is now an acoustical engineer. He is a partner in a company that designs the sound properties of concert halls, theaters, and churches throughout North America. He loves his work. He's found his niche. In a letter Caleb wrote to me recently, he pointed out, "When I head for work in the morning, I can't wait to get there. I love what I do." His parents are ecstatic. Caleb's mom made a statement so moving that I recorded it verbatim in Caleb's chart. She said, "Seeing how proud he is tells me how pained he was."

Children like Caleb bring to school their unique kinds of minds, and the many circuits of their brain wiring get modified and refined over time. As I meet children like him, I can't escape the conclusion that different kinds of kids' minds are destined to lead different kinds of adult lives. Minds seek and should find their best ways of functioning during their school years, a period during which brains give off little signals that reveal what they are and are not wired for. Is anyone listening?

There's a lesson to be learned from Caleb's saga, namely that by keeping an informed eye and ear on the year-to-year performance of a child, we can tune in to the drama of his young mind in formation. Not only that, we are also able to have a positive influence over the dramatic plot (as Mr. Peters did) and how it turns out as adulthood approaches.

Then there's Carson, a boy who was told over and over by his parents that he would never amount to anything. His teachers echoed these gloom-and-doom prophecies. The adults around him were convinced that Carson's dismal school performance was attributable to plain and simple laziness, a moral lack for which Carson was repeatedly found guilty. By age thirteen this likable and handsome New York City boy was carousing and congregating with much older adolescents as a citizen of a culture that led him to become seriously drug- and alcohol-dependent. Carson felt flattered by his older friends' interest in him, especially since no one in the adult world was offering him anything resembling approval. On several occasions before his fourteenth birthday, his parents had to bail Carson out of jail. His father, who felt deeply anguished and depressed over his boy's self-destructive lifestyle, told him he was a "loser," a label Carson had come to accept as accurate.

But Carson's parents, teachers, and even Carson himself were all wrong. His was a misunderstood mind. He had always suffered frustrating problems with math and writing, even though this boy was a first-rate reader and a fertile source of perceptive thoughts during class discussions. Looking back it was clear that Carson had crippling trouble with tasks involving the heavy use of his memory. Math facts, spelling, even cursive writing and punctuation seemed to exceed his mind's storage capacity. He was totally

unaware of his memory deficiencies; his parents were in the dark, as were Carson's teachers. In elementary school, he could have been taught strategies to improve his memory, such as forming images, associations, and examples of the facts he was memorizing. He could have been encouraged to use a calculator to solve math problems and taught keyboarding as early as possible to ease his writing trouble.

Carson nearly died of a drug overdose three weeks before his fifteenth birthday. He was in a coma for thirty-six hours, during which it was unclear whether he would ever come to.

I first met Carson about two months after he was discharged from the hospital and enrolled in a drug and alcohol rehabilitation program. School remained a threat to this beaten-down teenager. Carson confessed during his initial evaluation, "I'm sunk when it comes to learning. I'm so far behind I feel as if I'm drowning in the Pacific Ocean. I even have dreams about drowning—almost every night, and I see my teachers speeding by in a boat just as I'm going under." Carson's dad noted, "I think Carson is dealing with his substance abuse problems pretty well, but the thought of going back to school sends him into a tailspin. He's just plain afraid to fail again. And we're afraid for him. We've been hard on him for years and we wonder if we've been too hard."

Carson underwent testing at the Clinical Center for the Study of Development and Learning, which I direct at the University of North Carolina Medical School. Our evaluation team was able to confirm that this boy had some serious difficulties in math and in his writing. We also "diagnosed" his impressively strong language abilities, dazzling social skills, and a galaxy of other positive traits and capabilities, including his ability to come up with original and perceptive thoughts regarding current political and international issues. Carson pored over every inch of the daily newspaper and had an opinion on everything. But during my testing, when I gave him a list of numbers to repeat, Carson, this clearly brilliant boy, kept getting them out of order. Nor could he draw designs from memory, typically leaving out key details. Assessments of his long- and short-term memory revealed some huge gaps. It was hard to imagine this boy remembering quickly and accurately enough to do well on tests in school.

At the end of a morning of assessment, I had a chance to "demystify" Carson, to explain to him and his parents his strengths and weaknesses. I talked to Carson about his superb language functioning, his unusual creativity, and his phenomenal people skills. I pointed out his advanced reading performance and his razor-sharp critical thinking. I mentioned that I thought that at age sixteen he could hold his own on any college debating team. Watching his expression, I had the impression that Carson had never

before heard anyone say anything favorable about his brain! He lit up like a Roman candle on the Fourth of July.

Then we talked about the areas of his mind that needed some work. I told him everyone has these. I explained to Carson that he was by no means stupid, that his communication skills and insightful thinking were signs of a really outstanding kind of mind. I then explained that I thought Carson was far better at understanding and explaining things than he was at remembering, that he had been struggling in school because of difficulty filing and retrieving information and certain kinds of skills in his long-term memory. I used a diagram I developed called "The Memory Factory" to show Carson what aspects of his memory were falling short of expectations. I gave him examples of different techniques he might try in order to become more systematic in memorizing facts and testing himself. I assured him that over time if he kept consciously thinking about his memory while studying, his capacity for remembering would likely grow. I also let him know that cramming tons of information into your memory happens a lot in school but that this isn't a major part of most careers. So the outlook for Carson could be excellent once he found his niche in an occupation. I then fueled his optimism by discussing with him all the exciting career options in which he could excel just by using the strengths he already possesses.

Carson's father telephoned me several days after his evaluation to report, "I can tell you this kid is on cloud nine, and he's even talking about possibly going back to school next week—it's as if he's come to see some genuine uses for himself. We're delighted."

Carson did go back to school (with understandable trepidation). We arranged for him to get the help he needed in math. He learned some good memory strategies. His teachers offered some humane accommodations. For example, his history teacher agreed to refrain from calling on him in class for factual questions that demanded an immediate response and instead would call on him to offer his opinion on an issue. Because of his writing problems Carson was helped with his keyboarding.

Carson is now at City College in New York. He has stayed away from drugs and alcohol, is majoring in journalism, and was elected editor in chief of the college paper. Carson has always loved to travel and wants to become a foreign correspondent. He came back to see me during his spring break. He said, "I think I have my act together. I still worry a lot about school and have trouble sometimes on quizzes, but I made the dean's list last semester. For the first time I'm really starting to feel like a winner." Carson knew that I am a pediatrician, but he asked if he could still come back to see me in Chapel Hill from time to time, just to check in. He seemed a little embarrassed to be making this request, but I was delighted. It's visits

from the Carsons and Calebs that keep convincing me that we can help all kinds of minds thrive. Besides, often I identify so closely with these kids that I start feeling like their uncle.

One more true story, that of Nana from Illinois. She was a very active little girl who often got into hot water for doing too many things too quickly without thinking them through. She had a devilish personality but could cast her spell on absolutely anyone in her vicinity. Her infectious laughter, her bouncing coils of golden hair, and her zany sense of humor attracted the attention and affection of other children as well as adults. She succeeded with formal learning in school despite mostly subpar concentration and highly impulsive tendencies. Nana always did the first thing that came into her mind with little if any use of good judgment. As she told her teacher, "I have a jumpy brain. It keeps jumping into things without looking." That seemed to be part of an attention problem that had plagued her since her earliest toddler days.

One afternoon, when she was about nine years old, Nana had a fierce argument with a classmate Juanita as they were getting off the bus. Several moments after the vehicle pulled away, she impulsively pushed her friend into the street, where she was struck by a minivan. Juanita fractured her femur and her pelvis. She was hospitalized for several weeks and underwent surgery. Fortunately, she recovered, but had a noticeable limp long after the accident. Nana never recovered. She had bad dreams about her friend dying because of her. She would feel guilty and depressed whenever she saw Juanita limping across the playground.

During the first four grades of school Nana often got punished severely for her disruptive behavior but never got understanding or sympathy. Her parents could have considered some counseling for Nana had they realized that she was having trouble controlling her attention, a problem commonly accompanied by impulsive tendencies. With some coaching, Nana could have learned about the risks of being impulsive and been taught such techniques as stopping and counting and thinking before acting. She might also have benefited from medication to tighten her control over her attention.

Fortunately, now at age nineteen Nana has gotten some help from a local mental health professional who has explained to Nana the various aspects of her attentional dysfunction. She has recently started on medication, which is helping reduce her impulsivity, although she realizes that drugs are not the ultimate answer to gaining control over herself. Nana managed to get through high school and is now working in a beauty salon, where her great people skills have served her well. The psychologist who told me Nana's story reported that Nana is seriously considering attending college. She would like to become a social worker.

A MIND'S POSSIBILITIES

It's taken for granted in adult society that we cannot all be generalists skilled in every area of learning and mastery. Nevertheless, we apply tremendous pressure on our children to be good at *everything*. Every day they are expected to shine in math, reading, writing, speaking, spelling, memorization, comprehension, problem solving, socialization, athletics, and following verbal directions. Few if any children can master all of these "trades." And none of us adults can. In one way or another, all minds have their specialties and their frailties.

Each of us is endowed with a highly complex, inborn circuitry—creating innumerable branching pathways of options and obstacles. While some of us have brains that are wired to handle a lot of information at once, others have brains that can absorb and process only a little information at a time (often with greater accuracy). While some of us have brains that store and retrieve from memory with precision and speed, others possess brains that access facts more slowly or with less precision. Some kinds of minds prefer to dream up their own original thoughts rather than drawing upon the ideas of others, and vice versa.

Although some of us have minds that are more comfortable and effective visualizing complex political or even religious ideas, others are apt to do much of their thinking in words and sentences. So it is that we all live with minds wired to excel in one area and crash in another. Hopefully, we discover and engage in good matches between our kind of mind and our pursuits in life.

Our abilities and inabilities are tested and challenged throughout our school years and in the course of every day of our careers. We all face the never-ending looming threat of failure to meet expectations—both the expectations that are imposed upon us and those we set for ourselves. An eleven-year-old who has never earned a grade below B+ on her report card suddenly sees her self-esteem plummet as she discovers she has a horrible time learning a foreign language. A young boy makes a fool of himself trying to serve a volleyball in physical education class—he can't get the ball over the net. His conspicuous gross motor shortcomings provoke humiliating jeers from his infuriated, ruthlessly judgmental fifth-grade teammates.

Some price, modest or substantial, must be paid any time a mind is forced or attempts to learn or perform something in a way for which it is not wired. This happens to all of us from time to time, but the outcome is tragic when the mismatching of a mind to a set of important tasks becomes a daily event and when that poor fit is not understood. This phenomenon takes place every day in schools everywhere.

A PEDIATRIC PERSPECTIVE

To help you understand the roots of this book, I feel compelled to indulge in a modest outpouring of autobiographical detail. I have been what is called a developmental-behavioral pediatrician. This is a growing branch of pediatrics, one that deals with child development, behavioral issues, and learning. After my training at Harvard Medical School and at the Children's Hospital in Boston, I served as a captain and school physician at Clark Air Force Base in the Philippines. At that point I became fascinated with the remarkable ways in which pediatricians and educators could collaborate in helping kids find themselves in life. When that stint ended, I went back to Boston and directed outpatient clinics at the Children's Hospital. I was astounded by the large numbers of kids who came to see us, not with traditional diseases but with problems functioning, especially in school. They appeared to me to be neither emotionally disturbed, nor dumb, nor lazy; there was obviously something far more subtle and insidious going on inside them, something awaiting our detection and good management. I soon became obsessed with these "hidden dysfunctions" and ultimately based my whole career on trying to elucidate them in order to help kids. Subsequently, I became a professor of pediatrics and director of the Clinical Center for the Study of Development and Learning at the University of North Carolina Medical School, a position I currently hold.

In 1995 I was the co-founder (with Charles Schwab) of All Kinds of Minds, a nonprofit institute for the understanding of differences in learning. The institute is heavily involved in training teachers to understand and deal with differences in learning. It also is designed to work with parents, clinicians, and children in an effort to make sure that the many different kinds of minds of kids are well understood and educated. All Kinds of Minds has grown rapidly, and I am happy to relate that it is having a powerful impact on children throughout the world.

Like almost everyone, as a child I had to cope with my allotment of harrowing run-ins with my own brain wiring, although I was, for the most part, a good student. In preschool I could never stay within the lines when I colored. I was unable to use a scissors properly (and still can't). The exhilaration that comes from either drawing or cutting in a straight line was a thrill I could only watch my classmates experience. My artwork was substandard at every stage of my development, requiring me to bend over drawings and other works of art, so as to shield my products from the spying of my classmates. My artistic defeats no doubt were helped by the red-green color blindness I didn't discover until some years later. To this day I feel humiliated whenever I attempt to fold a sheet of 8½ × 11 paper so it will fit neatly

in an envelope. Not only have I remained unable to accomplish this elusive feat, but I also marvel at how others do so! I'm about equally stumped when I have to fold a road map; it gets jammed like turkey stuffing in the glove compartment. Furthermore, while I'm confessing my personal disrupted wiring, I should add that from early kindergarten up to the present, I have never been able to operate a pencil sharpener. Again, I watch with gnawing envy as my peer group displays its effortless mastery; whenever I insert a pencil, the utensil comes out a blunt wooden stub.

I was never an athlete. While I was quite good at interpreting complicated language, I could not understand a thing a physical education teacher ever uttered in my presence (probably still couldn't). I hit neurodevelopmental rock bottom when we had square dancing, as there was no way I could transform verbal instructions into a gross motor pattern—I inevitably swung my partner in the wrong direction. What an embarrassment! I passed through childhood being picked last for teams. I sometimes felt as if I were in a police lineup during the selection process. Gym class was like a nuclear weapon in its destructive effect on my self-esteem. In middle school the nurse's office on gym mornings became my bomb shelter. I often retreated there strategically to complain of excruciating upper abdominal pain. And I really felt that pain. Catching or throwing a ball was well beyond my brain's inborn job description. When I was a teenager, my father talked me into taking some golf lessons. After several sessions, the golf pro politely suggested I might want to pursue some alternative form of recreation, as my swing was such that its arc seldom paused to make contact with the ball. So instead of sports, I opted to become the editor in chief of my high school newspaper (which did little to fortify my body image).

In fifth grade I had grave problems relating to my teacher, Miss Briggs. I was inept when it came to organizing my homework and writing neatly. I started to care only about my pets (a collie, a turtle, and a school of assorted tropical fish), all of whom I loved passionately. I felt out of place in school that year. Miss Briggs, who would criticize me brutally each day in front of my classmates, wanted to shackle me with retention in the fifth grade, but thank goodness my parents would not hear of it, in part because my achievement-test scores were very high in all areas. I went on to earn mostly As in sixth grade. Like so many others, I had suffered my share of horror and the pain of humiliation in school. Over the years I have worked hard to help alleviate that pain in thousands of unsuccessful students whose failed efforts have been in strictly academic areas or else in the demanding world of social life or even in their ability to live up to their parents' loving hopes and expectations for them. In the process I think I have acquired enormous respect for parents and teachers, and at the same time, I have

come to view struggling children as modern day heroes and heroines repeatedly wounded by the fact that their thwarted struggles to succeed are so widely misunderstood by grown-ups and also by themselves.

While studying and trying to help these unhappy kids I have found myself opening some windows on learning. I have been educated in the uniqueness of individual minds. This, in turn, has forced me to think about "a mind at a time" and ultimately to write this book. This volume could have as its subtitle "What We Are Learning About Learning from Children Who Aren't Learning," since I have discovered unexpectedly that the study of problematic learning shines a floodlight on all learning and how it's supposed to work. My three decades of clinical observations, my many years of collaboration with schools all over the world, my extensive devouring of the neuroscientific literature, along with the research in which I have been involved, have helped me assemble a model of learning and, in particular, a model that tries to account for patterns of learning as I see them across the broad spectrum of kinds of minds. This model provides a means for understanding and managing weak school performance whenever a child's brain functions can't keep up with demands.

When people, adults and children, learn about their own gaps, they frequently show, or actually report, a sense of relief, because for the first time in their lives they are able to understand exactly why they've been struggling to meet certain demands and how they can go about conquering or bypassing these challenges. They can forgive themselves and set about becoming stronger people. When I explained to Caleb that he was having trouble understanding complicated language when his teacher was talking or while he was reading, he no longer felt as if he was hopelessly retarded compared to other kids. When I reviewed with Carson the fact that he was experiencing problems with his memory, his face lit up. "So that's what it is. And I thought I was born with bad brain damage," he proclaimed. When Nana learned what it means to be impulsive, she no longer felt evil. Insight is liberating—and forgiving.

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Learning disorders: The neurodevelopmental underpinnings

By Melvin D. Levine, MD, and Nancy C. Jordan, EdD

When children are failing in school, parents often seek guidance from the pediatrician. This article, the start of a special series on learning disorders, describes the most common classroom problems and the underlying central nervous system dysfunctions that may produce them.

Performance in school is perceived—by parents, teachers, and children themselves—as the hallmark of competency in childhood. Mastering the skills that schoolwork demands is a complex process involving a number of developmental pathways that converge and interact. Most children are able to do what's expected of them at the appropriate age. But for a sizable group of children, learning does not proceed smoothly. Their efforts are thwarted by central nervous system dysfunctions that are fairly common in childhood.[1] These disorders are frequently subtle and insidious, but their impacts are substantial.

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Pediatricians, neurologists, and mental health specialists are frequently approached by educators and parents anguished over a child who fails to achieve despite their most intense efforts. The problem is easily misconstrued as an emotional difficulty or a pure lack of effort. To be responsive to the needs of all concerned, professionals should be aware of the types of academic problems children experience and the underlying dysfunctions that can create them.

Underachieving children show a wide range of disturbances in learning and productivity.[1-4] We have selected six clinical scenarios commonly seen in the classroom:

1. Deficiencies of concentration
2. Inability to read
3. Inaccurate spelling
4. Difficulty in producing written work
5. Mathematical confusion
6. Disorganization and failure to strategize.

In a subsequent article, we will explore specific assessment techniques and offer practical guidelines for managing these problems. A glossary of important terms used in learning disorders appears on pages 18 and 19. These words will appear in italics in the text.

1. Deficiencies of concentration

The ability to extract what is salient and reject what is irrelevant from an array of stimuli involves a process of *selective attention*. To succeed in school, students must be able to filter out distractions as they ferret out what a teacher is saying, what is relevant on the chalkboard, or what is the main idea in a reading passage. Children who have great difficulty doing that are said to have *attention deficits*.*

There are a great many such

*See "Devising the proper drug therapy for attention deficit disorders," *Contemporary Pediatrics*, October 1984.

children. They have a propensity to focus on the wrong stimuli at the wrong times and often for the wrong length of time, so that much of what is especially relevant during the school day eludes them. These students much prefer the big picture and tend to abhor fine detail unless it happens to be in an area that especially interests them.

Poor selective attention seldom occurs in isolation. It is frequently part of a broader symptom complex that includes a cluster of the traits summarized in Table 1.[5-6]

Children with a significant number of those traits are said to have a *primary* attention deficit. It may result from abnormalities of neurotransmitter metabolism in the brain stem[7] or frontal lobe dysfunction.[8]

It is important to recognize, however, that attention problems may also be *secondary* to more fundamental developmental dysfunctions or information-processing weaknesses.[9] For example, a child with a language disability who has difficulty interpreting what the teacher is saying tends to "tune out," just as children with primary attention deficits do. Other children develop secondary attentional problems because they are anxious or depressed. Their attention is displaced by their consuming worries and feelings of anxiety. Some youngsters have "situational" attention problems. They have trouble concentrating in an environment that is mismatched to their personal styles, values, and

A glossary of key terms

Active working memory: The capacity to maintain one part of a task in mind while completing some other aspect of the same task.

Attention deficit: A defect in the ability to attend selectively to the most relevant aspects of one's surroundings. Attention deficits may be **primary** (basic neurodevelopmental defects that interfere with a child's ability to learn), **secondary** (arising from underlying problems with language, depression, anxiety, environmental stress, or medical conditions), or **situational** (arising from the mismatching of a child and a milieu).

Comprehension: In reading, the ability to grasp the meaning of the text.

Convergent recall: The kind of memory that is called for in learning mathematics or foreign languages. It involves the recall of precise data on demand and is tapped in courses where there is only one correct answer to a question.

Decoding: The process of translating written words into language sounds or meanings. A child who can decode is able to pronounce many of the words he sees in print, and possibly to associate them with meanings. Decoding is not necessarily accompanied by comprehension of sentences or passages.

Divergent memory: Recall of information in a loosely structured manner so that the student thinks about, talks about, or writes about whatever he can remember. While divergent memory is inadequate for academic tasks that require precision, a good divergent memory can be associated with creativity.

Dysphasia: Difficulty with retrieving words from memory or being able to name objects and actions. Sometimes the term is used more broadly, to encompass a wide range of language disabilities.

Dyspraxia: Difficulty in implementing a series of coordinated, purposeful muscle movements. Students with **fine motor dyspraxia** may not have a good sense of which hand muscles to relax and contract in what order to form written letters, or how to control oral muscles for correct speech.

Eclipse phenomenon: In spelling, a situation where a student can spell a word correctly on a spelling test but has so many other difficulties with writing that he can't pay attention to proper spelling in context. The term can refer to any learning situation in which one skill usurps another during performance.

Episodic memory: Memory that is tied to the events of the child's own life. Episodic memory can be enormously detailed, but it usually does not function to recall formal learning such as number facts or spelling rules that are central to academic success.

Finger agnosia: A disorder in which a child doesn't "feel" what position his fingers are in, but can only tell by looking at them. As a result, he writes slowly and laboriously, often with an awkward grip on the pencil.

priorities. A student from a culturally deprived family who attends a middle-class school may tune out because what is valued in the school seems irrelevant. Finally, certain medical conditions (iron deficiency anemia, low-level lead intoxication) and medications (antihistamines, theophyllines) may create or exacerbate attention difficulties.

Most children with attention deficits are easily distracted from the task at hand by irrelevant things they see and hear, by their own free flight of ideas or daydreams, by their overwhelming wants and unsatisfied desires, and by other children. Schoolwork, especially when they must sit passively and listen to what the teacher is saying, seems to tire them out. They yawn a lot.

Many youngsters with primary attention deficits are also quite impulsive. They tend to do things quickly, without thinking. They may take dangerous risks in the playground or blurt out whatever they are thinking. Their impulsivity often compromises their schoolwork. They have difficulty coming up with a plan or thinking about a problem before they try to produce the answer. Many children with attention difficulties also have trouble with "quality control"—monitoring their own work. They don't notice the errors they are making and fail to go back over their work to make corrections.

Gestalt processing: Identifying and deriving meaning from whole structures such as words, sentences, or geometric figures without first analyzing their component parts.

Kinesthetic: Referring to the sense with which we perceive our own movements.

Metalinguistic awareness: An appreciation of how one's native language works. Students who are deficient in this area may have a poor sense of what "sounds right" and what can be inferred from language.

Morphology: The study of meaningful units of a language, such as prefixes and suffixes.

Motor memory: The recall of specific motor patterns needed to accomplish tasks. Also referred to as procedural memory, this is the ability that enables most of us to remember how to ride a bicyle even when we haven't done it in years.

Nonverbal reasoning: The capacity to apply logic without language, such as the ability to visualize the angles that are identical in an isosceles triangle.

Phonologic awareness: The ability to perceive the distinctive sounds that make up the words of our language, and to distinguish one sound from another.

Phonologic memory: The recall of speech sounds in a language.

Proprioception: The capacity to get positional information from stimuli within the body, so that a child knows where his hands are on the piano keyboard, or how he's holding a pencil, by the way the muscles in his hands feel.

Reduced writing: Difficulty in producing written work of sufficient quantity to meet the requirements of the student's grade level. There may be a marked discrepancy between the quality of written and oral work.

Retrieval memory: The capacity to bring to mind specific stored memories such as telephone numbers or the spelling of a word when the information is needed.

Revisualization: The process through which one "pictures" a word in visual memory in order to spell it correctly.

Selective attention: The ability to filter out irrelevant stimuli in order to focus on the salient aspects of what one sees, hears, or reads.

Semantic memory: Recall of facts and formally learned data.

Sight vocabulary: The words that a reader can recognize at first sight, without analysis.

Word analysis skill: The ability to sound out the components of words that are not instantly recognizable and blend those sounds to form the whole word.

In the past, most children with attention deficits were thought to be hyperactive as well, but present knowledge suggests that the two conditions do not necessarily occur together. Some children with attention deficits are overactive, some are normally active, and some are, in fact, underactive.[10] Similarly, some children with attention deficits have significant social and behavioral difficulties while others do not.

One of the most confusing attributes of affected children is their inconsistency. They do not show attention deficits all the time. They have good hours and bad hours, good days and bad days, good months and bad months, displaying far more variation in performance and behavior than other children. Adults often observe, "We know he can do it. When he applies himself, he can get the job done." The children, however, are perplexed by their own lack of consistency.

It is difficult to predict how academically troubled a child with attention deficits will be. It depends on whether his problems with attention are compounded by other deficits. Frequently these children have associated problems with memory.[1] This can be confusing, since parents often tell you that the child has an incredible memory. Usually they are referring to the youngster's extraordinary capacity to remember experiences in his own life in

TABLE 1
Traits frequently associated with attention deficits

Trait	Manifestations
Poor selective attention	Tends to focus on unimportant stimuli, distractible, abhors detail
Cognitive fatigue	Yawns frequently, tires easily when required to sit still and do schoolwork, fails to persist at tasks
Insatiability	Has difficulty delaying gratification, tends to want things all the time, has strong future orientation
Impulsivity	Acts too quickly, without planning or premeditation
Performance inconsistency	Shows wide variations in patterns of concentration, production, and test scores
Inappropriate activity	Is (sometimes) overactive and/or has difficulty integrating attention and activity
Deficient self-monitoring	Does not check over assignments for errors, and sometimes does not try to control behavior
Poor memory	Has difficulties with retrieving and consolidating information, so that he may lag behind his age mates especially at the high school level
Motor dysfunctions	Has problems with fine motor planning and synchronous execution that often create writing impediments

great detail, a capacity known as *episodic memory*. This is very different from the *semantic memory* and *convergent recall* he needs for academic success. This is a child who can recall every detail of a hotel he stayed at during a vacation when he was 4, or the color of his mother's dress when they went to the circus six years ago. But he cannot retrieve the math rules he was taught during the school year for the final exam.

Subjects that build on cumulative memory, or those that allow only one correct answer to a question—algebra and geometry, foreign languages, and certain sciences—may be very difficult for such students as they proceed through secondary school. On the other hand, they may do relatively well in courses such as English and social studies that allow more leeway and draw on *divergent memory*.

Attention deficits in themselves do not prevent a child from reading at or above grade level if other developmental functions such as language, reasoning, and memory are intact. It is common, however, for children with attention deficits to have problems with writing. Their characteristic haste, as well as difficulty in consistently remembering the precise forms of the letters, may make their written work sloppy and illegible.

The traits we have enumerated vary considerably in their severity and distribution from child to child. Associated developmental strengths and weaknesses, the

TAKE-HOME MESSAGE

Most children with attention deficits are distracted by irrelevant things they see and hear, by their own free flight of ideas, by their overwhelming wants and unsatisfied desires.

quality of educational experiences, nurturance at home, and other environmental and temperamental factors all influence the clinical picture.

2. Inability to read

Inability to read is a major source of academic underachievement, especially in grade school and junior high. The development of reading ability occurs in multiple stages beginning in the preschool years and extending up through high school and beyond.[11]

The ability to read has two basic components: *decoding* and *comprehension* (Table 2). Decoding is the ability to turn printed symbols into sounds and words. Comprehension is the ability to extract meaning from the sentences and paragraphs that are composed of those words. When children in the early elementary grades stumble in learning to read, the difficulty is usually in decoding.

A child may simply have trouble associating certain letter combinations with their established English language sounds. In some instances this is because of poor *phonologic awareness*; that is, a youngster may not appreciate the distinctness of English language sounds.[12] He might not distinguish clearly the initial sounds of such words as *bat* and *pat*, for example. In other instances, the child can differentiate sounds but cannot recall the association between a particular sound and its visual (so-called graphemic) appearance. He may simply not remember that the letter combination "th," for example, is pronounced a particular way. Such a deficit of verbal memory is probably one of the most common causes of poor decoding.[13]

At one time, most researchers believed that problems with visual perception were the primary source of so-called "dyslexia." These children couldn't decode, the explanation went, because they couldn't distinguish and orient the visual appearance of letters; they confused *b* and *p* and *d*.[13] Recent research, however, indicates that visual-perceptual problems are common in good readers as well as poor ones. In fact, a growing body of work shows that decoding weaknesses are associated more often with phonologic and/or memory deficits than with visual-perceptual deficits.[14-16]

Decoding requires two different kinds of skills: *word analysis* and *sight vocabulary*. Word analysis involves "sounding out" the individual components of an unfamiliar word and then blending those sounds to form and articulate the whole word. Skill in word analysis requires good phonologic memory. Some children with specific kinds of memory problems as well as those who have difficulty retaining information in the correct order (sequencing problems) may have to struggle with this aspect of decoding.

Good readers also need a collection of words they can recognize instantly, on sight. The sight vocabulary grows as children progress through school. By the time they enter middle or junior high school, they ordinarily possess a substantial sight vocabulary. If they do not, their ability to read is seriously hampered. Difficulties with acquiring a proper sight vocabulary can be related to several underlying developmental factors, including problems with *gestalt processing* (recognizing whole configurations without previously analyzing their parts) and poorly automatized *retrieval memory*.

Without decoding, comprehension is impossible. But what about children who can decode but still can't comprehend? Some of these may be children with language disabilities, who have varying degrees of trouble processing what they hear and are likely to have

even more trouble interpreting what they read.[16]

Their language problems may include a limited vocabulary, an inability to apply *morphologic* rules (such as prefixes and suffixes), difficulty with interpreting complex grammatical constructions, or weak *metalinguistic awareness*.[17] This is the ability to think about language and understand how it works. A child with an underdeveloped metalinguistic awareness may have difficulty drawing inferences or knowing what is implicit in the meaning of a sentence.

Some children are delayed in reading comprehension because of higher cognitive weaknesses. That is, they have problems with abstraction, reasoning, or such concepts as cause and effect, comparing and contrasting, categorization, and the use of analogies—all essential elements of reading textual material by the time a child reaches middle school.

For some students, the basic problem is memory. They cannot retain the early portion of a chapter while reading its final sections and thus fail to grasp the cohesive meaning of the text. For others, the comprehension problem is attentional; they cannot pick out what is salient in a reading passage and ignore what is less important or irrelevant. They cannot summarize what they have read and restate it in their own words. Inability to summarize is common among struggling students in high school and college.[18]

By the time students reach high school, they need a flexible range of reading skills. They need to know when and how to scan reference works for key details, to skim casually through a lengthy work, or to focus on details in preparing for objective tests. English courses may require them to discern the author's point of view, detect the use of irony and recurring themes, deal with symbolism and analogy, and compare diverse points of view.[11] Students whose comprehension skills lag behind those of their classmates may find that they cannot satisfy these demands.

TABLE 2

Inability to read: Common developmental underpinnings

Decoding weaknesses

Deficient word analysis skills
- Poor awareness or appreciation of phonology
- Poor phonologic memory
- Sequencing problems

Inadequate sight vocabulary
- Poor gestalt processing
- Problems with automatic retrieval

Comprehension weaknesses

Problems secondary to decoding weaknesses

Poor verbal comprehension (syntax, morphology, vocabulary)

Memory disorders (poor recall)

Higher cognitive deficits

3. Inaccurate spelling

When poor spelling is a youngster's only school problem, he will not fare badly. In the long run he will master most academic skills and feel successful. Quite often, however, spelling problems are accompanied by academic delays in other areas. In fact, what is most significant about a spelling problem is not the problem itself, but the clues that a characteristic pattern of spelling errors may reveal about underlying developmental dysfunctions.[19] Types of spelling errors and their apparent relationships to developmental dysfunctions are summarized in Table 3.

Language disabilities can be an important source of spelling difficulty. Some children with weak recall of sound/symbol associations may have difficulty in spelling as well.[20] Their poor *phonologic memory* results in errors that are close visual approximations of the correct spelling but phonetically inappropriate. A student with this problem may spell "laght" for "light."

Language difficulties can also make it difficult for some children to spell in context, even when they are able to spell the same words correctly on a spelling test. These children cannot use the clues suggested by grammar and

TABLE 3
Common spelling errors and their associated dysfunctions

Error	Example	Commonly associated dysfunction/misapprehension
Visual approximations	"Frand" for friend	Poor appreciation of or recall of phonology, possible language disability
Phonetically correct misspelling	"Hite" for height	Weak revisualization, possible problem of visual memory for configurations
Mixed types	Both visual approximations and phonetically correct errors ("His highpothusis was interenting")	Generalized memory weakness
Inconsistent spelling	Same word spelled correctly and incorrectly in a paragraph or essay	Impulsivity and weak self-monitoring; may be associated with attention deficits
Eclipsed spelling	Same word spelled correctly in isolation, poorly in a paragraph	Other aspects of writing demand too much attention; possible motor or memory problems
Invented spelling	"Ez" for easy (use of letter names as letter sounds)	Common in preschool. Nonspecific association with severe spelling problems in older students
Illegal spelling	"Fuhdj" for fudge (use of non-English letter patterns)	Poor appreciation of rules and regularities. Possible problems with higher order cognition

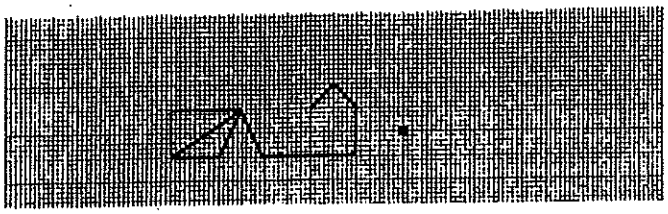
meaning as aids in spelling. They may have particular problems spelling words in the correct tense or knowing which spelling to use when two similar sounding words such as "son" and "sun" have different spellings and different meanings.

One group of poor spellers has persistent problems with *revisualization*; their ability to recall visual configurations is impaired. These youngsters rely on phonetics entirely, and they tend to make such phonetically correct errors as "lite" for "light."[19] Many of them have broader impairments of visual memory, and sometimes they have difficulty picking out the important aspects of visual patterns.

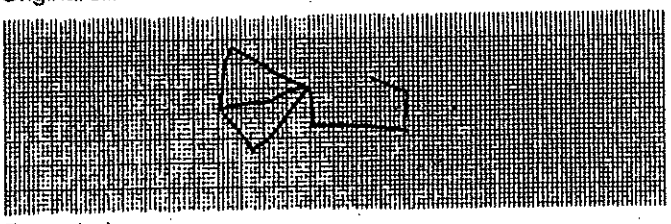
Another group of poor spellers makes a combination of phonetic and visual errors as a result of

Graph paper copying: A test of motor planning

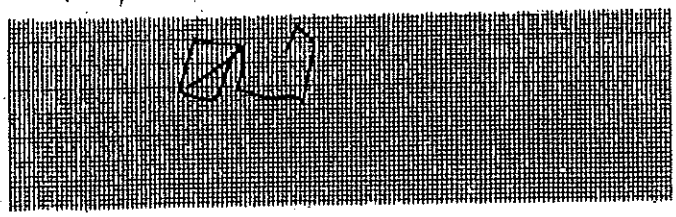
Using a graph paper grid to develop a motor plan is the challenge posed by this task, designed for children between the ages of 9 and 15. Youngsters who are impulsive, have trouble focusing on detail, or have fine motor dyspraxia find it difficult to reproduce the original drawing. The youngster who produced example A did not locate his copy in the same part of the graph; the left side of his drawing is distorted in size and inaccurate in detail. Example B differs from the stimulus more markedly in location, size, and detail; the dot on the right is omitted. This child's pencil control is poor and the drawing executed impulsively. Example C is located inaccurately on both the horizontal and vertical axes, and the size is distorted. Most of the detail is present, except for the dot.



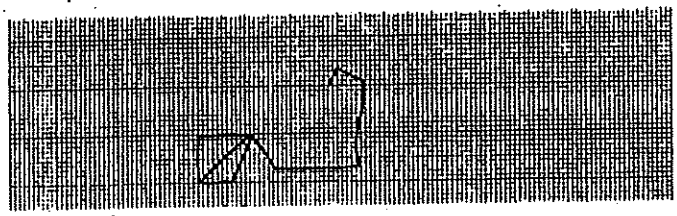
Original stimulus



Example A



Example B



Example C

general memory weakness. These children have broad deficiencies of retrieval memory that transcend specific visual and auditory pathways. In many cases, they invent spellings and may use the name of the letter as its sound so that they might spell the word "any" as "ne." This particular error is a primitive form of spelling and is normal in preschoolers. When an older child does it, however, the dysfunctions may be quite serious.

When spelling problems are associated with attention deficits, the errors are often random and inconsistent. These children may spell the same word in different ways within the same sentence or paragraph. Their errors are careless; sometimes they leave letters out, and sometimes they insert letters that don't belong. Because they characteristically fail to monitor their own work, the errors pass without correction.

Struggling junior high school students are often able to spell words individually but misspell the very same words when they attempt to use them in a paragraph.[1] These youngsters usually have significant writing problems as well, and their difficulty with spelling is really an *eclipse phenomenon*. That is, they are struggling so intently to recall letter formation, grammar, ideas, capitalization, punctuation, and organization that spelling is eclipsed by more compelling priorities.

Finally, some children are agonizingly slow to appreciate and apply spelling rules. They have

trouble perceiving the regularities of spelling in the English language. They are likely to commit errors that are orthographically illegal, such as "kwitt." Mistakes like these are phonetically correct but make use of bizarre letter combinations that do not exist in our language. Some children who spell this way have language disabilities, while others have higher cognitive weaknesses that interfere with the assimilation of rules and the appreciation of regularity and irregularity. Students with this last problem are susceptible to difficulties with other rule-laden subjects such as foreign languages and mathematics.

4. Reduced writing

Many students who are not doing well in school have particular difficulty producing written work. They fail to hand in written assignments or produce only a paragraph or two when a several-page paper is called for. They worry that the final examination will be an essay test, and when it is they do poorly. These students are often accused of laziness or having a negative attitude toward school, but they may in fact be suffering from problems with fine motor function, memory, language, or organization that make writing very difficult (Table 4).[21] The problem is referred to as *reduced writing*.

Several types of fine motor dysfunction can make writing an agonizing burden. Difficulties with finger localization *(finger agnosia)* are frequent. Affected children have trouble interpreting *proprioceptive* and *kinesthetic* feedback from their fingers, so that the only way they can tell whether they are forming letters correctly is to watch the moving pencil. This visual monitoring reduces the speed of writing, requires an inordinate effort, and drains attention from the content of what is written. Many of these children write with their heads almost resting on the desk because they need to have their eyes very close to the page. Others try to compensate for the lack of feedback from hand muscles by holding the pencil too firmly, too close to the point, or with a fist-like grip.

TABLE 4
Reduced writing and associated dysfunctions

Fine motor dysfunctions
Finger agnosia
Dyspraxia
Motor memory fluctuation

Memory weaknesses
Slow, imprecise, or out-of-synch retrieval memory
Poor revisualization (for spelling)

Language disabilities
Poor vocabulary, syntax, morphology, and narrative organization
Associated spelling problems

Fine motor dyspraxia may also impede writing. Children with this condition have difficulty implementing the motor plans for writing. They do not know what muscle groups to contract and relax in order to form written letters. As a result, their writing is painfully awkward and slow. Many dyspraxic writers also have oral dyspraxia; they do not know how to control the muscles that are involved in producing speech.

Another variety of fine motor dysfunction is a *motor memory* problem. Affected students are slow and inaccurate at recalling the motor engrams or "blueprints" for writing. As they write, they keep forgetting how to form specific letters. The same letter may be formed differently in different sentences. Their writing is characterized by false starts, pronounced hesitations, and frequent crossing out. Cursive writing is particularly difficult; most students with motor memory problems prefer to print.

Other forms of memory weakness can also impair writing. When a child writes a paragraph, he must simultaneously recall letter formations, spelling, punctuation, grammar, capitalization, vocabulary, and the flow of his ideas. It is not unusual to encounter students in whom one or more of these retrieval memory processes is slow, variable, or inaccurate. Writing then becomes so laborious that students fail to complete assignments, submit brief or

simplistic reports, and show a marked discrepancy between the quality of their thoughts in a class discussion and what they are able to transcribe on paper.

Children with language disabilities commonly experience writing problems.[16] Those who have expressive language weaknesses are likely to encounter particular problems putting their thoughts on paper. Word finding difficulties *(dysphasias)*, problems with sentence formation, impoverished vocabularies, and weak narrative organizational skills all are apt to compromise written language.

5. Mathematical confusion

It is not unusual for children with difficulties in mathematics to develop a significant degree of "math phobia." A range of underlying dysfunctions can impair the acquisition of mathematics skills (Table 5).[1] Some students with math disabilities are bothered by the kinds of reasoning required to appreciate and manipulate math concepts. Those who have problems with *nonverbal reasoning* encounter cognitive barriers in appreciating certain crucial mathematical concepts such as place value (the changing significance of a numeral depending upon its position in a large number), proportion, and equation, and such geometrical concepts as volume, perimeter, or parallelogram. Some of these children try to succeed at math by translating all concepts into linguistic formulations, although they may have only a tenuous grasp of the concept's real meaning. For example, a student may keep trying to verbalize the concept of proportion but be unable to picture actual fractions or percentages of volumes or lengths.

TABLE 5
Factors in poor math performance

Weak nonverbal reasoning
- Poor or tenuous conceptualization
- Overreliance on rote memory
- Deficient problem-solving skills

Language disability
- Poor understanding of teachers' verbal explanations of mathematical processes
- Poor understanding of language used in word problems

Memory dysfunction
- Problems retaining component elements during computation (failure of active working memory)
- Poor recall and/or delayed automatization of basic math facts

Attention deficits
- Careless errors
- Lack of planning and use of effective strategies for problem solving

Some students depend upon rote memory to master arithmetic ideas and processes. This approach constrains their flexibility and ultimately can cause lags in computation and its practical applications.

Although mathematics places a heavy emphasis on nonverbal reasoning, language ability is also germane. Students must be able to understand their teacher's explanations of mathematical procedures. They must solve word problems and contend with the terse explanations favored by the authors of math textbooks. Some children with language disabilities have a very difficult time figuring out which mathematical algorithms are called for in word problems. They may know what steps to go through to do long division, for example, but they don't know whether division will provide the answer to a word problem, or whether a number given in the problem is supposed to be the dividend or the divisor.

Memory difficulties can also impair a child's ability to learn math. Deficiencies in *active working memory*, or the ability to coordinate several processes in one's mind simultaneously, can make arithmetic exceedingly difficult.[22] A student with a dysfunction in active working memory may, for example, add the units column in an addition problem and find that he needs to carry a digit to the next column; before he starts adding up the next column, he has forgotten what he meant to do with the number that he carried.

Continued

LEARNING DISORDERS

been confused about time and sequence all their lives. They are frequently late and have a marked tendency to procrastinate. Many of these children were slow in learning to tell time, in mastering the days of the week and the months of the year, and in following multistep directions. They have problems organizing their day and presenting their ideas in the proper sequence in an essay or in speech.

One way of understanding organizational disabilities is to contrast these students with successful learners. Good students have strategies for learning. They have a feeling for what is essential to know for a final exam and how to go about reviewing it. They know what material in a course should be memorized and whether they memorize best by talking out loud, writing things out, or reading silently. They have learned from experience how much time they need to research and write a term paper, so that they know when to start work in order to be finished by the due date. They know whether a detailed outline, notes on index cards, or working directly from the reference books works best for them. If one technique fails, they have other ways of going about the task.[23]

Many students with learning problems lack these strategic organizational skills. They do everything the hard way. When they encounter an obstacle, they are overwhelmed with feelings of frustration and anxiety. At that point, they may take guesses or give up on the task entirely and lose their motivation. By the time they reach high school, they are at a serious disadvantage and need considerable assistance if they are to avoid failure.

Summing up

The six disturbances of learning that have been described here, and the developmental dysfunctions that contribute to producing them, are common. They are not, however, mutually exclusive. Many struggling students have more than one of these problems, and often it is the additive effect of several minor dysfunctions that is disabling. A child may have moderate fine motor problems that interfere with his writing, for example, along with slight language disabilities and mild weaknesses of attention. No one lag would be severe enough to impair his ability to learn, but together they make his efforts in school inefficient and unrewarding.

Children have strengths as well as weaknesses, and their neurodevelopmental assets can be used as a kind of "collateral circulation" to circumvent learning problems. Identifying a child's strengths and devising learning strategies that are based on them are important parts of therapy for these patients.

Difficulties in school cannot be explained exclusively in terms of neurodevelopmental dysfunctions. Children live in a world of parents, peers, neighborhood, and teachers, all of which influence learning. So do the child's

He is not able to preserve all of the numbers and processes on an imaginary screen in his mind long enough to complete the necessary calculation.

Discrete weaknesses of memory can also reduce a child's ability to master facts such as the multiplication tables. If a student is going to be an adequate mathematician in secondary school, these facts must be instantaneously and effortlessly retrievable. When the student's retrieval memory is imprecise or slow, math becomes difficult.

Finally, children with attention deficits may experience problems in math because of the impulsivity that is often a part of their problem. Their failure to plan and to check their work results in frequent, careless errors.

6. Disorganization and failure to strategize

Some students have an underlying inability to organize that cuts across many categories of learning and affects everything they do. Often the disorder becomes apparent early in a child's school career, when he seems to struggle inordinately with the props and products of the classroom. Children like this have trouble maintaining a notebook, finding things in their desks or lockers, bringing home the right books, locating pencils or paper, or remembering to submit assignments after completing them. They often have a long history of losing their possessions.

Other youngsters seem to have

physical health, the critical events in his life, his temperament, coping ability, and overall mental health.[24]

The emotional complications of learning disorders often prove more damaging than the disorders themselves. Children who repeatedly fail in school suffer from profound feelings of inadequacy. They are often ashamed and anxious, and some become overtly depressed. They pretend indifference to their lack of academic success and employ face-saving strategies—from playing the class clown to acting cool, defiant, and controlling—that are usually self-defeating. These self-imposed "cures" are worse than the "disease." In severe cases, especially when academic difficulties are combined with family problems, young people may become involved in substance abuse, delinquency, and other strongly antisocial behavior.

Ideally, through prompt recognition and accurate descriptive diagnosis, the negative effects of learning disorders can be minimized while developmental assets are identified and exploited. In such cases, a seemingly damaged or disabled CNS can emerge as a specialized brain, one that is proficient in its own way. □

In the next article, the authors will discuss assessment and management techniques that can improve learning and minimize the devastating complications of too much failure too soon in life.

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Learning disorders: Assessment and management strategies

By Nancy C. Jordan, EdD, and Melvin D. Levine, MD

Assessing the child with learning disorders and designing a workable program of remediation require collaboration among many disciplines. Pediatricians can be key members of this team, serving as diagnosticians, coordinators, and advocates for the child.

In the first part of this series, we described common patterns of academic underachievement that are associated with neurodevelopmental dysfunctions.* Children with these problems often feel a pervasive sense of failure and an erosion of self-esteem. In many cases, emotional and behavioral difficulties accompany their academic problems. Parents, teachers, and the children themselves may not understand why learning is so difficult or how the situation can be improved. Education and health professionals can help these children in two ways: by making an accurate and detailed neurodevelopmental assessment of the child's specific strengths and weaknesses, and by developing a plan for managing the child's education in ways that enhance both academic skills and feelings of self-worth.

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ASSESSMENT

The assessment of a failing or faltering child is designed to provide a detailed description of strengths and weaknesses in multiple areas of function. In addition to the assessment of academic skills, the areas of investigation usually include neurodevelopmental strengths and weaknesses, environmental supports and stresses, coping abilities, and a variety of social interactions. Such a description can then serve as a guide for intervention by parents and school personnel.

A detailed diagnostic description will help teachers, parents, and children understand both the sources and effects of learning dif-

*See "Learning disorders: The neurodevelopmental underpinnings." *Contemporary Pediatrics*, August 1987.

TABLE 1
Components of an assessment of learning problems

History taking and environmental assessment
- Family history
- School history
- Developmental and health history
- Current patterns of function

Neurodevelopmental evaluation
- Systematic observation of developmental dysfunctions
- Evaluation of attentional strength across domains
- Descriptive profile

Cognitive testing
- Assessment of higher order cognition
- Qualitative analysis of problem solving strategies

Psychoeducational assessment
- Assessment of basic academic skills
- Fine-grained analysis of error patterns and learning style

Socioemotional screening
- Rule out primary emotional disturbances
- Assessment of temperament, coping abilities, and social competence

Physical, neurologic, and sensory examination
- Identification of complicating medical factors
- Rule out genetic, sensory, or neurologic disorders

ficulties. A good assessment can uncover complications of the disorder as well as such associated diagnoses as depression, vision and hearing problems, or chronic illness. The assessment can also identify factors in the child's environment—domestic turmoil, cultural discord, inadequate housing—that may interfere with learning.

In most states, assessments are mandated in order to determine eligibility for special services in schools. Guidelines for making these determinations are often based on discrepancies between scores on achievement and IQ tests. In these situations, qualifying the child for services is a necessary objective of the assessment. That, however, should not preclude a comprehensive evaluation of multiple aspects of function, many of which are not figured into the state eligibility formulas. Establishing the child's eligibility for services should never be mistaken for a complete evaluation.

What goes into a good assessment?

The optimal components of an assessment, summarized in Table 1, are interrelated. Clinicians should watch closely for recurring themes and variations throughout the evaluation procedure.

History taking and environmental assessment. An assessment must include careful consideration of a child's family history. Reading disorders, for example, are often genetically predisposed, and a child with a reading disability may have a parent or sibling who also had problems acquiring reading skills.[1] Perinatal history and early development and behavior can also be significant. Did the child's mother take medications during her pregnancy? Was the birth premature? Was the delivery by cesarean section? Were there eating or sleeping problems in infancy? Was it difficult to console this baby? How old was he when he first spoke a two-word sentence?

The child's world at home, in the community, and at school should also be explored. What aspects of his environment help him cope and make him feel valued? Is he good at sports or interested in music? Does he get along well with other children? What stresses might be complicating his learning disorder? Is he an adopted child? Does he have to live with excessive criticism or humiliation

at school or in the neighborhood? Such criticisms can significantly complicate a learning disorder.

This kind of information is obtained through interviews with parents, teachers, and students. Questionnaires highlighting relevant historic and environmental variables can focus the interview, since there may be too much to ask about in the time available. We use the ANSER system (Aggregate Neurobehavioral Student Health and Educational Review), a series of questionnaires we have developed that are keyed to distinct age groups.[2] Follow-up ANSER forms are used to monitor progress.

Neurodevelopmental evaluation. Direct observation of a child's neurodevelopmental status can be especially helpful for pinpointing underlying dysfunctions. A complete evaluation should document strengths and problems in the following areas: neuromaturation (presence or absence of minor neurologic indicators or "soft signs"); fine and gross motor function; language; memory; visual-spatial processing; and temporal-sequential organization. Observing variations in the student's attentional strength from one area to another is important; the presence of impulsivity, distractibility, performance inconsistency, and weak attention to detail all should be documented. As these areas are tested, the tempo of the student's work and the way he applies—or fails to apply—learning strategies are significant.

TAKE-HOME MESSAGE

Assessments are susceptible to disciplinary bias; diagnosticians make the diagnoses they have been trained to make. There is a need for multidisciplinary checks and balances.

Neurodevelopmental information is usually elicited by pediatricians, psychologists, or professionals in such allied disciplines as special education. We have developed and applied a series of pediatric neurodevelopmental examinations that are designed to generate empirical descriptions and functional profiles of developmental strengths and weaknesses.*

Many other neuropsychologic test batteries are available, as well as assessments that tap single developmental functions such as language.

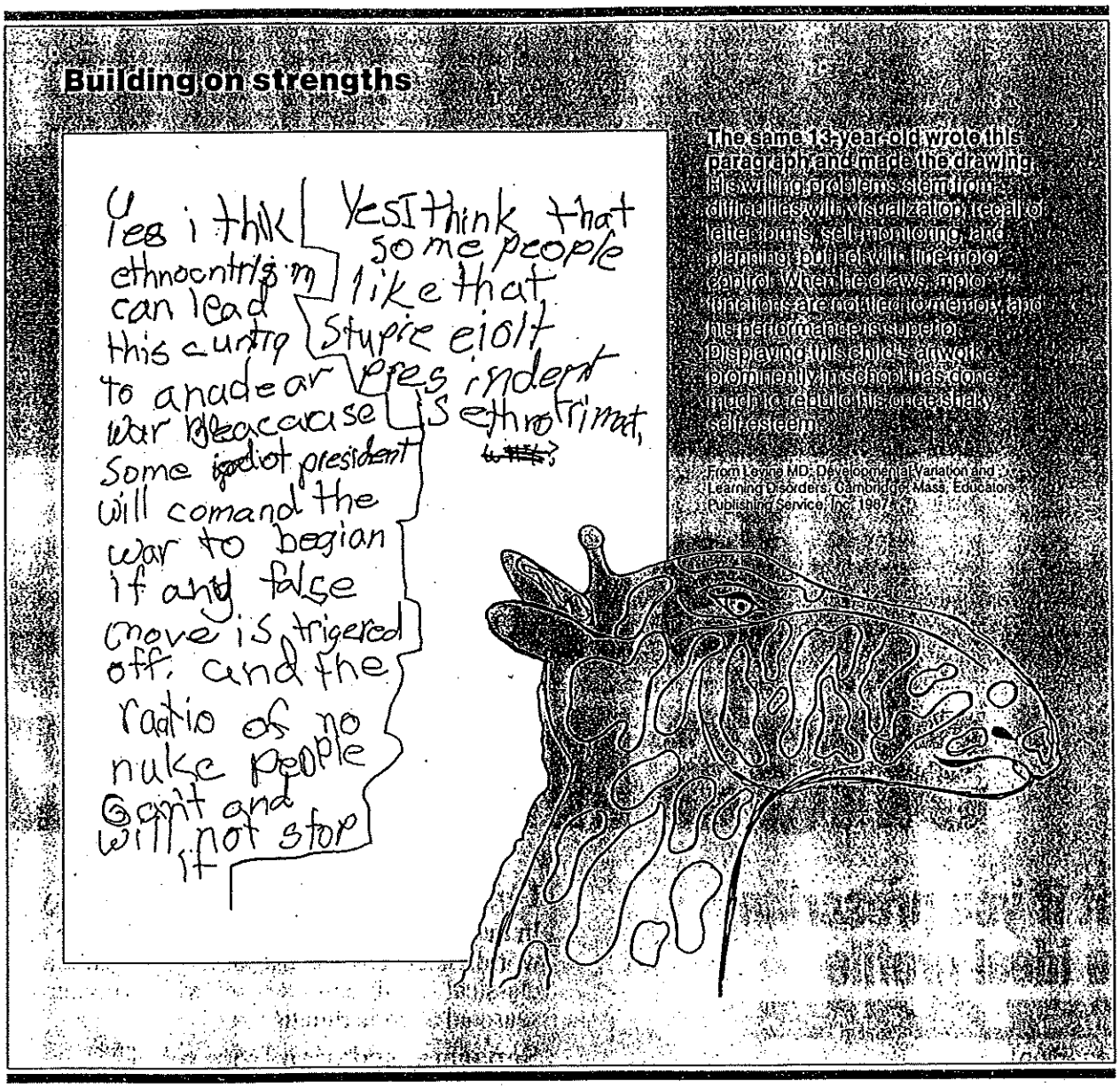
Cognitive testing. Tests of higher order cognition and problem solving skills should be part of the assessment. The student's capacity for abstract reasoning, cognitive flexibility, and application of specific problem solving strategies all must be evaluated.[3] The Wechsler Intelligence Scale for Children-Revised (WISC-R) is commonly employed for these purposes.[4] The WISC-R offers an opportunity to assemble a portrait of the child's cognitive strengths and weaknesses by analysis of individual subtests. Qualitative descriptions of problem solving strategies and learning propensities usually are far more revealing and have greater therapeutic value than the student's IQ. Narrow interpretations of intellectual "potential" made on the basis of IQ alone should be avoided.

Psychoeducational assessment. A thorough evaluation of the child's academic skills is important for determining how neurodevelopmental and cognitive functions interact with scholastic achievement. Skills in reading, writing, and mathematics should be evaluated, but here, too, numerical test scores or "product measures" are not sufficient by themselves.

It is important to include "process measures" that elicit a fine-grained analysis of a student's error patterns and learning style. Pervasive developmental weaknesses are often mirrored in performance on academic tasks. In

*PEERAMID (Pediatric Examination of Educational Readiness at Middle Childhood) for children ages 9 to 15, PEEX (Pediatric Early Elementary Examination) for children 7 to 9, PEER (Pediatric Examination of Educational Readiness) for children 4 to 7, and PEET (Pediatric Extended Examination at Three) for 3- and 4-year-olds. Educators Publishing Service, Inc., 75 Moulton St., Cambridge, MA, 02238-9101

Building on strengths



spelling, for example, an abundance of phonetically correct errors may be a manifestation of generalized problems with visual memory. Alternatively, nonphonetic approximations may be associated with poor phonologic coding or memory.

Psychoeducational tests seek to generate practical suggestions for remediation. They should be performed by a psychoeducational specialist—a professional who is trained in educational psychology, child development, or special education. Assessment measures and techniques vary according to the student's age and developmental

level. In the early elementary years, for example, decoding skills are the focus of the teaching of reading. A diagnostic reading evaluation for a second grader might ask a student to read a short paragraph aloud and answer questions about the content. The decoding errors (such as mispronunciations, substitutions, omissions, or additions) can then be matched against the comprehension errors.

Socioemotional screening. Descriptions of the child's mental health and social competence are part of a comprehensive evaluation. Such a screening is usually performed by a clinical psychologist, social worker, or child psychiatrist. Important information on temperamental features, coping abilities, family difficulties, and affective disturbances might be detected. The child's prevailing moods should be assessed. Levels of self-esteem, motivation, and outlook for the future are prognostically relevant. Children who are depressed or exhibit "learned helplessness" may be especially at risk.[5]

Physical, neurologic, and sensory examinations. The physical examination can identify factors that contribute to or exacerbate a learning disorder. Anemia, lead intoxication, seizures, vision and hearing deficits, and a variety of genetic and neurologic disorders can produce or contribute to difficulties in learning.[6] Identifying these physical factors is essential for accurate diagnosis and effective remediation.

TAKE-HOME MESSAGE

A developmental dysfunction must never be allowed to abort a child's education. Bypass strategies permit education to proceed even in the face of disability.

Where is the assessment done?

Most underachieving youngsters are assessed at school. Public Law 94-142, the Education for All Handicapped Children Act, provides for multidisciplinary assessment of children whose poor school performance may be the result of learning disorders. The student may be evaluated by the school psychologist with additional input from teachers, a guidance counselor or social worker, and the school nurse or physician. These individuals contribute their personal views and data, from which an educational plan is derived. School system assessments are designed to classify children in terms of existing categories that define eligibility for various forms of assistance.

School-based assessments have the advantage of being done without cost to the family. Testing that is done privately can be expensive; costs range from $300 in some areas to as much as $1,000 in others, although some of that cost may be covered by health insurance. Further, school assessments provide access to remedial services without additional financial burdens for the family. There are, however, potential drawbacks. A school-based assessment may be distorted because of budgetary constraints. A school system with insufficient special education personnel may be reluctant to say that a child requires a high level of services for a learning disorder. Additionally, interpersonal and political considerations—personality conflicts between child and teacher, or bureaucratic infighting—can bias assessments. While it is likely that most evaluations in school are highly objective, parents and outside professionals need to be vigilant for conflicts of interest.

Independent, multidisciplinary evaluations may be available at a nearby university, child development center, or hospital clinic. Such evaluations avoid the potential for a conflict of interest that might arise when a school evaluates its own students. They may, however, be susceptible to bias toward diagnosing those disorders they are equipped to treat.

Another alternative is to seek

TAKE-HOME MESSAGE

The advocacy role makes the most difference. The pediatrician can protect the child from humiliation, offer management suggestions, foster optimism, and defend basic rights.

the services of a pediatrician working in this field. Increasing numbers of pediatricians are offering such evaluations, many of them in collaboration with psychoeducational specialists.* The pediatrician compiles the comprehensive history and performs a neurodevelopmental and physical examination, while the psychoeducational specialist undertakes academic and cognitive testing. They then prepare a report that describes the child's difficulties and makes specific recommendations for management or subspecialty consultation. The psychoeducational specialist often serves as a liaison with the school.

Evaluations may be performed independently by professionals from specific disciplines. However, assessments by an individual pediatrician, clinical psychologist, or psychoeducational specialist working in isolation are highly susceptible to disciplinary biases. Not surprisingly, diagnosticians tend to make the diagnoses they have been trained to make. Therefore, there is a need for eclecticism, for multidisciplinary checks and balances, and for recognition that an underachieving child may have more than one contributing problem.

*See "Solving school problems with a team approach." *Contemporary Pediatrics*, December 1984

What can go wrong?

Regardless of where the assessment is done, certain pitfalls are common. The traps to avoid include:

Labels. Labels can become self-fulfilling prophesies that burden the children who must carry them. Frequently, the labels are gross oversimplifications. It is inappropriate, for example, to be forced by state eligibility requirements to determine whether a child with attention deficits and associated behavioral impulsivity as well as academic difficulties is "emotionally disturbed" *or* "learning disabled." Even the label of attention deficit disorder (ADD) implies that all such children have the same syndrome. In reality, there is considerable variation with respect to etiology, pathophysiology, treatment needs, and prognosis. The categorical label itself can be severely constraining and too influential in shaping the clinical view of a child.

Terms such as "immature," "capable but not living up to his ability," and "potential" have little concrete meaning. What is worse, they can have potent but misleading implications for therapeutic intervention. Morally laden language (such as "laziness") only creates anxiety for a child and his parents. We prefer a full description to rigid labeling.

Scores. The result of any particular subtest or item is merely one piece of evidence. Test scores must be interpreted with caution and fitted into a case building process, in the same way that an attorney uses pieces of evidence to build an argument. A test score in isolation is no better than circumstantial evidence; the whole story comes out only when scores are interpreted in the light of other information gathered from the history and direct observations.

Eligibility. If a child does not fit into one of the categories that make him eligible for school services, the assumption often follows that he has no real problems and needs no special help. Such an assumption, based solely on ineligibility, is not warranted. In truth, some highly disabling dysfunctions may not manifest themselves in such a way that a child qualifies for services.

For example, a student with an attention deficit may have difficulty organizing and completing work in the classroom, where many distractions are present. When tested on a one-to-one ba-

sis, however, he may do well, and his test scores will not show the discrepancy between achievement and IQ that would ordinarily make him eligible for services in many states. The school would not provide special services for a child like this, but his learning difficulties would have to be managed, possibly through private tutoring and certainly with respect to the way he is viewed and taught in the classroom.

Associations vs. causes. The evaluation can be distorted because an associated factor is mistakenly thought of as etiologic. If a student is struggling in school *and* the parents are divorced, it does not necessarily follow that the child is doing poorly in school *because* of the divorce. Poor performance is often caused by more than one functional deterrent.

MANAGEMENT

The management of developmental dysfunctions and learning disorders requires multidisciplinary collaboration and continuous monitoring. The plan should be based on a broad and accurate description of the child.

Some aspects of management take place primarily within the school; others may be largely the province of the parents or pediatrician. However the responsibilities are parceled out, a successful management plan should include the following:

- Demystification
- Mobilization of strengths
- Bypass strategies
- Direct remediation
- Medical therapies
- Specialized services
- Advocacy for the child plus ongoing monitoring

Demystifying the disorder

Children with learning difficulties need to understand the nature of their problems. Too often, they receive services without having any insight into their dysfunctions. The situation is analogous to trying to manage a child with diabetes without providing diabetic education. Unless accurate explanations are offered, children with learning problems may fantasize unhelpful explanations of their own. Some believe they are retarded, while others have a vague notion that they are "born to be losers." It can be highly redeeming for a child to have a clear idea of the circumscribed dimensions of the learning problem. Once they understand the reasons for their difficulties with schoolwork, children are more likely to cooperate with a program of remediation.

The clinician needs to spend some time with the parents and child explaining the youngster's functional profile. A pediatrician might point out: "You know, sometimes you may think that you are a dummy because you are having so much trouble with reading. But we know that you really are smart. You just have problems with certain parts of your memory. It's hard for you to remember what some groups of letters sound like. When you see them, you forget how to pronounce them. A lot of children have different kinds of memory problems; yours are getting in the way of reading. But that doesn't mean you're dumb. You know there are a lot of important things that you're very good at thinking about and remembering."

Children with language problems can be told that, although they have a hard time learning "through their ears," they are quite good at understanding and retaining what they see. Those with attention deficits need to understand that they are having trouble staying "tuned in" but that basically they are good at reasoning or thinking.

Explanations like these can help the child understand that the problem is not hopeless. Once it is seen as limited, it can also be viewed as soluble. At the same time, the child needs to know that it is his responsibility to work as hard as he can—with sufficient help and understanding—to overcome his dysfunctions. This support is most likely to be forthcoming when parents and classroom teachers are involved in the demystification process, so that everyone shares an understanding of the problem, has similar expectations, and agrees on the techniques and goals of management.

Mobilization of strengths

Parents, teachers, and clinicians need to be especially sensitive to the fact that learning disabled children may not have achieved

LEARNING DISORDERS

Diane's story

Diane, a 12-year-old sixth grader, is having a lot of trouble with the work in her suburban elementary school. Reading comprehension, written expression, and some aspects of math are very difficult for her. She started French at the beginning of the school year but did so poorly she had to drop the course. Diane's teachers and her parents have no problem with her behavior, but they do describe her as somewhat isolated socially, with few friends.

The problems have been getting worse, and Diane can't seem to concentrate on her classwork. School wasn't always so difficult. In the first three grades she did well, acquiring beginning skills in reading, writing, and math with no difficulty. She has always been a good speller. Why is she having problems now, and what can be done to help her?

A professional assessment of Diane's abilities pinpoints her strengths and dysfunctions. She has no problems with fine or gross motor functions, is in good physical health, and is cooperative, self-reliant, and emotionally stable. However, she has significant weaknesses in language processing and production. She hesitates and makes many errors on tasks when instructions are given verbally, cannot arrange words she is given into meaningful sentences, and gives responses like "bulb cover" for a picture of a lamp shade and "plug-in" for an electrical outlet.

Testing also reveals deficiencies in temporal-sequential organization (alphabetizing, questions of time orientation, repeating digit sequences) and possible problems with active working memory (performing two tasks in order). She shows weakness of attention only when the area being tested is difficult for her; she fidgets, yawns, and impulsively ignores some of the instructions. By contrast, she works attentively and carefully on the fine motor and visual processing tasks, where her scores are high. Overall, Diane's test performance in conjunction with data supplied by parents and teachers indicate that her school problems stem from language disabilities complicated by temporal-sequential disorganization. The attentional weaknesses are secondary.

On the basis of these findings, recommendations for Diane include:

- Encouraging her talent for photography, to help her exploit her visual and spacial processing strengths and gain self-esteem.
- Using teaching strategies that bypass her weaknesses and build on strengths: writing assignments broken down into stages (prewriting, brainstorming, outlining, producing a pencil draft, revising, and proofreading); visual aids such as charts and graphs to supplement verbal explanations; and verbal directions that are kept short and structured and repeated if necessary.
- Remedial tutoring in reading comprehension and written expression, in small group or one-to-one settings.
- Intensive language therapy to develop skills in vocabulary, sentence comprehension, production, and narrative organization.

At 12, Diane is a delightful, charming girl. Her parents are invested in her performance and are concerned for her welfare. Her teachers like her. Her recent school problems have not yet impaired her good feelings about herself. If these recommendations are followed, there is every chance that she will mature into a successful adult.

mastery in *any* area of their lives. They have been chronically deprived of feelings of success, and their self-esteem is often severely damaged.

Reversing this condition is a matter of recognizing the child's underlying strengths and finding ways to mobilize them. Children who are struggling academically but have good artistic abilities, talents in sports, or special mechanical aptitudes can gain in self-esteem and overall feelings of effectiveness when they are given the opportunity to "practice their specialties" (See the box on page 39). Clinicians need to be particularly alert to the child with underdeveloped talents, the youngster whose interests and assets are somehow being stifled either by a lack of recognition or by a preconceived idea on the part of parents or other adults regarding what the child should be like.

Bypass strategies

A developmental dysfunction must never be allowed to abort a child's education. Teaching strategies that bypass or circumvent a child's learning problems permit education to proceed even in the face of disability. There is almost no limit to the teaching tech-

niques that can be devised when a child's developmental dysfunctions and strengths are understood. For example, if the teacher knows that a child has word finding difficulties as part of an expressive language dysfunction, she can help him avoid embarrassment in front of his classmates by asking only "yes" or "no" questions. This avoids open-ended questions that demand sophisticated word retrieval and complex sentence formation.

A sixth grader who has difficulty remembering all of the different components of writing can be shown how to work on one component at a time. Such a student could begin a book report, for instance, by dictating ideas into a tape recorder in order to concentrate on thinking without being bogged down in the mechanics of writing. The next step would be to listen to the tape and copy down the best ideas. From there, she could develop an outline, then a rough draft, and one or more refined versions. Each stage might occur on a separate evening, thereby reducing the burden on simultaneous recall.

Another sixth grader who also finds writing difficult may have an entirely different kind of problem rooted in fine motor dysfunctions. A child with this problem can be taught to type or use a word processor. She can be allowed to use a keyboard for some assignments while continuing to work at cursive handwriting to improve her graphomotor fluency.

In the early grades, the choice of a reading curriculum can be based on an understanding of a child's strengths and weaknesses. Certain approaches might be more effective than others for children with weaknesses in language or those for whom visual memory is problematic. A linguistic approach, one that emphasizes regular spelling patterns and word families (fat, mat, cat, for example), might be appropriate for a first grader who has trouble with sequencing and sound blending. Later on, high school students might take the same approach to choosing courses. Students with a history of problems with attention, memory, or language, for example, should postpone studying a foreign language for as long as possible.

Students with attention deficits should be seated as close to the teacher as possible. Every effort should be made not to humiliate them (e.g., by calling on such a child while he or she is staring out the window). Often they need to have their work broken down into manageable chunks. A student might be overwhelmed, for example, by the prospect of solving 15 mathematics problems. He might be permitted to divide the task, completing several problems, then doing something else, and subsequently returning to finish the work.

In some cases, children with attention difficulties as well as other kinds of neurodevelopmental dysfunctions need a reduced work load. Teachers can make it clear that the reduced amount of work must be of higher quality. Students are often pleased with this kind of a trade-off; it helps to make the bypass strategies less humiliating.

Direct remediation

Remedial help can be provided at two distinct levels: developmental enhancement and academic skill building. The former is more controversial. Can one really remediate a child's attention? Is it possible to enhance memory? Can language skills be substantially improved? Even if developmental functions can be taught, will improved function result in higher levels of performance?

Despite the controversial nature of these issues, there are compelling reasons for trying to help a child overcome specific developmental dysfunctions. By working with a learning disabilities specialist on mnemonic strategies, for example, a child with memory problems may at least come to understand the nature of the dysfunction and how these techniques can enhance recall. A child receiving language therapy might make significant gains in sentence comprehension, vocabulary size, and expressive abilities that in turn can lead to improved academic performance. Children who have fine motor weaknesses, such as dyspraxia that affects writing ability, may be helped by working with an occupational therapist.

Recently, there have been encouraging results with cognitive-behavioral therapy for children

TABLE 2

Stimulant medications and dosages*

Medication	Preparations	Administration	Dosage range	Duration of action
Methylphenidate (Ritalin)	5, 10, 20 mg tablets	2–3 times daily; optimally 30–45 min before meals	0.3–1.0 mg/kg (5–60 mg/d)	3–5 h
	20 mg sustained release	Daily before breakfast; short-acting pill may be added p.m. or in a.m.	20–60 mg/d	8 h
Dextroamphetamine (Dexedrine)	5 mg tablets 5 mg/5 mL elixir	2–3 times daily	5–40 mg/d	3–5 h
	5, 10, 15 mg "spansules"	Daily before breakfast; short-acting pill may be added	5–30 mg/d	8–10 h
Pemoline (Cylert)	18.75, 37.5, 75 mg tablets	Daily before breakfast	37.5–112.5 mg/d	8–12 h

Possible side effects: Insomnia, loss of appetite, precipitation of Tourette's syndrome, growth suppression, apathy, fatigue, abdominal pain, mild depression, skin rash, overstimulation. In general, significant side effects are unusual. Additional uncommon adverse reactions exist (see the package insert literature).

* Reprinted with permission from Levine MD: *Developmental Variation and Learning Disorders*. Cambridge, Mass: Educators Publishing Service, Inc, 1987.

ith attention deficits.[7] Children ractice controlling their symp- oms; they learn to be less impul- ve, to monitor their work and ehavior, and to pay attention to etails. Such therapy helps not nly to reduce the symptoms but so to teach the child about the ature of his difficulties.

Direct remediation of academic kills is a more conservative and adily justifiable form of inter- ention.[8] With targeted remedial support, a child can improve skills in reading, spelling, writing, and mathematics. On a more general level, remedial work on study skills, organization, and learning strategies is a more recent development.[9,10] An effective special educator or tutor needs to be aware of a student's strengths and weaknesses, using developmental assets to enhance educational skills. For example, a child who has notable strengths in language but is doing poorly in arithmetic can be taught to work out a verbal explanation of how the computation should be done before he starts making the actual calculations.

Direct educational services may be provided within a resource room or learning center at the child's school or by a private tutoring center. Under Public Law 94-142, such services are frequently provided as part of the

educational plan for children with learning difficulties.

Medical therapies

Some components of management are particularly the province of the pediatrician. Parents often seek medical explanations and therapies for their child's learning problems. Their hope for a medical "cure" is sometimes warranted, although usually it is not. Certainly it is essential to rule out any complicating or etiologic health factors; while these are relatively rare, accurate identification and treatment can be critical. Treating such conditions as a seizure disorder, chronic sinusitis, or anemia can produce significant developmental and academic gains.

Physicians are commonly called upon to deal with the management of attention deficits, usually by prescribing stimulant medication. It is important for children and parents to realize that stimulants are intended to help with attention but are not supposed to be tranquilizers and will not make children smarter. A small dose should be used initially (Table 2) and a mechanism for feedback from the teacher established. In our programs, we make use of the Anser System Questionnaires,[2] which inquire about academic performance, behavior, and patterns of attention. Such data can be very helpful in monitoring both dosages and treatment outcome.

From time to time, children should be given a drug holiday during which no medication is taken. At some point, a child

may want to stay off medication beyond the holiday. This is commonly a way to terminate such therapy. More detailed work is available on the artful use of psychostimulants as well as their side effects and contraindications.[11]

In treating attention deficits, pharmacotherapy is never the entire answer. Children seem to benefit most from multimodality treatment that also includes counseling, modifications in the educational program, and cognitive-behavioral therapy.

Pediatricians may also be asked for guidance on a variety of controversial therapies for learning disorders. The best known of these is probably the Feingold diet, which eliminates certain food additives and other chemicals from the diet.[12] Studies of the effectiveness of this diet have been disappointing. Low-sugar diets have also been advocated. While there is strong anecdotal support for their efficacy, scientific studies have not confirmed an important effect. In general, if parents feel strongly that a particular form of nutritional abstinence is helpful to their child, it is probably not a good idea to be opposed as long as the child's basic dietary requirements are met. When parents seem to be in danger of falling victim to such seductive but questionable interventions as motor training ("patterning"), optometric exercises, and other so-called "alternative therapies," the physician can help them evaluate the therapies more critically. Controversial therapies in the treatment of learning disorders will be discussed in detail in a forthcoming article.

Referral for special services

Some complicated learning problems require referral for specialized interventions. Pediatricians can play an important role in identifying the need for such services and maintaining an awareness of effective community resources. When there are signs of significant domestic turmoil or symptoms of major psychopathology, children can benefit from mental health services. Psychotherapy is especially effective when the professional is knowledgeable about the phenomenology of learning disorders. When psychotherapy is provided by a therapist with little background or training in this area, significant misunderstandings can occur. Generally, children with learning problems and their parents can benefit from a highly supportive, advice-giving approach. Other kinds of intervention may also merit consideration: speech and language therapy, occupational therapy (for fine motor weakness), social skills training, recreation therapy, and vocational counseling.

Advocacy and monitoring

The final components of high-quality management of childhood learning disorders may be the most important: monitoring the child's progress and acting as an advocate. Pediatricians are well qualified for these tasks. Managing childhood learning disorders

calls for the same kind of continuing, flexible supervision that is essential for managing chronic illness. Learning difficulties evolve and require new forms of assessment and management as the child grows older. Pediatricians can monitor the child's progress by asking parents to bring follow-up questionnaires to return visits and by insisting that professionals working with their patients provide regular written reports.

In the long run, the advocacy role is probably the one that makes the most difference in the child's total development. The pediatrician must do what he can to protect the child from inordinate humiliation or public embarrassment. Children who are overcriticized by their parents, teachers, or peers require a great deal of support and empathy. The pediatrician can make a specific request to teachers not to humiliate the child in front of others. He can warn parents and school personnel that certain tactics—such as telling a child that he can do better when he really cannot—may do serious harm. Over time, the physician can play a humanitarian role by offering ongoing management suggestions, fostering optimism, and representing the basic rights of a struggling child.

Implications

The school problems of children represent a significant challenge for pediatrics. Impaired educational performance constitutes a final common pathway where environmental factors, genetic predispositions, and neurodevelopmental phenomena may converge.

Just as all of these factors affect educational performance, school failure itself is a significant risk factor for subsequent health and life fulfillment. Learning difficulties are common, chronic problems with serious consequences. Managing them successfully requires a professional outlook that is both longitudinal and general. A variety of specialties and services must be coordinated and integrated. Pediatricians are trained to be sensitive to issues of development in physical well-being; it is now proper to assume responsibility for functional development as well. Knowledge in this area is expanding rapidly. We must be ready to respond by applying what we are learning about children who are not learning. □

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INSIGHTS

Childhood Neurodevelopmental Dysfunction and Learning Disorders

by Melvin D. Levine

As many as 15% to 30% of children may suffer school failures because of learning disorders that result from subtle deficiencies in neurological development or mild brain dysfunctions. Several such dysfunctions may have the cumulative and additive effects of seriously impairing a child's development and resiliency. Heredity, chromosomal disorders, birth complications, head injury, and a mother's alcoholism or drug abuse may be factors, but in most cases the cause is unknown. Medication may temporarily disguise neurodevelopmental problems, and standardized tests, especially IQ tests, do not detect many of the common and serious dysfunctions. Mental health professionals should be aware of a child's neurodevelopmental status before undertaking psychotherapy.

There are several types of dysfunction:

1) **Attention.** Attention deficits are among the most common causes of academic underachievement. Teachers, parents, and clinicians must be careful not to misinterpret this symptom as a poor attitude or lack of motivation: children with attention deficits only become more anxious and confused when told that they can do it if they really want to. Although some of them have behavior problems as well, for most attention deficits comprise a significant learning disorder. Affected children are bored in school, and their day-to-day performance is erratic and inconsistent. They have trouble deciding what is relevant when they listen or read. Many experience inordinate mental fatigue and are inattentive to details. They often make careless errors and organize their work poorly. Writing is especially difficult for them, and many have associated memory problems.

2) **Memory.** Schools put a great deal of stress on memory — far more than most careers or professions do. Certain children with otherwise intact cognitive capacities have serious memory deficiencies. Some find it difficult to register new facts or procedures in short-term memory; they study for hours without retaining salient material. Sometimes this deficit is confined to one processing modality, such as the visual, sequential, or verbal. Other students have difficulty maintaining several items at once in active working memory. They forget the content of a book chapter while reading it, or lose their train of thought while solving a mathematics problem or trying to remember a word's spelling or translation.

Many students cannot meet academic demands on long-term memory. They have difficulty transferring facts or skills to permanent storage and filing them away systematically. Some suffer from an inability to retrieve stored learning effortlessly, a phenomenon known as delayed automatization. Children with limited access to stored material recall slowly and imprecisely, and may have reduced capacity to recognize patterns or associations they have previously encountered.

3) **Language.** Problems may occur at various levels of verbal processing and production. Some children have difficulty interpreting and manipulating the sounds of language. They often must use contextual cues to understand speech, and they commonly find it difficult to read, spell, or learn foreign languages. Others have difficulties at the semantic level — understanding the meanings of words and the relationships among them. Many students are confused about syntax, word order, or grammatical forms. Inability to cope with abstract, symbolic, and technical language ultimately has disastrous effects on school achievement.

Some children speak fluently but understand poorly; others understand well but express themselves ineptly. These discrepancies are often confusing to adults, who may not suspect a disabling language deficit in a child who seems to communicate fluently in social settings. The everyday conversational skill of such students is in striking contrast to their

lack of facility with more academic, literate English.

4) **Organizational skills.** To succeed in school, children must develop effective techniques and habits of organization. Some children suffer from temporal-sequential disorganization: they have difficulty allocating and estimating time, following schedules, meeting deadlines, and solving problems in stages. Other children have trouble with material-spatial organization: keeping track of possessions, maintaining notebooks, arranging desks, and finding objects like pencils and books. Another type of problem is disorderly transitions: difficulty in settling down and functioning effectively when expectations or settings change. Some children have problems related to prospective retrieval; they cannot remember what they are required to do.

5) **Neuromotor functioning.** Some students write poorly because their fingers do not keep pace with the flow of their thoughts and language. They may grasp pencils awkwardly, form letters poorly, and hesitate on every word. They often prefer printing to cursive writing, and they are reluctant to complete written assignments. They may have gaps in motor visualization or motor sequential memory, deficits in the hand movements required for writing, or finger agnosia (impaired awareness of the location of fingers). Like children with attention deficits, they are often accused of being lazy or having a poor attitude, and in many cases neither they nor the adults around them understand what the true problem is.

6) **Higher cognitive functions.** Problem-solving skills, creative and critical thinking, analogical reasoning, and concept formation spare memory and make school more gratifying for competent learners. Students with deficiencies in these areas become bored and apathetic and rely on rote learning without full understanding. The problem may be generalized or limited to certain fields such as history or chemistry.

7) **Social cognition.** Some students cannot meet the social demands of school life. They lack social cognitive awareness and skill — a constant source of public humiliation. They do not know how to approach peers, interpret their responses, predict their reactions, or resolve personal conflicts. Many show signs of verbal pragmatic dysfunction: they do not use and understand language in relevant ways in social contexts, and therefore inadvertently offend or annoy others when they speak. A closely related problem is deficient political skills — inability to win the respect and admiration of teachers or influential classmates.

The misinterpretation and mismanagement of neurodevelopmental dysfunctions may have more devastating effects than the disorders themselves. Children whose problems are unrecognized may become anxious and depressed, reject demands for academic performance, decide that success is impossible, and lose all ambition. They may then live from day to day without considering the future, act out aggressively to mask their feelings of ineptitude, and try to punish families whose expectations they cannot satisfy, while continuously denying their problems and denigrating the school instead.

School personnel, parents, clinicians, and the child must collaborate in evaluation and treatment. These problems are best approached by a multidisciplinary team using a neurodevelopmental and educational test battery to examine the child's neurodevelopmental strengths and weaknesses, neurological status, academic skills, and emotional problems. The resulting description is usually more valuable than a mere list of test scores or a label such as attention deficit disorder or learning disability.

Once the nature of the problem has been defined, several steps should be taken. First the child, parents, and teachers should be educated about the child's problems and strengths. The child and teacher must make use of strategies for circumventing weaknesses, such as providing more time to take tests. The child should also be given help to strengthen weak functions, continued counseling, and medication for attention deficits if necessary. Efforts should be made to emphasize and enhance the child's strong points. (Not all variation in academic skills is a sign of deviation or deficiency; many of these students have highly specialized rather than dysfunctional brains, and often succeed when allowed to practice their specialties as adults). A long-term commitment is required.

Children with neurodevelopmental dysfunctions experience excessive failure and intolerable humiliation. Because schools have tremendous potential to help or harm them, school personnel must become more sophisticated in recognizing their problems. Greater community awareness and more research are also needed. Mental health professionals must accept the challenge to provide the understanding and humane care needed by these children and their desperate and understandably confused families.

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Learning Disorders: Their Elucidation and Management

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Academic underachievement is a common source of anguish and misunderstanding during a child's school years. Children who feel they are a disappointment and endure too much personal failure early in their lives represent a highly vulnerable segment of the pediatric population.

Frequently, the inability to keep pace with academic expectations is a direct result of underlying learning disorders, most often of unknown etiology. Such learning disorders can be deceptive in their overt manifestations at the same time that they are diagnostically elusive.[1] Yet, their accurate elucidation is critical for effective remediation and for the prevention of their possibly devastating consequences.

Learning disorders can exert their effects in a multitude of clinical patterns, ranging from discrete delays in the acquisition of skills to serious deficiencies of day-to-day productivity at school and at home.[2] In many instances, learning disorders are associated with problematic behaviors (including conduct disorders, oppositional tendencies, performance anxiety, and/or depression). Other common complications include motivational loss (and so-called "learned helplessness"), social withdrawal, and excessive dependency upon parents, teachers, or peers. It is not at all unusual, in fact, for a learning disorder to masquerade primarily as a behavior or motivational problem.

Parents frequently seek advice from pediatricians and other health care providers when children experience difficulty learning. It is imperative, then, that physicians and other health care providers have a solid understanding of the variety and magnitude of learning disorders that may afflict our patients. Such insight can enable us to recommend and support courses of action. The following overview should provide the pediatrician with a practical course for the counseling and management of patients presenting with these conditions.

Classification of Learning Disorders

There are many different legitimate ways to classify childhood learning disorders. Four common disorders will be explored in this review, as well as some of the possible neurodevelopmental dysfunctions that underlie them. Disorders of reading, mathematics, writing, and general academic productivity will be considered. It is important to stress that these conditions are not mutually exclusive; a child may harbor more than one of these learning disorders.

Disorders of Reading

Difficulties with phonological awareness are thought to be the most common source of reading failure. Many young students have a diminished appreciation of the components of language sounds. Often there are certain language sound transitions that these students simply cannot process quickly enough. As a result of their weak and/or slow processing of the sounds, they may have trouble associating these sounds with appropriate letter symbols.[3] Additionally, once they manage to acquire sound: symbol associations, they may encounter problems holding together the sounds in a multisyllabic word. Thus, the ability to sound out and then resynthesize words is apt to be impaired. The result is a substantial delay in the acquisition of accurate and relatively effortless word decoding skills. Ultimately, the enormous effort and time required to decode individual words may be so great that comprehension becomes seriously compromised.

Other types of reading disorders are also common. Included are a range of language disabilities that cause students to have problems with verbal comprehension. Such a *receptive language problem* has the potential to interfere with reading comprehension.[4] Likewise, difficulties with memory can subvert the reading process. Some students experience great difficulty recalling and summarizing material they have read.

Currently, considerable controversy surrounds the role of *visual processing deficits* in the pathogenesis of reading disorders. There may be some youngsters whose decoding skills are reduced because of problems with the rapid and accurate visualization of symbols.

Disorders of Mathematics

Failure in mathematics can be an especially traumatic setback for a young child. It has been shown that children commonly assess their own intellectual abilities on the basis of how they are performing in mathematics.[5] Moreover, mathematics is a highly cumulative subject, such that the grasping of new material is totally dependent upon one's understanding and recall of all that went before it. As a result, it

is possible to fall hopelessly behind in mathematics, thereby feeling that any effort will be unrewarding and even embarrassing.

Some students experience inordinate difficulty with *concept formation* in mathematics; they simply cannot seem to grasp what is occurring in an equation or what is actually happening during long division or multiplication.[6] They may also be unable to see relationships between concepts; so, for example, it may be difficult for them to discern the ways in which decimals, fractions, and percentages are similar.

Other students have problems with the *language of mathematics*.[7] Somehow they fail to master arithmetic vocabulary (words such as "denominator," "subtrahend," and "factor"). Such language deficient students additionally are prone to trouble deciphering word problems. Still other youngsters struggle with the *non-verbal* ingredients of mathematics comprehension. They often find it hard to visualize non-verbal concepts, such as proportion or hypotenuse, and they may have trouble picturing various geometric shapes and their properties.

Memory plays an important role in mathematical proficiency and efficiency. Some students with memory impairments find it hard to memorize and later recall with ease their mathematical *facts*, such as the multiplication tables, and *algorithms*, including how to perform long division. Children with sequential memory deficits may have trouble recalling the correct order of steps in a mathematical process. Those with *active working memory deficits* experience frustration as they attempt to engage in mental arithmetic: they seem unable to sustain several different mathematical task components in active memory while manipulating them.[8] Often these students find it hard to retrieve facts and reason at the same time.

Students with attention deficits commit seemingly random careless computational errors and show puzzling performance inconsistency on mathematics quizzes. Some of them have weak *problem solving skills*. They tend to be as unsystematic and impulsive in their approaches to mathematics challenges as they are in many other aspects of their lives.

Disorders of Written Output

Students with writing problems often convey the impression that they are lazy and poorly motivated.[9] Yet, there exist a number of legitimate causes of poor performance on paper. The signs of writing impairment include extreme reluctance to write, poor legibility, reduced volume of written output, and ideation on paper that is significantly discrepant from the quality of thinking the child demonstrates in other settings or contexts.

Several different forms of *fine motor dysfunction* deter writing.[10] Problems with motor planning ("dyspraxias"), difficulties implementing complex fine motor patterns ("production deficits"), and deficiencies of sensory feedback ("finger agnosia") can make writing unduly labored. These dysfunctions may also create illegibility. Often the extreme effort required to form letters tends to undermine other components of written output, such as punctuation, spelling, and ideation.

Children with language impairments, especially those with *expressive language disabilities*, tend to have problems communicating their thoughts on paper. They may exhibit unsophisticated grammatical construction, an impoverished vocabulary, and highly simplistic ideas when they write.

...these conditions are not mutually exclusive; a child may harbor more than one of these learning disorders.

Gaps in memory commonly thwart written output. Most often writing failure occurs in students who are unable to engage in rapid simultaneous retrieval memory. They fail to recall all at once such subcomponents as spelling, punctuation, capitalization, vocabulary, and factual information. Typically they can perform any of these functions far better in isolation than they can while writing a passage. Many of them have trouble thinking and writing at the same time. It is common for such students to become highly reluctant writers.

Disorders of Academic Productivity

A large number of children have great difficulty simply "getting their acts together" in school. Such students are likely to underachieve with or without specific skill deficits, such as those enumerated above. Common symptoms include trouble studying properly for tests, a tendency to accomplish most tasks the hard way, and a pronounced lack of engagement in any subject matter or in the act of learning in general.

Children with attention deficits usually exhibit reduced levels of academic productivity. Many of them experience agonizing mental fatigue when they attempt to concentrate. They may also demonstrate task impersistence and stubborn disinclinations to perform any kind of work unless they find it romantically attractive.[11] Such students also have difficulty with self monitoring and planning, two critical regulatory functions needed to facilitate academic productivity.

Some students demonstrate tremendous *organizational problems*. Some have material/spatial

organizational problems. They keep on losing essential implements, have difficulty arranging and maintaining a notebook, and predictably manage to create disarray in their lockers, desks, and living quarters. Other children have problems with time management and temporal orientation. They seem suspended in time. They are poor at meeting deadlines, estimating and allocating time, organizing tasks in a logical, stepwise order, and dealing with schedules.

It is also essential to consider a child's strengths and interests, since such assets can often be exploited in the effort to remediate deficits.

Finally, some students have been described as passive learners.[12] These children and adolescents assume a notably inactive role in the learning process. New knowledge and skill is not very richly represented in the memories of such learners. They may over-rely on rote memory, while failing to relate new information to material they have encountered previously. Such students are often non-methodologists as well; that is, they tend not to have effective strategies to facilitate and simplify learning and school-related output.

Diagnostic Evaluation

Every child with a learning disorder must have a careful evaluation to elucidate the nature and extent of underlying neurodevelopmental dysfunctions as well as any possible etiological factors, behavioral complications and important environmental factors. It is also essential to consider a child's strengths and interests, since such assets can often be exploited in the effort to remediate deficits. Physicians can actively participate in the evaluation process, utilizing the following evaluation components:

1. A complete review of the history to gather a description of the child's current function from multiple perspectives (parents, teachers, and, in the case of older children, the children themselves).

It is also important to review the child's early history to document developmental milestones, relevant health factors, early temperament, and the onset of any learning and/or behavioral difficulties. Such history taking can be greatly facilitated with the use of standardized parent, teacher, and student questionnaires, such as the ANSER System found on page 13.[13]

2. A complete physical and neurological examination to rule out any causal or associated medical problems.

There are many medical conditions that can have a bearing on the learning process. These include seizure disorders, allergies, anemia, hypothyroidism, and sensory impairments. One should seek signs of any unusual patterns of physical growth and maturation, such as delayed or precocious puberty. The child's nutritional status should be noted, although dietary factors have not been shown as common causes of learning disorders. It is also important to rule out genetic or chromosomal abnormalities, such as Turner Syndrome, Klinefelter Syndrome, and Fragile X.[14]

3. Neuropsychological and/or neurodevelopmental testing to compile a profile of a child's cognitive strengths and weaknesses.

Included should be developmentally and academically relevant measures of attention, language ability, memory, reasoning skills, sequential organization, visual processing functions, and motor skills.[15] An IQ test, such as the WISC-III, is usually helpful, but it should never be assumed to be a comprehensive audit of academically required cognitive functions, nor should it represent the final word regarding a child's academic potential.

4. Psychoeducational testing to document clearly the nature and extent of a student's academic delays.

An educational diagnostician should undertake careful observations to detect and describe patterns of errors as well as learning styles and strengths that can be utilized to develop an educational plan and remedial program for the student.[16]

Other forms of assessment may be needed, depending upon the results of the above evaluation components. Speech and language testing, a more in-depth mental health assessment, or a complete neurological evaluation, are examples of such further evaluations.

Frequently, children in the United States undergo evaluations in school as part of Public Law 94-142.[17] Such evaluations often constitute eligibility determination for special education services in school. Usually an Individualized Educational Plan (IEP) is generated. While in-school assessments are often extremely revealing and helpful, they generally do not comprise thorough evaluations of health and neurological status, and of neurodevelopmental, emotional, and educational functions. Consequently, many parents seek outside independent evaluations by multidisciplinary teams, or, at least, it is common for them to seek medical advice. Pediatricians, nurses, and family physicians are often involved in this consultative process.

The following ANSER questionnaire provides a systematic way for physicians to compile a relevant patient history. It is not intended to be used as a diagnostic tool; rather, it is designed to help physicians serve as informed advocates for the learning disabled children under their care.

	1.0	PERFORMANCE AREA	Typical Performance: Strong for age	Typical Performance: Appropriate for age	Typical Performance: Delayed less than 1 year	Typical Performance: Delayed more than 1 year	Variability of Performance: Consistent performance	Variability of Performance: Somewhat variable	Variability of Performance: Highly unpredictable	Cannot say
ACADEMIC SKILLS	1.1	Reading comprehension								
	1.2	Reading rate								
	1.3	Oral reading								
	1.4	Silent reading								
	1.5	Word analysis skills								
	1.6	Sight vocabulary								
	1.7	Spelling								
	1.8	Arithmetic facts								
	1.9	Arithmetic concepts (speed and ease of learning)								
	1.10	Computational skill								
	1.11	Arithmetic spatial abilities								
	1.12	Solution of word problems in arithmetic								
	1.13	Letter formation in writing								
	1.14	Pencil control								
	1.15	Rule application in writing (punctuation, capitalization, etc.)								
	1.16	Writing speed and efficiency								
	1.17	Written language; sentence structure								
	1.18	Overall general factual knowledge								
	1.19	Musical skill								
	1.20	Artistic ability								
MOTOR OUTPUT	1.21	Playing sports								
	1.22	Building things; crafts activities								
	1.23	Balance								
	1.24	Coordination								
	1.25	Mechanical skills								
LANGUAGE	1.26	Word pronunciation/ articulation								
	1.27	Comprehension of verbal instructions								
	1.28	Oral sentence structure and fluency								
	1.29	Size of vocabulary								
	1.30	Participation in class discussions								
VISUAL-PERCEPTUAL FUNCTION	1.31	Copying from chalkboard								
	1.32	Orienting letters (b-d, etc.)								
	1.33	Keeping place in reading								
	1.34	Knowing left from right								
	1.35	Discriminating similar words/letters								
MEMORY	1.36	Retaining recent instructions								
	1.37	Retaining yesterday's lessons								
	1.38	Retaining skills following vacations								
	1.39	Visual memory								
	1.40	Remembering classroom routines								
TEMPORAL-SEQUENTIAL ORGANIZATION	1.41	Following multiple-step instructions								
	1.42	Performing tasks in correct order								
	1.43	Describing events in correct order								
	1.44	Using words in correct order								
	1.45	Understanding time concepts								
ORGANIZATION	1.46	Study habits								
	1.47	Organization of work/tasks								
	1.48	Ability to take timed tests								
	1.49	Knowing when to ask for help								
	1.50	Remembering to take home or bring in things								
ASSETS	1.51	Motivation								
	1.52	Imagination								
	1.53	Creativity								
	1.54	Sense of humor								
	1.55	Enthusiasm								

In assessing this child's function in each of the areas listed, please rate typical performance in each area as compared to others of the same age. To do this, put an X in the appropriate column under "Typical Performance." Also, please rate the child in terms of "Variability Performance" in each area. The child whose ability seems to change from day to day or hour to hour should be scored "Highly unpredictable;" the child who shows minor degrees of variation in the quality of his or her performance should be considered "Somewhat variable;" and the child who has the amount of consistency that we would expect from children of that age should be marked under "Consistent performance." Thus, for each performance area, both a typical performance rating and a variability rating should be selected. When an item is not pertinent at a student's grade level, please check "Cannot say."

Please list any comments you may have on these performance areas.

Physicians can play significant roles in the diagnosis and treatment of patients who have learning disorders. These roles include:

Compilation of historical data
- Ruling out of neurological and other health problems
- Neuropsychological and/or neuro-developmental evaluation and monitoring
- Behavioral assessment using questionnaires such as the ANSER System
- Early screening and detection

Case management
- Demystify the nature of the disorder to the child
- Suggest bypass strategies for use in school to improve opportunities for success
- Recommend developmental therapy and/or psychotherapeutic counseling
- Monitor medication use
- Collaborate with other relevant disciplines

Ongoing advocacy

Above all, it is essential to emphasize a child's strengths and affinities. Children with learning disorders need help in developing their talents and their natural and acquired proclivities. The judicious exploitation of these strengths can have an enormously positive impact on self-esteem and the child's long term vocational success.

Management

The management of a child with learning disorders demands long-term involvement with periodic re-evaluations and ongoing advice for the school, parents and child. Because the identification and treatment of learning disorders differs greatly from community to community, the role physicians and other health professionals play varies. However, the following principal components of effective management apply regardless of the physician's level of involvement.

Demystification. A clinician needs to explain the nature of a child's learning disorder to the child. Simple, concrete language, along with the use of analogies and an opportunity for the child to ask questions and to give examples of demands that are problematic in school, should all be part of the demystification process. Keeping the tone "upbeat" and optimistic is very beneficial. It is equally important to help clarify issues for the parents and for the child's teacher(s). Two books and accompanying cassettes have been created for students as a means of facilitating the demystification process, *Keeping a Head In School*[18] and *All Kinds of Minds*.[19]

Bypass Strategies. A variety of techniques can be deployed in the classroom to circumvent a child's learning disorders. These measures do not "cure" a student, but they are essential in minimizing the negative impacts of learning disorders and permitting a child to go on acquiring knowledge and skill. Among the many bypass strategies are such measures as allowing a child to use a calculator during mathematics quizzes, permitting him or her to write shorter reports, granting more time on mathematics tests, warning a child with an expressive language disorder in advance before calling upon him or her in class, or secretly signaling a child with an attention deficit when he or she is "tuning out."

Direct Remediation. Specific educational therapies may be required in an effort to enhance skills. An educational therapist or tutor should make use of a knowledge of a child's neurodevelopmental strengths and deficits to devise methods of helping him or her to overcome academic lags, such as in reading, writing, or mathematics. Such a person can also work on any disorders of productivity, helping a student develop organizational skills and study habits.

Developmental Therapies. Sometimes it is possible to intervene directly upon a child's neurodevelopmental dysfunction(s). The possibilities include language therapy, occupational therapy (for motor problems impeding writing), or cognitive-behavioral therapy (for difficulties with attention).

Mental Health Services. Psychotherapeutic counseling may be indicated, especially when there are substantial issues relating to extreme family stresses, behavioral management and/or clinical depression. Such therapy may need to involve the parents and sometimes the entire family. It is critical that the therapist be an individual who has an excellent understanding of learning disorders and their effects.

Some Useful Books For Parents And Students

The Self-Esteem Teacher. Brooks, R.T. Circle Pines Minnesota: American Guidance Service, 1991.

Directory of Facilities and Services for The Learning Disabled. Novato. California: Academic Therapy Publications, 1991.

Endangered Minds. Healy, J.M. New York: Simon and Schuster, 1990.

All Kinds Of Minds. Levine, M.D. Cambridge, Massachusetts: Educators Publishing Service, 1992.

Keeping A Head In School. Levine, M.D. Cambridge, Massachusetts: Educators Publishing Service, 1990.

Why Johnny Can't Concentrate. Moss, R.A. New York: Bantam Books, 1990.

Student's Guide To Good Grades. Orlow, M. Concord, Massachusetts: Wayside Publishing, 1990.

The FCLD Learning Disabilities Resource Guide. New York: FCLD, 1985.

Lovejoy's College Guide For The Learning Disabled. Straughn, C.T. New York: Monarch Press, 1988.

Smart Kids With School Problems. Vail, P.L. New York: EP Dutton, 1987.

Learning Disorders Research

Learning disorders have traditionally been diagnosed in terms of psychoeducational criteria. However, the hypothesis of a neurological basis for learning and attention disorders has received support from recent anatomic, physiologic, and behavioral findings which implicate abnormal brain mechanisms in persons afflicted with these disorders.

Some of the most promising research has been in the areas of reading disabilities and attention deficits, including studies in the following areas:

Brain Morphology: Studies of magnetic resonance imaging scans of dyslexic and ADD/H children found that there are specific deviations in normal brain symmetry patterns. Left and right anterior and posterior width and area, length of bilateral insular region, and length of bilateral planum temporale were measured and compared with normal subjects. The dyslexic and ADD/H children had significantly smaller right anterior-width measurements than did normal subjects.[22] It was also found that in 90% of the dyslexic children, the left greater than right pattern of plana asymmetry was not present.

Genetics: Familial recurrence rates reported for dyslexia range from 35 to 45%, considerably higher than the population base rates of 3 to 10%.[23,24] A study of families concluded that a sex-influenced, additive, or dominant transmission may occur in a significant proportion of dyslexic families.[25]

Cerebrocortical microdysgenesis: A great deal of research is ongoing at the Dyslexia Neuroanatomical Laboratory located at Beth Israel Hospital and Harvard Medical School in Boston. Studies there, including the examination of focal cerebrocortical microdysgenesis,[26] find significant brain variances between normal and dyslexic subjects.

Medication. Children whose learning disorders are complicated by the presence of attention deficits may benefit from the use of a stimulant medication to enhance concentration while diminishing impulsivity and fostering a more appropriate work pace. Methylphenidate (Ritalin), dextroamphetamine (Dexedrine), and pemoline (Cylert) are among the most commonly prescribed.[20] In cases of depression, desipramine (Norpramine) has been used. When drug therapy is implemented, there should be careful monitoring with periodic revisits for follow-up examinations and history taking. It is important to "titrate" the drug dosage and to recommend, when feasible, period "drug holidays," periods when the child is off all medication.

Strength Strengthening. It is essential that any therapeutic program include a strong emphasis on the ongoing identification of strengths and affinities. Children with learning disorders need help in developing their talents and their natural and acquired proclivities. Such efforts are likely to be critical in working toward the enhancement of self esteem. The judicious exploitation of strengths also can have enormous long term vocational implications.

Advocacy and Humiliation Protection. A clinician can play a critical role in serving as a staunch advocate for a child with a learning disorder. In particular, it is important that one ensure that a child is not overexposed to criticism or humiliation in front of peers. Certain measures may be particularly humiliating and of no value in helping the student. The best example of this is grade retention, which has been shown to be ineffective while representing a major psychic blow to a student.[21] A clinician through judicious letter writing on behalf of a child and by close interaction with the parents and the school can provide much needed advocacy for an underachieving youngster.

Case Management. Learning disorders are like any other chronic pediatric condition. They require meticulous follow-up and monitoring. The health care professional can exert a durable, positive influence in serving as the coordinator of continuing multidisciplinary care over a period of many years.

Resources

Learning Disabilities Association of America (LDA)
4156 Library Road
Pittsburgh, PA 15234
(412) 341-1515

Orton Dyslexia Society
724 York Road
Baltimore, MD 21204
(301) 296-0232

Foundation for Children With Learning Disabilities
99 Park Avenue
New York, NY 10016
(212) 687-7211

Children With Attention Deficit Disorders (CHADD)
499 NW 70th Avenue, Suite 308
Plantation, FL
(305) 587-3700

The Stakes

When a child is failing in life, there is all too much at stake. All children with learning disorders have the potential to sink into despair and disillusionment as they regularly disappoint themselves and those they care about. These children uniformly possess redeemable strengths which can be mobilized and enhanced to enable them to savor success and feelings of effectiveness throughout childhood, and beyond. Through sensitive evaluation and management, much can be done to increase the likelihood that they will discover and pursue pathways that lead them to fulfillment and gratification.

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Vitamin C Stability in Gerber® Infant Juices

Several of the adult products did not contain the amount of vitamin C indicated on their nutrition panel, (e.g., samples C_1, C_3, D_3). Besides being mislabeled by FDA definitions, these products failed to meet the federally-established WIC guidelines of 30 mg of vitamin C per 100 ml of juice.[9]

In fact, within three to six days of refrigerated storage, 60% of the adult juices in the study fell below the labeled amount of vitamin C and the WIC minimum (e.g., samples A_3, B_1, B_2). This is well before the juices would be consumed under normal conditions, when used in a single infant or child household.

Gerber® Infant Juices, on the other hand, were found to contain initial levels of at least 78 mg/100 ml vitamin C, well above the labeled amount of 120% (42 mg) U.S. RDA for infants, and well above the WIC minimum. The 4 oz container delivered a consistent, high level of vitamin C, as did the 750 ml container, even in the final 4 oz serving on the sixth day of refrigerated storage.

This study has given us tremendous confidence in the superiority of Gerber® Infant Juices to deliver 100% of the U.S. RDA of vitamin C, when compared to adult juices.

Conclusion

Because of the unique role juice plays in the infant diet, it is critical for health professionals to recommend a commercial juice product that provides a reliable source of vitamin C. Both infant and adult juices are given to babies and young children. However, Gerber® Infant Juices, relative to adult juices, provide a superior source of vitamin C.

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Attention Deficits:
The Diverse Effects of Weak Control Systems in Childhood

MELVIN D. LEVINE, MD

Disordered attentional processes comprise a common and perplexing source of academic underachievement. Attention deficits are variably associated with information processing weaknesses, behavioral maladaptation, academic skill deficiencies or inefficiencies, poor social adjustment, and behavior problems.[1] Children harboring signs of attentional difficulty constitute a widely diverse group, likely to differ from each other in precise clinical manifestations, cognitive profiles, etiologies, responses to therapy, and prognoses.[2] Yet, there are shared attributes that justify a unified conceptual model to account for symptoms among these challenging children.

Children with attention deficits can be thought of as manifesting dysfunctions of neurobehavioral control systems that regulate learning and adaptation. Nine such control systems may be affected to varying degrees and on varying bases in children with attention deficits.

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THE CONTROL SYSTEMS

1. Focal Control

Many children with attention deficits have problems confronting an array of potentially informative stimuli and selecting the most salient features for processing, retention, and utilization. A child with attentional difficulties may perseverate or concentrate upon unimportant data or may focus with too little intensity to foster sufficient depth of processing to hold relevant information in memory. In addition there may be problems controlling focal time allocation. A child may be said to have a "short attention span." However, this is likely to be an oversimplification since the same children who fail to concentrate long enough on

Even within a sensory modality control can be poor; a child seemingly listening to the teacher may be tuning in to background noises thereby missing critical facts or instructions.

salient data may perseverate or overattend to other (less relevant) stimuli. The basic problem is one of allocating the right amount of time and focal intensity to informative data.

Some children who lack focal control exhibit a considerable degree of cognitive impulsivity. They have trouble mobilizing the necessary reflective behavior to plan and organize their work or their problem-solving activities. Therefore, they tend to leap before they look, plunging into academic tasks in a disorganized helter-skelter manner.

2. Sensory Control

It is common for children with attention deficits to exhibit varying forms of sensory distractibility (typically visual, auditory, and/or tactile distractibility). While attempting to listen, for example, they may fail to inhibit visual attention, so that a student may stare out the window or focus intently on an inconspicuous crack in the wall or loose screw in a door hinge. Even within a sensory modality control can be poor; a child seemingly listening to the teacher may be tuning in to background noises thereby missing critical facts or instructions. Children with auditory distractibility may have great difficulty in school because of their listening problems. Those with strong language skills may succeed during the early grades only to underachieve in secondary school because of chronically deficient listening. In elementary school they could generalize from context and take advantage of linguistic redundancies. In secondary school, their lack of sustained auditory attention causes underachievement in critical content areas. Problems with the control of visual distraction may impair reading skill and the appreciation of detail in mathematics.

3. Associative Control

Many children with attention deficits have difficulty controlling free associative thinking. They are easily diverted into the "free flight of ideas" (sometimes known as "daydreaming"). Words, sights, or feelings too easily elicit a protracted chain of associations distracting them from more relevant pursuits in a classroom.

4. Appetite Control

It is not unusual for children with attention deficits to have difficulty delaying gratification. They seem insatiable; what they want they want desperately. When ultimately they fulfill their desires, they lose all interest and almost immediately erect new targets for their intense appetites. This leads to chronic restlessness, a seeming inability to delay gratification, egocentricity, difficulty sharing, and a tendency to be intolerant of equanimity. Insatiable children frequently crave intense experience and are distracted by their overwhelming desires. They tend to be oriented very strongly toward the future, always seeming to be looking ahead as if there is a sense that conditions this afternoon will be far more satisfying than they are this morning.

5. Social Control

Frequently children with attention deficits have difficulty "filtering out" their peers. In a classroom, they perpetually tune in to others and thus cannot focus on a teacher or text when other children are present. They exhibit an inordinate need to inspect, manipulate, or provoke their peers. Their social temptations and drives are frequently out of control.

6. Motor Control

It has been known for decades that children with attention deficits may be physically overactive exhibiting either fidgetiness or overt total body hyperkinesis. It should be stressed, however, that not all children with attention deficits display overactivity. Some in fact are normally active and others are underactive or lethargic. Often, however, motor activity is inefficient or not goal-directed.

7. Behavioral Control

The capacity to regulate conscious behavior is reduced in some children with attention deficits who fail to facilitate acceptable actions while inhibiting those that are inappropriate. In particular, they may not foresee the social consequences of their actions. Often affected children are impulsive; they act precipitously and allow little or no time for the prediction of outcomes. The result is a pattern of recurrent unpremeditated behavioral offenses. Often the child disclaims any role in the illegal act because it transpired so quickly and was unplanned.

8. Communicative Control

Some children with attention deficits are verbally disinhibited. They are loquacious and say the wrong things at the wrong times. They seem unable to predict the consequences of their statements; in some instances, they have trouble taking the perspective of the listener so as to determine what communication will please, what will offend, and what will engender conflict.

9. Affective Control

Children with attention deficits are often described as emotionally labile. They vary considerably in their affect, exhibiting wide mood swings that are often

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It is critical to recognize and acknowledge that children with attention deficits do not have attention deficits all of the time.

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difficult to predict or account for. At times, the mood seems not to match the occasion or circumstance in which a child finds him or herself.

ASSOCIATED MANIFESTATIONS

In addition to their weaknesses in several or all of the nine control systems described above, other propensities are common among children with attention deficits. Like the deficiencies of control systems, these associated manifestations can be major determinants of academic competency and social/behavioral adjustment.

Performance Inconsistency

One of the puzzling and agonizing features of weak control systems is their predictable inconsistency. It is critical to recognize and acknowledge that children with attention deficits do not have attention deficits all of the time! In virtually all cases, the often ineffective control systems operate well from time to time, thereby creating diagnostic and moral confusion. A child who seldom is able to focus on mathematics one day does so and completes all 12 word problems exhibiting superb concentration, admirable sustained reflection, and keen self-monitoring. This leads to the nearly inevitable accusation: "We know he can do it. We've seen him do it. The other day in math class he sat there and did all of his work magnificently. We know that when he puts in the effort, he can concentrate and live up to his potential." Such admonitions augment the suffering of children with attention deficits, as their performance inconsistency is as enigmatic to them as it is to adults. The inconsistency can lead to inexplicable error patterns on tests. A child may miss easy items while succeeding on more difficult ones. Quiz scores in secondary school may vary dramatically, ranging from a 98 one day to a 31 two days later, depending largely upon the extent to which any focal control was operative during the test or study session. Similarly, there can be inconsistency of behavior, of communication, of appetite control, and of motor regulation.

Fatigue

It is not unusual for children with attention deficits to experience substantial mental fatigue, especially when they concentrate or engage in sustained cognitive effort. Many of them yawn and stretch when required to listen for detail. Some appear to have a sleep/arousal imbalance. They sleep lightly or erratically at night and experience problems remaining fully aroused in the classroom. In many cases they must become physically active or fidgety to remain mentally alert. As the amount of detail and the demand for prolonged passive listening grows in secondary school, many students with attention deficits become increasingly inefficient and disorganized. Their fatigue weakens focal control as well as their other control systems.

Reduced Feedback Sensitivity

It is common for children with attention deficits to exhibit difficulties with self-monitoring. They exercise little quality control over their work and may be insensitive to social feedback cues as well. Any task that entails self-monitoring is performed carelessly. Additionally, such children may be relatively insensitive to both positive and negative reinforcement. They may fail to appreciate the significance of feedback, including either praise or criticism.

Memory Dysfunction

It is common for children with attentional difficulties to encounter certain typical problems with memory. Frequently they underachieve in secondary school when the mnemonic demands become particularly convergent and stringent. Because they are accustomed to registering nonsalient information in memory, they have a tendency to recall mainly trivia or incidental information while experiencing failure in courses that stress precise and rapid retrieval of factual details and/or previously learned skills. High school subjects that demand cumulative memory may be especially frustrating for these students.

Cognitive Dys-synchrony

Often children with attention deficits exhibit extraordinary ideational fluency enabling them to synthesize interesting thoughts at a rapid rate. They indulge liberally in divergent exploratory and creative thinking processes which often transpire at a rapid tempo. Commonly there is originality and scintillation in their ideas. However, other developmental functions are unable to keep pace with the fast flow. In particular, verbal fluency, precise memory retrieval and graphomotor speed may not be well synchronized with ideation. This is a very common cause of the writing difficulties so often seen in children with attention deficits. Their poor writing is frequently blamed on a fine motor problem but, in reality, they cannot synchronize motor movements with emanations from their thinking, remembering, and verbalizing processes. Consequently, their writing is labored, and poorly representative of the quality of their thoughts or extent of their knowledge.

Social Imperception

Some children with attention deficits endure social problems. Their impulsivity, their insatiability (and associated egocentricity), their tendency toward the

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There are a limited number of ways in which the central nervous system can communicate that all is not well in its "wiring" and/or in its interactions with the outside world.

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free flight of ideas (and associated "spaciness"), and their unresponsiveness to social feedback cues place them in jeopardy, especially with regard to peer acceptance. Often they have no idea why they are unpopular, which can generate anxiety and elicit a series of maladaptive face-saving strategies, such as clowning, excessive controlling, aggression toward siblings, and the acquisition of a "macho" veneer.

COMPLICATIONS

The most common complication of attention deficits is chronic success deprivation. Children who have experienced long-standing attentional difficulties may be lacking in mastery and overdosed with criticism from the adult world (and sometimes from peers and siblings), which engenders low self-esteem, anxiety, and reactive depression. Academic underachievement is common. Further, it is not unusual for children with attention deficits to appropriate certain maladaptive face-saving strategies. At times the efforts at face-saving are believed to be the primary problems; the attention deficits may go unrecognized because the methods the child deploys to deal with them are more conspicuous than the direct effects of the weak control systems.

The complications of attention deficits extend into early adulthood. Underemployment, marital instability, criminal behavior, college dropout, and automobile accidents may be sequelae.[3]

THE QUESTION OF PRIMACY

There is growing evidence that certain highly specific central nervous system biochemical or perhaps anatomical lesions can predispose to attention deficits. An aberration in neurotransmitter metabolism has been suggested as one such factor.[4] It is likely, however, that the symptom complex comprising attention deficits ultimately will turn out to be nonspecific. That is, weak control systems in childhood may represent the developmental equivalent of inflammation as a concomitant of many infectious and autoimmune diseases. There are a limited number of ways in which the central nervous system can communicate that all is not well in its "wiring" and/or in its interactions with the outside world. The various forms of loss of control we have cited may constitute the nonspecific phenomenology of broad neurodevelopmental/behavioral dysfunction. Ultimately, it will be important to develop a more precise taxonomy, to be able to elucidate the subtypes of attention deficit. It is likely that various forms of attention deficits will differ with regard to etiology, pathophysiological mechanism, optimal treatment and natural history.

A general approach to subgroups of children with attention deficits can be suggested at this time. The following classification can be helpful in designing a management program:

Primary Attention Deficits—Children might be said to have primary difficulties with attention if they have had long-standing signs of multiple weak control systems that have affected their function in many situational contexts. These children often show minor neurological signs (such as synkinesias or associated movements). They commonly reveal high levels of impulsivity, insufficient attention to detail, inconsistency, and easy cognitive fatigability.

Processing-Specific Attention Deficits—These are attention deficits that are secondary to information processing deficiencies, such that a child may develop attentional difficulties because concentration repeatedly goes unrewarded. For example, a student with a significant language disability may fail to receive reliable information through verbal processing. Consequently, he or she chronically "tunes out" and becomes distracted in a classroom. Ultimately, this behavior spreads to other contexts. The child becomes overactive, impulsive, easily fatigued, and susceptible to sensory and associative distractibility. A child who endures recurrent episodes of otitis media during the toddler years may fail to have auditory attention rewarded with good information. This can promote a tendency to escape into visual distraction with a subsequent loss of focal control. Once again, there is a possibility that such secondary attentional difficulties can manifest themselves in multiple areas.

Anxiety-Induced Attention Deficits—Some children are preoccupied and chronically anxious. Attention is dislodged by their preoccupations. Compelling problems at home, conflicts with peers, or even more elusive forms of dysphoria may compete with and displace academically salient attentional foci. Multiple control systems can be adversely affected by anxiety. It is of interest that many of the symptoms of childhood depression overlap with those of attention deficit.[5]

Neurotoxic and Medically-Induced Attention Deficits—A growing number of medical conditions are known to interfere with focal control as well as other control systems. Children who endured low level lead intoxication during their toddler years have been found to have attentional difficulties subsequently.[6] There are some indications that low iron levels can promote attentional problems.[7] Various medications have been implicated as possible sources of weak attention. These include aminophylline-containing compounds, antihistamines, and certain anticonvulsants (such as primidone). Moreover, a number of neurological disorders can mimic a primary attention deficit.

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A primary attention deficit may be complicated by an information processing deficiency, by anxiety, and by situational inattention.

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Included are Tourette's syndrome, some seizure disorders, and space occupying lesions.

Situational Inattention—Some children reveal weak control systems only in specific situations wherein a child is mismatched with environmental circumstances or expectations. For example, a student from a culturally deprived home may become inattentive and lose control in school because of the formidable disparity between language and values at school and at home. A child whose learning style differs markedly from the teaching style of a particular teacher may tend to "tune out" frequently. What characterizes such attentional difficulties is that they are highly specific to particular circumstances and settings.

Mixed Forms—The above categories of attentional difficulty are not mutually exclusive. In fact, we have found that approximately 60% of children with attentional difficulties will also have associated information processing weaknesses.[8] Sometimes it is difficult to tell whether their attentional problems have resulted from their processing problems or whether their processing problems stem from their attentional weaknesses. For example, in a youngster who has both language disabilities and multiple signs of attention deficit, it can be hard to determine whether that child developed attentional problems because of the futility of listening or whether the language problems evolved because he or she so seldom listened! Furthermore, as we have noted, children with attention deficits experience inordinate criticism and failure in life which can foster anxiety and even depression which, in turn, can aggravate pre-existing attentional problems. Additionally, such a child may be placed in a classroom with a teacher who is overly critical and lacks understanding of the child's plight. Thus, a primary attention deficit may be complicated by an information processing deficiency, by anxiety, and by situational inattention.

Attention deficits may sometimes occur in isolation. A child may have a primary attention deficit with no signs of anxiety or additional information processing weaknesses. Some youngsters, however, have been said to have *attention deficit plus*. That is, in addition to their primary attention deficit, they have other developmental dysfunctions. In many cases, these are not substantial or pervasive enough to create secondary attentional problems. Instead, they comprise associated weaknesses, most commonly involving deficiencies of memory. Sometimes, however, there are problems with sequential organization, visual processing, and/or language.

EVALUATION

The assessment of a child with attention deficits is complex but ultimately rewarding and vital. It is critical that the affected child undergo a thorough assessment that takes into consideration the multiplicity of sources and ramifications of attention deficits. The following components must be included in any complete evaluation:

Symptom Inventories

It is necessary to document individual symptom complexes. Certain youngsters with attention deficits concentrate most or all of their problems in a very few of the control systems, while others have more pervasive manifestations. Data usually can best be obtained by utilizing parent and teacher questionnaires, such as the one illustrated in the Figure. Ultimately, it is more important to derive a picture of the distribution and relative severity of different symptoms than it is to dwell upon a total score on a questionnaire. For this reason, the ANSER System questionnaires elicit highly specific clusters of symptoms as indicative of the nature of a child's attention deficits; such questionnaires are filled out by parents, school personnel, and the child.[9] Of interest is the fact that these sources of data do not always agree with each other.[8] Contradictions or differing perceptions can have important implications for management.

Direct Observations of Attention

It is most revealing to observe the child in the act of performing. This can be done with the use of neurodevelopmental examinations, by direct assessments of attention (such as vigilance tests), during intelligence or achievement testing, or through actual classroom observations. Typically children with attentional difficulties display their impulsivity, their tendency to yawn and stretch, their distractibility, their lack of self-monitoring, and their performance inconsistency. It should be stressed, however, that it is not unusual for a child with attention deficits to reveal no symptoms whatsoever when being tested on a one-to-one basis. If he or she finds the experience highly motivating and challenging, it is likely that attention will strengthen beyond its usual intensity so that an unreliable or misleading behavioral sample is obtained. For this reason, it is essential that a diagnostician be willing to overrule his or her own direct observations when the history is compelling. We have often employed a rule of consensus when evaluating such youngsters. In comparing the perceptions of the parents, the school, and the diagnostic team, we have felt that if any two of the three sources agree that a child shows manifestations of multiple weak control systems, it is concluded that some form of attention deficit is present.[8]

Evaluation of Neurodevelopmental Status

It is essential that children with attention deficits

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INVENTORY OF SYMPTOMS

KEY	
Definitely applies	= *Much more* frequent and/or extreme than in others of the same age
Applies somewhat	= A little more frequent and/or extreme than in others of the same age
Does not apply	= Not different from others of the same age

			Definitely applies	Applies somewhat	Does not apply	Cannot say
8.0	SELECTIVE ATTENTION—ACTIVITY					
8.1	FSQ	Notices things that no one else does				
8.2	FSQ	Can concentrate for only a short time unless things are very interesting				
8.3	FSQ	Understands the main ideas of things but misses important details				
8.4	SAB	Gets tired or seems to "burn out" too easily when expected to concentrate				
8.5	SAB	Has trouble getting started in the morning				
8.6	SAB	Has difficulty falling asleep or staying asleep at night and/or is a restless sleeper				
8.7	RIM	Does work or performs many tasks carelessly without thinking				
8.8	RIM	Doesn't seem to plan or organize *before* doing things				
8.9	RIM	Is in a hurry to get work or chores over quickly instead of doing them well				
8.10	AMP	Is able to remember minor or unimportant details better than most others can				
8.11	AMP	Learns a new skill well one day and then can't seem to do it a few days later				
8.12	AMP	Shows a great ability to recall things that happened a long time ago				
8.13	PCN	Does the same job or task very well sometimes and extremely poorly at other times				
8.14	PCN	Receives very unpredictable (inconsistent) grades or test scores in school				
8.15	PCN	Can work well *only* on things he/she really enjoys doing or thinking about				
8.16	FBR	Often doesn't notice when he/she makes mistakes				
8.17	FBR	Seems not to realize when he/she is disturbing someone				
8.18	FBR	Doesn't do much better after punishment or correction				

Figure. The inventory of symptoms shown above is completed by parents of children with possible attention deficits. It is part of the ANSER System Questionnaires. The capital letters to the left side of each item represent the particular component of attention that is being assessed. FSQ = focal strength and quality; SAB = sleep arousal balance; RIM = reflectivity-impulsivity; AMP = associated memory problems; PCN = performance consistency; FBR = feedback reception; SEC = sensory control; ASC = associative control; APC = appetite control; SOC = social control; MOC = motor control; BEC = behavioral control. There is a companion teacher questionnaire which has most of the same items and all of these categories represented. A clinician can scan a completed inventory to survey the relative manifestations of specific symptoms.

INVENTORY OF SYMPTOMS (continued)

KEY

Definitely applies	= *Much more* frequent and/or extreme than in others of the same age
Applies somewhat	= A little more frequent and/or extreme than in others of the same age
Does not apply	= Not different from others of the same age

			Definitely applies	Applies somewhat	Does not apply	Cannot say
8.0	SELECTIVE ATTENTION—ACTIVITY (continued)					
8.19	SEC	Is a poor listener				
8.20	SEC	Seems to be looking around or staring a lot				
8.21	SEC	Makes comments about or is distracted by background noises or unimportant things				
8.22	ASC	Has an excellent imagination; keeps having original or unusual ideas				
8.23	ASC	Says things that have little or no connection to what others are saying or what is going on				
8.24	ASC	Daydreams often; seems to be in his/her own world				
8.25	APC	Is restless; gets bored too easily				
8.26	APC	Seems to want things right away and/or is hard to satisfy				
8.27	APC	Keeps thinking ahead (about what's coming next or later)				
8.28	SOC	Has trouble concentrating in a large group of children, such as at school				
8.29	SOC	Annoys or bothers other children				
8.30	SOC	Has problems getting along with other children and doesn't understand why				
8.31	MOC	Seems to have too much energy				
8.32	MOC	Body is in motion much of the time				
8.33	MOC	Is fidgety; keeps doing things with hands and/or feet				
8.34	BEC	Behavior is variable and hard to predict				
8.35	BEC	Gets into trouble without really meaning to				
8.36	BEC	Is a troublemaker; stirs things up				

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undergo thorough evaluation of a broad range of cognitive/developmental functions. These should include the following:

1. Memory
2. Language
3. Visual Processing
4. Temporal Sequential Organization
5. Fine and Gross Motor Function
6. Problem-Solving and Higher Order Cognition (including the use of cognitive strategies)

Specific neuropsychological test batteries or neurodevelopmental examinations can be employed for this purpose. Simply giving an intelligence test may not be sufficient to detect possible information processing deficits.

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It is only with effective interdisciplinary collaboration that the child's broad needs can be determined and addressed.

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Assessment of Emotional Status

The child's overall emotional status requires evaluation. Signs of depression, autistic tendencies, or other major forms of psychopathology need to be ruled out. At the same time, sources of environmental turmoil must be identified and assayed with respect to their impact upon the child.

Physical and Neurological Examination

It is necessary to rule out any primary medical conditions that may be eroding attention. Some laboratory tests can be helpful (such as a serum Ferritin to rule out underlying iron deficiency). In some cases, an electroencephalogram is helpful in detecting an underlying seizure disorder. In general, however, this procedure does not have a high yield. A thorough neurological examination should always be performed and should include an assessment of minor neurological indicators (so called "soft signs"). The latter can be part of an overall neurodevelopmental examination.

Educational Assessment

Educational skills should be evaluated by a psychoeducational specialist who can uncover the child's specific error patterns as well as his or her stylistic approach to learning and task completion. Such observations can lead to specific recommendations for the classroom teacher as well as for special educational intervention (if needed).

Most children with attention deficits can benefit from an evaluation by a multidisciplinary team. If this is not done, there is a danger that only one facet of a child's difficulties will be identified. In complex cases, it is possible that individuals trained in a particular discipline will be biased toward seeing within the child the particular clinical conditions that they were trained to find. Thus, a youngster with attentional difficulties who only sees a language specialist may be diagnosed as having a "central auditory processing problem." Such a language therapist can be valuable in elucidating the linguistic implications of the attention deficit. However, that specialist should not be the only individual who assesses the child. Similarly, a particular professional may focus only upon the psychodynamic issues, the neurological dysfunctions, or the educational problems. It is only with effective interdisciplinary collaboration that the child's broad needs can be determined and addressed.

MANAGEMENT

Children with attention deficits can be managed successfully; their informed care can prevent the devastating complications of chronic success deprivation, depression, and maladaptive strategy deployment. It has been shown convincingly that various forms of multimodal therapy can be highly effective in caring for children with attention deficits.[10] The following components (in varying combinations) are likely to be beneficial:

Demystification—Children with attention deficits and their parents are in desperate need of information regarding attention deficits. Such education can alleviate anxiety, guilt, and accusatory crossfire. The demystification has to be non-accusatory and non-technical. Concrete examples and good analogies should be used. Children must come to recognize that they are not pervasively defective but that they have trouble "tuning in," that they are like television sets whose channel selectors or antennae are malfunctioning. Phenomenology such as performance inconsistency, impulsivity, and the lack of attention to detail must be dealt with directly in a supportive matter of fact tone. At the same time, the child must come to understand that he or she is accountable for steady (if slow) improvement. Attainable short-term goals must be set to facilitate this accountability. Optimism should be fostered. The process of demystification needs to be ongoing.

Educational Accommodation—Changes often need to be made in the school program so that attentional difficulties do not totally abort a student's education. "Bypass strategies" are needed in the classroom. A child may require preferential seating close to the teacher. There may need to be frequent feedback regarding whether or not there have been any "mind drifts." The child may need more frequent breaks. Sometimes there may need to be more repetition of instructions, less dense detail, and smaller chunks of required work. In older youngsters whose attention difficulties are complicated by memory problems, there may need to be some alteration in course selection. For example, a foreign language may need to be postponed until eleventh grade so as to minimize the heavy memory drain that is typical of ninth grade. Many children with attentional difficulties need special provision to lessen the writing burden which they encounter in late elementary and junior high school.

Cognitive/Behavioral Management—Children with attentional deficits appear to benefit from some form of cognitive/behavioral therapy.[11] This may be done by a specially trained psychologist or educational specialist. Such counselling entails continuing demystification regarding a child's attentional difficulties combined with specific exercises to work on the most bothersome or severe traits. Thus, a child may be helped to understand his or her impulsivity. Then certain tasks may be designed to enable that child to practice being less impulsive. The child may be given a mathematics problem that would ordinarily be rushed through in 20 seconds and told to do it in a few minutes

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instead. This can both strengthen reflective behavior at the same time that it enhances the child's personal insight into his difficulties. In some cases, programs of reinforcement can be developed to encourage the more reflective approach. In a less formal manner, most children with attention deficits and their parents can benefit from ongoing advice. They desperately seek suggestions on how to handle specific situations. A structured behavioral and cognitive management counselling program can be rewarding. Those children who also have social interactional problems can gain from social skills training. Generally speaking, a psychotherapeutic approach that offers little if any concrete management advice tends to be unsuccessful with this particular group of patients.

Medication—The use of stimulant therapy for attention deficits has been well established as an important element of treatment. There are good reviews of this subject.[12] In general, stimulant drugs (such as dextroamphetamine, methylphenidate, and pemoline) have been used effectively. It is important to stress, however, that these stimulant drugs, which appear to help arousal and establish more effective focal and behavioral control, are never panaceas. They appear to be much more effective when they constitute one component of a multimodal approach to treatment. Children should not be begun on such medication without having a complete evaluation and without attending to their counselling and educational needs. Although isolated pharmacological treatment may result in a temporary improvement, it is likely that associated problems will fester and ultimately cause difficulty. Some anxious children with attention deficits benefit from antidepressant medication (such as imipramine). In cases where Tourette's syndrome is confirmed, haloperidol may suppress the impulsivity as well as the tics. Other drugs, such as thiodorazine are sometimes effective in resistant cases. In general the stimulants should be tried first unless there is evidence that a child has Tourette's syndrome or a major psychiatric disorder.

Other Therapeutic Modalities—The treatment of children with attention deficits must be individualized. Certain youngsters will also require language therapy, occupational therapy (for motor weaknesses only), or mental health intervention (especially where there are difficulties in the family or when the child is significantly depressed). Most children with attention deficits desperately need success induction as part of their treatment. A clinician should identify underutilized or unrecognized areas of developmental strength and guide the child into activities in which he or she can experience mastery.

Advocacy and Monitoring—Children with attention deficits desperately need advocates. Often the pediatrician can serve effectively in this capacity. Parents need support in dealing with schools, especially those institutions that fail to recognize attentional difficulties or that subject these children to too much humiliation and criticism. Students deemed ineligible for services because of arbitrary state criteria may be in particular need of strong advocacy from their physicians. As with any other chronic conditions in childhood, follow-up is of critical importance. A child's pediatrician or another interested clinician can fulfill this function by scheduling regular follow-up visits during which progress is monitored and ongoing advice dispensed. Generally, children with attention deficits evolve over time in their needs. This means that anticipatory guidance is called for. Advocacy also entails helping parents to resist irresponsible interventions. As they become increasingly desperate, parents may be tempted to try therapeutic interventions that are unscientific, expensive, and sometimes even fraudulent. A responsible clinician needs to warn parents and hopefully divert them from such tempting quick cures.

OUTLOOK

In dealing with children who have attention deficits, there is every reason to foster optimism. Many of the traits of affected children have the potential to evolve into strengths during adult life. Insatiability during youth can become ambition in adulthood. Distractibility can mature into creativity. Overactivity can emerge as high productivity. Impulsivity can engender a strong closure orientation on the job. Moreover, as we have seen, attention deficits can be effectively managed. The pediatrician's challenge is to increase public awareness of this problem and to mobilize resources within communities to offer the multimodal therapy that can redeem these children. If the challenge is met, we can avert the heavy toll that these children and society ultimately pay when their needs are neglected. ■

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Attention Deficits in Adolescence: Description, Evaluation, and Management

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Attention deficits represent the most common developmental problems in schoolchildren. Whereas it was once thought that the affected school-aged child "outgrew" his or her maladaptative traits at puberty, it is now recognized that 50% to 70% of children with attention deficits diagnosed between 6 and 12 years of age continue to manifest troublesome symptoms through middle adolescence.[1,2] The prevalance declines to about 35% in late adolescence and further diminishes through early adulthood; however, for many affected adolescents, the problems worsen amid the strenuous challenges of secondary education.[3]

Attention deficits most likely represent signs of disorganized CNS function and are invariably affected (exacerbated or ameliorated) by environmental and social factors. The symptoms of attention deficits in adolescence may be more subtle than those of the school-aged child, and they are apt to be especially elusive when overt behavioral problems are not a part of the clinical findings. The classic difficulties described in many younger children with attention deficits include varying degrees of overactivity, poor concentration, impulsivity, excessive talking, distractibility, overexcitability, poor self-monitoring, and noncompliance with rule-governed behavior. Some children manifest few, if any, symptoms until they confront the evolving behavioral, social, and academic demands of the teenage years; in other cases preexisting symptoms are exacerbated by the complex demands of adolescence including the drive toward autonomy, the transition from concrete to abstract conceptualization, the explosion of academic detail and work demands, and the tyranny of peer influence.

There is no specific Educational Objective this year for dealing with the broad subject of attention deficit disorders in adolescence, although Recent Advances Objective 49 for 1987/88 relates to psychostimulant drugs. We have published two previous articles in *Pediatrics in Review*, one in January 1987 and one in October 1984; nevertheless, the problem is a frequent cause of referral to pediatricians. This review, with special focus on the adolescent, should be helpful to our readers. (R.J.H.)

Throughout this review the authors have not made use of the psychiatric construct and label of "ADD" (Attention Deficit Disorder). This is because the authors do not accept the assumption that this is a uniform condition akin to nephrotic syndrome or rheumatoid arthritis. Instead, we prefer to think of attention (and its various components) as a dimension of human function, one that can be perturbed by a variety of stresses in a multitude of ways. We have emphasized in this article the diversity of the sources and manifestations of attention weakness in adolescents.

SPECIAL FEATURES OF THE ADOLESCENT WITH ATTENTION DEFICITS

Although they represent a heterogeneous group, teenagers with attention deficits can be characterized by traits in four general domains: (1) academic performance, (2) behavioral features, (3) complications, and (4) redemptive characteristics.

Academic Performance

Disappointing academic performance is a common stimulus for referral of the adolescent with attention deficits. Some affected youngsters perform relatively well in grade school, mobilizing such compensatory strengths as highly developed conceptual ability, linguistic skill, or creativity. When they enter junior high school, however, the demands for more sustained attention to detail, the increased work load (especially with respect to writing), and the call for efficient planning and self-monitoring are apt to be overwhelming. Such heightened demands may precipitate the apparent onset of attentional problems. The result is a failure to integrate academic skills effectively and a decline in grades. The following are some of the traits most likely to compromise academic performance (Table 1).

Associated Processing Problems. Many children with attention deficits also have other developmental dysfunction(s) whose clinical manifestations and degrees of severity are variable. The associated processing

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Attention deficits—a collection of conditions of varying etiology in which there is an apparent failure of age-appropriate control systems governing selective facilitation and inhibition with manifestations affecting one or more of the following functions: (1) attention to relevant detail or action, (2) cognitive planning, (3) modulation of physical activity, (4) control over behavioral impulses, (5) self-monitoring, and (6) stabilization of affect. The individual manifestations themselves may be [redacted] become abnormal when they are excessive in degree and when their intensity, pervasiveness, and persistence result in significantly compromised performance.

weaknesses may include deficiencies of visual/spatial ability, temporal/sequential organization, language, or higher reasoning. It is important to emphasize that these same students may demonstrate discrete strengths in particular areas of information processing. Such assets can help an adolescent override or minimize the effects of attention deficits and associated processing problems. Most often, adolescents with attention deficits are struggling with uneven development; certain developmental functions are advanced, whereas others lag. Such unevenness can seriously impair the working efficiency of a high school student. It is not unusual to encounter inattentive adolescents who are remarkably strong in their conceptual abilities and language skills but relatively weak in memory, motor function, and/or sequential organization. Such students can be stressed when they try to harness their superb ideation or to decelerate their cognitive tempos to accommodate to their relatively labored writing, poor organizational skills, or vague recall of precise facts.

TABLE 1. Academic Impacts of Attention Deficits in Adolescence: Associated Problems and Symptoms

Characteristics	Manifestations
Associated processing problems	May have visual-spatial, temporal-sequential, language, or reasoning problems. Discrete compensatory skills may be evident
Associated memory problems	Divergent memory usually stronger than convergent memory. Difficulty with content-rich subjects, especially those emphasizing cumulative knowledge and skills
Cognitive fatigue	Tendency to tire early in school day, especially with passive listening tasks. Often associated with "sleep arousal imbalance"
Fine motor dysfunction	May result from impulsive and hurried style, poor motor memory, or poor motor planning
Ineffective self-monitoring	Poor execution of quality control over work. "Careless errors" often noted. Ineffective study skills
Excessive motivation dependency	Inordinate motivational intensity required to sustain attention to routine tasks
Disorganization	Affects tasks that require organized, systematic routines, eg, management of time and materials. Lack of strategies or flexibility may be noted
Performance inconsistency	Day-to-day or even hour-to-hour variation in learning, behavior, and sometimes mood patterns for no apparent reason
Impersistence	Poor on-task performance in both quality and quantity. Difficulty finishing assignments
Poor selective attention	Difficulty in distinguishing the salient detail from irrelevant or trivial. Distractibility is major concern
Abhorrence of or inattention to detail	Tendency to be cursory or superficial. May be good generalizers or conceptual thinkers

Associated Memory Problems. Adolescents with attention deficits are especially susceptible to undue strain upon memory in school Because of the inconsistency of their attentional patterns, these students are likely to register and consolidate nonsalient data in memory. They are apt to have difficulty determining and thence remembering what is relevant when reading a text or studying for an examination. Furthermore, the superficiality of their attention may result in information being stored or consolidated in a rather tenuous manner.

In secondary schools, it is especially important that students become good mnemonic strategists. They must be adept at developing and using techniques to facilitate memorization. The highly impulsive learning style of many adolescents with attention deficits leaves no time for the use of effective strategies. Additionally, many students with attention deficits exhibit a divergent approach to memory. That is, they prefer to roam about their storehouse of knowledge and talk about what they find (often in a highly creative manner) rather than being confronted with direct questions for which there is only one correct answer (ie, the use of convergent memory). All of these factors predispose to memory problems that interfere with academic proficiency at a time when content area courses place increasing stress on rapid, convergent retrieval.

Not surprisingly, students with attention deficits are likely to have their greatest difficulty with classes that

stress cumulative and precise memory. Subjects such as mathematics, science, and foreign language may present more problems than English or social studies (which tend to be more discontinuous in their memory demands). Often parents believe that their child with an attention deficit has a superb memory. Generally, they are referring to an excellent recall of trivia (because of the registration of nonsalient information) as well as a highly developed, episodic memory (recall of details associated with life events).

Cognitive Fatigue is frequently noted in affected adolescents. While sitting in class or while doing homework, they may seem to tire easily; a tendency to "burn out" may contribute to task impersistence. Some of these teenagers appear to have a "sleep-arousal imbalance," that is, they have difficulty falling asleep or remaining asleep at night, and this is associated with some underarousal or fatigue during daytime hours. Usually, these students find that they tire most when they are expected to engage in sustained passive listening. Under such circumstances, they may become overactive or fidgety in an effort to arouse themselves, through foot tapping, finger movements, or various body contortions.

Fine Motor Dysfunction. It has been well-recognized that many elementary school children with attention deficits encounter apparent difficulties with the motor aspects of writing (dysgraphia). This seems to be somewhat less of a problem in adolescence, but some students continue to struggle with legibility. Paradoxically, many of them perform admirably in other fine motor domains. They may be excellent artists, good mechanics, or talented musicians. It is only when they try to write that they seem to have problems with their fine motor function. There appear to be several possible explanations. First, dysgraphia may be a direct manifestation of the same CNS disorganization that produces attention deficits. Second, for many of these students writing is a frenetic, inpulsive act. If they would regulate the tempo, their legibility would improve dramatically. In other instances, students seem to have trouble with motor memory or the precise retrieval of letter forms. This may be part of their broader picture of poor convergent retrieval. Finally, many of them exhibit poor motor planning and organization—just as they have difficulty with planning and organization in nonmotor spheres.

Ineffective Self-Monitoring represents another common impediment to academic proficiency. Frequently, students with attention deficits fail to exercise quality control over their work. They may neglect to proofread when they write. In mathematics, there may be a strong reluctance to check work or to determine whether answers look right. The result may be predictably careless errors and test scores that are not reliably indicative of the student's knowledge. Adolescents with attention deficits may have great difficulty studying for examinations, because they tend not to consider or know what they know and what they do not know or need to know. Their lack of insight and self-testing skill is part of their inefficient self-monitoring.

Excessive Motivation Dependency. There is always a direct relationship between attention and motivation (Fig 1). Any individual finds it easier to concentrate on intensely motivating material or experiences. A common characteristic of adolescents with attention deficits is an inordinate need for motivational content to concentrate effectively. It is commonly observed that such an adolescent has no difficulty paying attention when "he's (she's) doing something he (she) really likes." It appears that affected adolescents display particular difficulties concentrating at moderate or low motivation levels. In the absence of a strong romantic allure to the subject matter or pursuit, their attention to detail, their ability to persist, to be reflective, and to self-monitor all deteriorate. In high school, many subject areas require self-discipline, the capacity to withstand a certain amount of drudgery, and power to delay gratification. Students with attention deficits may confront some of their most formidable obstacles when faced with the need to focus intently on unexciting stimuli!

Disorganization plagues most adolescents with attention deficits. The management of time and materials,

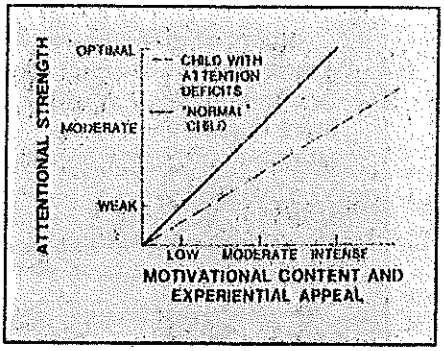

Fig 1. Direct relationship between attention and motivation. "Normal" adolescent can sustain attention when target or pursuit is only of mild or moderate interest. Adolescent with attention deficits, however, requires an inordinate degree of high motivational content to achieve same intensity and maintenance of attention as illustrated in graph; therefore, he or she has difficulty with routine details of learning and academic work where there is a prolonged delay of gratification.

the preparation of long-term assignments, the adherence to regular study hours, and the development of effective study skills are likely to be problematic. Some of the disorganization may stem from chronic cognitive impulsivity or a failure to plan and reflect prior to engaging in tasks. Little attention is paid to *how* things are done; instead there is a preoccupation with "getting it over with." Ironically, the need to proceed quickly results in disorganization which ultimately makes work more time-consuming and laborious. Disorganization also stems from a disordered CNS. The adolescent may try to reflect and plan but is simply unable to do so.

Performance Inconsistency as manifested by a fluctuation in learning, and behavioral and mood patterns from day to day (the "good days —bad days" phenomenon) causes confusion and frustration in the adolescent, teachers, and parents; they are uncertain what the adolescent knows or understands and may accuse him or her of "not trying." Because the manifestations of attention deficits are often situational and not pervasive, this variation in performance may create interobserver disagreement. Quiz scores may vary capriciously from day to day or week to week. There can even be variation in the results of IQ and achievement tests, reflecting the wide and unpre-

dictable fluctuations in attentional strength.

Impersistence pervades the work patterns of many teenagers with attention deficits. They have great difficulty remaining "on task" with sufficient intensity and endurance to complete and sustain the quality of what they begin. Difficulty following through and a failure to finish what they undertake are often of great concern to parents and teachers. During adolescence this becomes an increasing problem, as the sheer volume of required work grows. The affected student seemingly lacks the working capacity to maintain effort during an extended period.

Poor Selective Attention is a trait that may be encountered at any age but is especially troublesome during the adolescent years. When confronting an array of stimuli, the affected student may have difficulty determining what is truly salient, what is less relevant, and what is irrelevant or distracting. For example, despite being a good reader, an adolescent with attention deficits may have real trouble determining the gist of a reading passage. He or she may not be able to ferret out what is most important in a text and, therefore, most likely to appear on an examination. In a classroom setting, such a student may reveal problems remaining focused on the chalk board, on what the teacher is saying, or on other relevant information sources. In particular, the student may be predisposed to one or more forms of distractibility. Irrelevant visual or auditory stimuli (so called *sensory distractibility*) may be diverting the student. He or she might also be drawn off target by free associations and day dreams (so called *free flight of ideas*) or by personal needs and desires (ie, *insatiability*). *Social distractibility*, a preoccupation with others' activities and appearances, is another potential source of fragmented attention. In secondary school, the demand for selectivity is great. There is simply too much distraction and too much salient information. Students who cannot actively reduce the load through judicious selectivity are at a distinct disadvantage.

Abhorrence of or Inattention to Detail is a common finding among underachieving adolescents with attention deficits. Many of them are much better at dealing with the "big picture." They are likely to be good conceptualizers and generalizers, but they may experience difficulty with much of the relevant, fine detail of school. Such students may be far better in open-ended class discussions than they are in taking tests. They may succeed in courses that stress generalizations and broad-based ideas while struggling to made the grade in those subjects that entail the assimilation of a considerable amount of precise detail.

BEHAVIORAL FEATURES

There exists considerable variation in the behavioral patterns associated with adolescent attention deficits. Obviously, a range of environmental, neurologic, temperamental, and developmental factors interact to shape the behavioral proclivities of any adolescent. Many of the troublesome behaviors stem from performance deficits rather than skills deficits, in that the adolescent is *aware* of the appropriate behavior but cannot always *act* accordingly.[4] Some teenagers manifest academic difficulties with no signs of significant social or behavioral disturbance. In some instances, an affected younger's popularity and/or successful behavioral adjustment can mask underlying struggles with selective attention. In other cases, the behavioral manifestations are so prominent that parents, teachers, and diagnosticians may overlook important cognitive deficiencies (Fig 2). The following traits are some of the more commonly encountered sources of behavioral maladaptation (Table 2).

Insatiability and Restlessness are traits that are frequently linked. An affected teenager may appear to live in a steady state of wanting. He or she may have a tendency to look ahead, to be engaged in a continuous search for intense stimulation, to crave pleasure at all times. This can result in difficulty delaying gratification and a tendency to feel bored much of the time. As part of the perpetual quest for intense experience, the affected adolescent can exhibit provocative behaviors, egocentricity, and an unwillingness to assume responsibility for mundane chores at home. Students who are highly insatiable may be difficult to live with, especially for their siblings. Excessive sibling rivalry and combat are common.

Behavioral Impulsivity is a variable concomitant of attention deficits and may result in actions that get the adolescent into trouble with parents, teachers, and peers (Fig 2). These actions may include lying, cheating, stealing, being verbally abusive, and getting into fights. In some cases, a teenager may appear to be hostile, but his or her actions mainly reflect impulsivity.

Weak Reinforcibility in adolescents with attention deficits can lead to the perpetuation of maladaptive behaviors and discipline problems. Many of these teenagers are thought to be only weakly reinforceable in that their response to punishment, and reward fails to influence future behavior. This can lead to chronic discipline problems in school and home, to a failure to respond to repeated warnings and punishments, and to beliefs on the part of teachers and parents that somehow the adolescent is defiant or unable to deal with authority.

Social Failure is encountered in a number of adolescents with attention deficits.[5] In many cases, the social difficulties parallel a student's academic problems. The same impulsivity that contributes to underachievement in the classroom results in a failure to think prior to acting a certain way or expressing a thought before a peer. There is often a failure to predict the social consequences of actions. Certain traits, such as impulsivity, insatiability, and (when present) overactivity can be unattractive to others and can lead to outright rejection by peers. Furthermore, the lack of self-monitoring in the cognitive realm may also exist in social settings. Affected youth may fail to read or respond appropriately to social feedback cues, somehow seeming not to know when and if they have said or done the wrong thing. Deficient language skills (receptive and expressive) are associated with poor social skills. For some adolescents, "social learning disabilities" may be

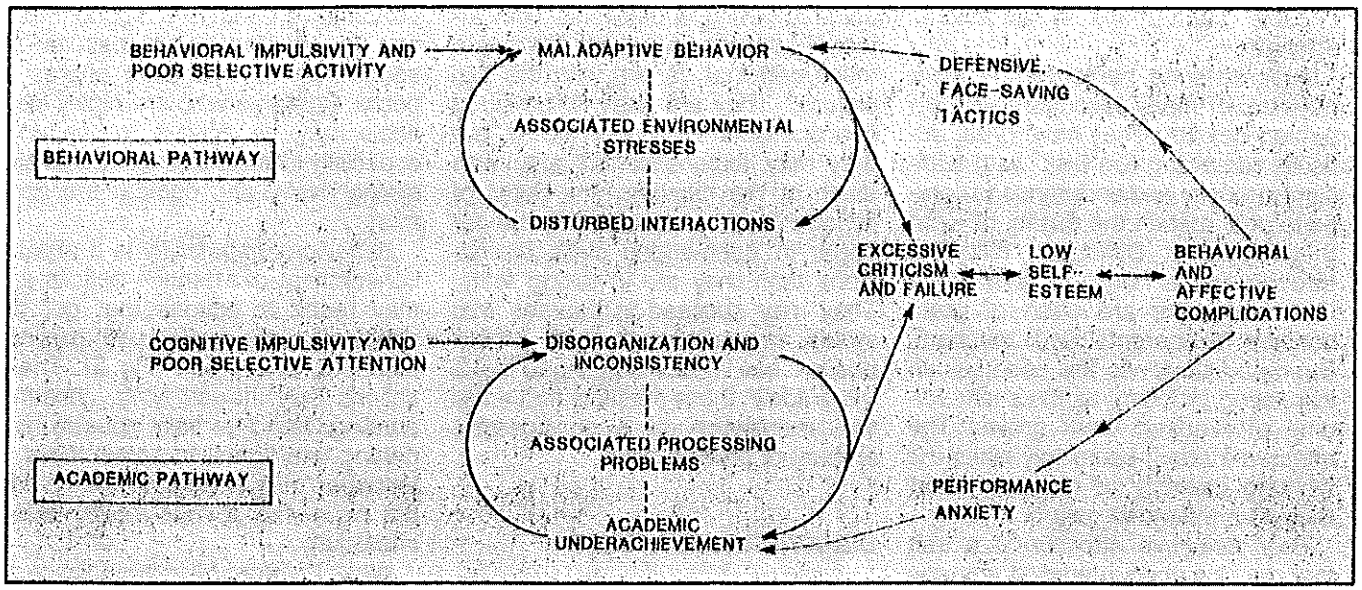

Fig 2. This conceptual model depicts cyclic pathway operant in adolescents with attentional deficits. Attention deficits may initially impact on behavioral pathway and/or academic pathway in either case resulting in criticism and failure, diminished self-esteem, and other complications. Original symptomatic dysfunctions are further complicated by defensive face-saving tactics, performance anxiety, and a continuing downward spiral in which failure begets more failure. This can make it difficult to decide whether a student is not achieving because he or she is anxious and/or disruptive or if he or she is anxious and/or disruptive, because he or she is not achieving. In fact, both of these phenomena are likely to pertain, so that assessment and intervention must take account of educational, affective, and behavioral issues without dwelling upon which came first, which precludes the others, or which is most important.

neurologically based, indicating that not all dysfunction is necessarily learned behavior.

Delinquent or Antisocial Behavior is a frequently raised concern about a subgroup of adolescent boys with attention deficits. Those with continued hyperactivity and a tendency to manifest deliberate aggression appear to be at risk for antisocial behavior which may include fire setting, vandalism, fighting, truancy, serious lying, carrying illegal weapons, and aggression.[6] Antisocial behavior is more likely to occur if the symptoms and complications of attention deficits are aggravated by poverty or other major environmental stresses. These adolescents are at risk for encounters with police and juvenile authorities, and their disorder may represent an entity distinct from most attention deficits, one that does not respond favorably to the traditional interventions.[7]

Alcohol and Drug Abuse do not appear to be more frequent or problematic in most adolescents with attention deficits; however, those adolescents with a history of antisocial behavior and who seek out a similar peer group are more likely to be involved with substance abuse.

TABLE 2. Behavioral Features of Attention Deficits in Adolescence: Symptoms and Consequences

Characteristics	Manifestations
Insatiability and restlessness	Difficulty delaying gratification. Tendency to look ahead and feel bored. Excessive sibling rivalry
Behavioral impulsivity	Variable among affected teenagers. Lying, cheating, interrupting, arguing, minor stealing, and risk-taking behaviors may be evident
Weak reinforcibility	Chronic, insufficient responses to repeated rewards or punishments may result in long-standing discipline problems
Social failure	Difficulty "reading" social situation and feedback cues. May result in rejection by peers
Delinquent or antisocial behavior	Affects a subgroup of adolescents whose behaviors are more serious and aggressive. Encounters with police and juvenile authorities
Alcohol and drug abuse	Not especially problematic in most adolescents. More associated with antisocial behavior
Motor vehicle accidents	Motor planning problems, distractibility, impulsivity, aggressiveness, and poor self-monitoring may be factors

Motor Vehicle Accidents are caused more frequently by these adolescents.[2] This may result from motor-processing problems, aggressiveness, distractibility, impulsivity, poor self-monitoring, and/or a risk-taking behavioral style. Accidental injuries are noted even in young children whose behavior is marked by aggression and impulsivity.[8]

TABLE 3. Complications of Attention Deficits in Adolescence

Characteristics	Manifestations
Low self-esteem	Common complication. May result from chronic academic underachievement/failure, social difficulties, or behavioral problems. Affected adolescents report lower expectations
Anxiety or depression	School absenteeism, an unwillingness to attempt new tasks, or resignation may be evident. Endogenous depression *v* affective complications of attention deficits may present diagnostic challenge
Loss of motivation and learned helplessness	Chronic failure and criticism may result in maladaptive, facing-saving tactics or weak internal locus of control

TABLE 4. Clinical Depression and Attention Deficits*

	Depression	Attention deficit
Mood	Dysphoric	Labile; intermittently dysphoric
Appetite	Poor or increased	Normal or increased
Sleep	Insomnia or too much sleep	Sleep-arousal imbalance; difficulty falling asleep
Energy level	Low	Low, normal, or increased
Psychomotor status	Agitated or "retarded"	Variable
Interest	Loss of interest or pleasure in usual activities	Inconsistent, superficial, incompletely pursued interests
Concentration	Poor	Poor and inconsistent
Self-image	Often poor	Often poor
Suicidal intent or thought	Common	Unusual

* Criteria for depression, adapted from *Diagnostic and Statistical Manual of Mental Disorders*, revision 3 (American Psychiatry Association, 1980). Table is taken from Levine and Satz[12] and used with permission from University Park Press.

Complications and Secondary Impacts

The complications resulting from chronic attention deficits, failure, and criticism invariably affect social interactions and self-esteem (Table 3). The converging and overlapping forces of maladaptive behavior, poor performance, and diminishing self-esteem tend to lock the adolescent into a cycle that feeds on itself (Fig 2). It is important, while recognizing the secondary effects, to investigate the endogenous predispositions also.

Low Self-Esteem, whether stemming from poor academic achievement, unrewarding social interactions, or behavioral difficulties, is one of the most consistently noted symptoms in the adolescent with attention deficits.[2,3,5,9] Failure in any one of these domains adversely affects the others and may precipitate the vicious cycle in which failure begets failure (Fig 2). Social interaction and achievement are first experienced within the family setting. As the youngster enters elementary school, and then especially in junior high school, these successes and achievements are increasingly linked to feelings of self-worth and competence. Children with repeated failures may evidence diminished self-esteem as early as the second grade.[10]

Adolescents suffering chronic success deprivation are intensely aware of the gap between their hopes and standards and their actual achievement. They may report lower expectations of future success and lower ambition. They may describe themselves in negative terms, and parents may describe them as loners subject to frequent periods of loneliness.

Anxiety or Depression may be evident in some affected adolescents. Anxiety may be evidenced by school absenteeism, an unwillingness to attempt new tasks, and/or by a tense or insecure demeanor. Depression is an often reported complication of chronic underachievement and social failure.[11] It may be difficult for the clinician to readily distinguish whether the clinical depression is endogenous or is a reflection of the chronic attention deficits[12] (Table 4).

Loss of Motivation and "Learned Helplessness" can emerge as serious complications of prolonged failure. The cumulative effects of failure, criticism, and declining self-esteem often result in the adolescent feeling unmotivated and inadequate. Adolescents experiencing learned helplessness may appear unwilling to accept new challenges or even to keep trying. They may believe that personal effort makes no difference and hence become passive and resigned to their fate. It may appear that the adolescent has lost an internal locus of control and thinks that his or her outcome is dependent on external forces.

REDEMPTIVE FEATURES

All adolescents with attention deficits exhibit redeeming features that are actually direct manifestations of their attentional patterns (Table 5). An *abhorrence of or inattention to detail* may be associated with real strengths of conceptual ability, an enhanced capability to see the "big picture." *Insatiability* may be associated with ambition and initiative. *Distractibility* may be intimately linked to creativity. A student who notices things no one else does is in a position to detect meaningful interrelationships that elude more disciplined minds. A student who is highly *impulsive* may ultimately evolve into an adult with a

strong orientation for closure, a person who accomplishes a great deal during the working day. Furthermore, it is not unusual to encounter adolescents with attention deficits who have superb senses of humor, appealing personalities, true leadership skills, and unquestionable individuality. It is obviously important for clinicians, parents, and teachers to recognize and acknowledge that every adolescent with deficits of attention also possesses unique strengths of attention.

TABLE 5. Redemptive Features of Attention Deficits in Adolescence

Characteristics	Redemptive Manifestations
Abhorrence of/inattention to detail	Good conceptual abilities
Insatiability	Ambition, initiative
Distractibility	Ability to notice or appreciate things that others do not. Creativity
Impulsivity	Ability to achieve many tasks in a day
Other	High levels of energy, sense of individualism, good imagination and well-developed social skills

EVALUATION OF THE ADOLESCENT WITH ATTENTION DEFICITS

Evaluation of the adolescent with attention deficits requires a systematic method of taking in a vast amount of information. A useful method is to use a combination of evaluation tools.

Questionnaires, such as the ANSER System,[13] provide important medical, developmental, attentional, behavioral, demographic, and social information (available through Educators Publishing Service, 75 Moulton St, Cambridge, MA 02238). A detailed family history should include information about seizures, tics, depression, attention or behavioral problems, school failure, learning disabilities, or substance abuse in parents, siblings, or other relatives. The questionnaires also encourage the inclusion of the adolescent's compensatory skills, interests, positive personal characteristics, and other redemptive features. School questionnaires provide information about achievement, behavior, social interactions, attention, past evaluations, and underlying strengths. The self-administered questionnaire allows the adolescent to assess his or her own performance in various realms and allows for an expression of other skills and interests. Together all of these questionnaires give the clinician much information as well as an appreciation of the degree of insight and understanding that parent, teacher, and adolescent each has about the problems.

Review of past evaluations, diagnoses, and treatments should be undertaken prior to the evaluation. This may be helpful in understanding the problems, their development throughout time, the response to treatments, and the compliance of the parents, teachers, and adolescent. It is important to gauge the parents' and adolescent's understanding of these past evaluations and their reactions to them, emotionally and intellectually. It is helpful to determine what labels, especially potentially stigmatizing ones, (eg, "ADD," "LD," "emotionally handicapped," "lazy," "poor attitude," "trouble-maker") may have been assigned to the adolescent and how these labels may be affecting his or her self-image, self-esteem, and function.

Direct testing and observation techniques are numerous and may include the following: (1) Comprehensive psychoeducational testing during adolescence should include a process-orientated assessment that describes error patterns in academic skills and characterizes learning style. It also yields achievement levels in areas such as reading comprehension, writing, spelling, and mathematics. This assessment should reveal *how* a student learns or approaches a task, emphasizing both strengths and weaknesses. It is intended to yield direct therapeutic interventions. It also may need to address eligibility issues specifically, such as receiving special educational services from the school system. (2) Neurodevelopmental or neurophysiologic evaluations such as the Pediatric Examination of Educational Readiness at Middle Childhood (PEERAMID),[14] assess language (receptive and expressive), fine motor function, sequencing, and visual processing. Additional observations can be made regarding memory, attention, behavior, affect, organization, and implementation of effective strategies. The results may reveal discrete areas of dysfunction and/or strength that should be used in conjunction with findings from other diagnostic sources to tailor appropriate interventions. The neurodevelopmental evaluation requires about one hour and may be administered by the pediatrician in the office setting. Such an evaluation also might suggest the need for other studies, such as speech and language evaluation or an occupational therapy assessment. Information concerning the evaluation and management of learning, developmental or attentional problems may be obtained through the Child Development Section of the American Academy of Pediatrics, an increasing number of continuing medical education courses, or from experienced pediatricians. (Annual courses and "mini-fellowships" (2 to 4 weeks) that include the administration and interpretation of various neurodevelopmental evaluations for different ages are offered.) (3) A physiologic appraisal should also be included. IQ testing may be necessary to determine eligibility for special education, and the subtest scores may further define developmental areas of strengths and weaknesses. IQ scores may fluctuate widely depending on the adolescent's attention, anxiety, level of motivation, and rapport with the examiner. Results should be used in conjunction with other data, not exclusively for diagnostic or prognostic purposes. Affecting testing is important in determining the emotional status or weighing the effects of environmental stresses on the adolescent.

There are many types of psychologists available. The physician should be familiar with them to select the

most appropriate one for evaluating the adolescent with attention deficits, whose difficulties often and inappropriately are ascribed to emotional or behavioral causes. Various psychologists include behavioral (behavior modification and parenting skills), clinical (psychodynamically orientated and offering cognitive and affective testing), and school (cognitive, achievement and affecting testing in the school). Neuropsychologists are trained in brain-behavior relationships and may provide information useful to the school. Psychoeducational specialists assess achievement and are process orientated, describing *how* the adolescent learns.

Interviews should be conducted separately with the parents and the adolescent and then with the family together. This allows a clarification of the problems because parents or adolescents may hesitate to record all pertinent information in the questionnaires. The adolescent interview establishes a sense of trust and advocacy; it should be conducted in a semistructured manner to assess the adolescent's own perceptions, his or her thinking process, language skills attention, affect, and level of motivation. A skilled and sensitive social worker should interview the parents to assess domestic and social issues that affect the adolescent.

Physical and neurologic examinations are a necessary part of the evaluation. A general assessment of health, physical, and sexual development is helpful. Relatively rare but critical conditions such as brain tumors, Wilson disease, or thyroid dysfunction may be detected and implicated as a cause of the adolescent's deteriorating function. Neurologic "soft signs" are rare in adolescents. Hearing and vision screening tests should be routine components.

Differential diagnosis should include the consideration of conditions that may appear clinically similar to attention deficits. Affective disorders such as depression, anxiety, or schizophrenia might appear as day dreaming, fatigue, lethargy, hyperactivity, or the making of irrelevant comments. Tourette syndrome may be represented by various movements, tics, restless behavior, the uttering of odd sounds, or irrelevant comments including coprolalia. Allergies may cause irritability or poor concentration. Medications such as anticonvulsants, bronchodilators, or antihistamines may alter concentration and activity. Seizure disorders need to be considered. Petit mal seizures are rare in adolescents; however, other seizure disorders such as temporal lobe epilepsy may masquerade as attention deficits with unusual behaviors.

Secondary attention deficits should be considered. Some adolescents may *appear* to have primary attention deficits but in reality their attention goes unrewarded because of other difficulties, such as a language processing disability, which causes the adolescent to become increasingly inattentive because of the futility in trying to keep pace with the increasing language demands of high school courses. Secondary attention deficits may exist in conjunction with primary attention deficits.

MANAGEMENT OF ATTENTION DEFICITS IN ADOLESCENCE

Treatment Goals

Treatment goals need to be comprehensive in their scope and should address all aspects of the adolescent's dysfunction (Table 6). Treatment is a complex, challenging, time-consuming, and prolonged process that requires participation of the parent(s), teachers, the adolescent, the pediatrician, and sometimes others such as counselors, social workers, psychiatrists, or psychologists. Compliance with recommendations and a system of quality control are vital for a favorable outcome. There are five major treatment goals: (1) *insight by the adolescent* into his or her attention deficits and their impacts on day-to-day function; (2) *prioritization* of the most problematic areas of dysfunction; (3) *implementation of specific treatment plans*; (4) *formulation of realistic expectations and goals*; (5) *mobilization of strengths and resources* in the adolescent, the family, the school, and the environment.

MANAGEMENT TECHNIQUES

The management of adolescents with attention deficits should be multimodal and based on a coordinated plan of problem-specific treatments. Treatment plans should be individualized for each adolescent. Such problem-specific management is more therapeutic and cost-effective than vague, general recommendations such as "would benefit from tutoring" or "needs medication." Some adolescents benefit from limited interventions, whereas others may require more comprehensive management. Management techniques may be divided into (1) pediatric counseling; (2) mental health counseling; (3) behavioral or cognitive therapy; (4) educational therapy; (5) pharmacotherapy; (6) periodic reassessment, redirection, and long-term advocacy.

Pediatric Counseling is a multifaceted role that centers on helping parents and adolescents accomplish changes that improve their current function and later outcomes.[15] Counseling should consist of the following elements: (1) allowing the family to ventilate feelings; (2) providing highly specific advice regarding management at school, at home, and in the community; (3) helping the family to develop its own resources; (4) preventing self-criticism and reducing parental guilt; (5) making referrals when necessary; (6) providing anticipatory guidance; and (7) serving as an advocate for the adolescent. Counseling should entail (1) *demystification* in which the phenomena of attention deficits are explained in concrete, nontechnical language; (2) the rendition of a *functional profile* which outlines *specific examples* of the particular adolescent's attention deficits and complications while highlighting *specific strengths and resources* of the adolescent and his family; (3) the setting of *appropriate, realistic, and achievable goals* that allow *active* participation and result in a sense of success, competence, and gratification; and (4) the dispensing of *specific advice* about issues that are most troublesome to the family (eg, sleep habits, homework, staying out late, working part-time jobs). The pediatrician also must help parents take aim at only a *few issues* rather than launching a total reform.

Other parental initiatives can be encouraged, such as the acquisition or

use of a word processor, an organized, quiet study area that is separate from the bedroom or the active parts of the home, specific quiet hours in the home, the availability of parents to answer questions or to check on work when necessary, frequent trips to the library or other resource areas, and other supportive services like limiting phone calls, music playing, television viewing, and social activities during the week.

Appropriateness for higher education is a frequent concern among the affected adolescents and their parents. A transitional year in which the adolescent takes only a few college courses or attends night school, while holding down a regular job, allows for additional maturity, organization, and responsibility. During this transitional year the adolescent can focus on career interests, raise his or her motivational level, and whet the appetite for higher education or vocational training.

Mental Health Counseling is often recommended but frequently meets with resistance on the part of the adolescent. Individual psychotherapy alone may end in failure if the adolescent thinks that he or she alone is to blame for the difficulties; however, if and when the adolescent wants and requests help, greater efficacy is likely. Family therapy, when indicated, is often more successful, because it provides a supportive, emotionally neutral climate in which the adolescent and parents can discuss common concerns and goals within a "team work" format. Within this setting parents may state that, for the first time, they really appreciate the adolescent's perceptions and feelings.

Other forms of mental health counseling may be offered by the school guidance counselor or school psychologist, whose roles also allow him or her to advocate for the adolescent within the school system, monitor behavior and academic work, help plan for appropriate higher education (college or vocational school), or advise the student about employment opportunities or the consideration of a transitional year. A compassionate school nurse also may be a source of informal and supportive mental health counseling.

TABLE 6. Treatment Goals for Attention Deficits in Adolescence

To enhance adolescent's insight and parents' understanding of attention deficits and how they affect adolescent
To target most maladaptive traits for special insight and specific management
To set reasonable and realistic expectation and goals
To identify associated processing problems or learning disabilities that compromise school performance
To identify complications and secondary effects such as social or emotional problems and family dysfunction
To improve adolescent's interactions with parents, teachers, and peers
To strengthen communication between home and school
To stage interventions and treatments rather than using a "shotgun approach"
To mobilize adolescent's strengths and resources
To convey sense of support and hope that implies faith in adolescent and belief that he or she can do better

Behavior Modification involving a system of rewards and punishments for the modification of external, measurable events is usually not effective in the adolescent, especially if used singly. Adolescents may complain that they are being treated like children and often are not as invested in tangible rewards or responsive to punishments. Compliance in this group is problematic.[1] Contract systems that are devised by parental and adolescent cooperation and give the adolescent increased responsibility for desired goals may be effective.

Cognitive Behavior Therapy is based on task-specific strategies aimed at helping the adolescent develop more consciously derived and monitored techniques for learning and behaving. The ultimate aim is to allow the adolescent to *think* and *act* in a systematic and adaptive manner to reduce troublesome symptoms. Increased *self-awareness* and *active participation* are underlying principles.

The "stop, look and listen" (and think) conceptual model is one example of cognitive behavioral therapy.[16] More specifically, verbal controls are used to inhibit and to initiate voluntary behavior. First, the target behavior is controlled and directed by the speech of another person, usually an adult. Second, the adolescent uses overt speech to regulate his or her behavior. Third, the adolescent uses covert (inner) speech to govern his or her voluntary behavior. This system of self-instruction, self-monitoring, and self-reinforcement has proved successful.[17] The self-reinforcement is critical, because it ultimately raises the adolescent's level of motivation, a key ingredient to success. This therapeutic intervention is especially useful with impulsivity that affects behavior and academic performance. It is also useful because it can be generalized to other situations and can transfer throughout time.

Cognitive Therapy may prove effective especially in situations in which affective disorders, such as depression or anxiety, are the concern. It is a directive, active, time-limited, structured therapeutic approach that is based on the assumption that one's affect and behavior are shaped by the way in which one *thinks about or perceives* the self and the environment.[18] The specific techniques include (1) highlighting the adolescent's specific misconceptions and maladaptive assumptions; (2) monitoring his or her negative, patterned thoughts (cognitions); (3) recognizing the cause and effect relationship of cognition, affect, and behavior; (4) verifying his or her dysfunctional thought patterns; (5) substituting more adaptive and reality-based interpretations for these biased cognitions; and (6) identifying and changing the dysfunctional believes that have predisposed the adolescent to misinterpret his or her experiences.

TABLE 7. Stimulant Drugs Used for the Treatment of Attention Deficits*

Drug	Preparations	Drug Effects			Dosage
		Onset	Peak	Duration	
Methylphenidate	Ritalin 5-, 10-, 20-mg tablets	30 min	1.9 h (0.3–4.4)	4–6 h	10 mg (q AM bid, or tid) with weekly increase of 5–10 mg to maximum of 60–80 mg daily (usual dosage: 0.3–1 mg/kg with maximum of 2 mg/kg)
	Ritalin SR (sustained release) 20 mg	30 min–1 h	4.7 h (1.3–8.2)	8 h	Corresponds to 8-h dosage of Ritalin tablets
Dextroamphetamine	Dexedrine 5-mg tablets; 5 mg/5 mL elixir	30 min	3–4 h	7 h	5 mg (q AM bid, or tid) with weekly increase of 5 mg to maximum of 40 mg daily (usual dosage: 0.15–0.3 mg/kg with maximum of 0.4 mg/kg)
	Dexedrine Spansule 5-, 10-, or 15-mg capsules	30 min–1 h	"Sustained"	12+ h	Corresponds to AM dosage of Dexedrine tablets
Pemoline	Cylert 18.75-, 37.5-, or 75-mg tablets; 37.5-mg chewable tablets	2–4 h	"Sustained"	12 h	18.75–37.5 mg q AM with weekly increase of 18.75 mg to maximum of 112.5 mg daily (effective dosage about 2.25 mg/kg)

* Adapted from Dworkin[23] and used with permission from WB Saunders Co. Some of the dosage figures have been modified for the adolescent's requirements.

Educational Intervention is critical because attention deficits in adolescents invariably interfere with academic performance.

Important interventions may take place in the *regular classroom* where modifications in expectations, teaching techniques, and the environment may improve the adolescent's function. The teacher should be made aware of and sensitive to the student's special needs. Specific recommendations in this setting depend on the student's needs but generally aim to improve concentration, organization, on-task performance, and academic achievement. Modifications in the curriculum, reduction of memory strain, the addition of elective courses, mobilization of the students' strengths and interests, and the avoidance of public humiliation by teachers are critical. Even though a student may not qualify for special services, academic problems and gaps in achievement still exist. The student still could benefit from a reduced work load, small group instruction or tutorial assistance, and help with study skills (staging long-term projects, preparing homework assignments, proofreading, and general organization).

Attention deficits are less commonly diagnosed in girls and young women, possibly because their behavioral features are mild or nonexistent. Nevertheless, they may be struggling inordinately but inconspicuously with the various components of attention. Evaluation and treatment are the same as for boys.

Special Education or time in a resource room provides part-time help. This help may include one-to-one or small group instruction, work on study skills, efforts at reducing the adolescent's cognitive tempo, guidance toward improving attention to detail through better self-monitoring, learning to identify salient material in reading or listening, and aid at devising memory strategies. The special education teacher may also implement some aspects of cognitive behavior therapy.

Pharmacotherapy, although the single most effective treatment for attention deficits, *should never be used in isolation*. Not all adolescents with attention deficits need medication. Stimulant medication is the most effective pharmacotherapy with methylphenidate (Ritalin) being the most frequently used, because its "behavioral half-life" is most predictable. Dextroamphetamine (Dexedrine) and pemoline (Cylert) are the other two commonly used stimulants (Table 7). The use of pemoline requires periodic liver function tests.

Contrary to some traditional wisdom, adolescents and young adults with attention deficits do benefit from stimulant medication.[3,19] Compliance among adolescents, however, is problematic, even when they experience a positive response. On the other hand, many adolescents are willing to suffer (mild) side effects of medication, such as appetite reduction, mild weight loss, affective changes (being more quiet, less talkative), and sleep disturbances once they experience the positive effects (improved concentration, reduced restlessness and impulsivity) and subsequent improved function. Within the appropriate educational setting and with the use of stimulant medication, adolescents do improve their learning.[20] The reduction of target behaviors, the enhancement of

positive adaptive behaviors, and the monitoring of side effects (especially decreased growth velocity) are the three criteria by which to judge the response of the adolescent to medication; a checklist of target behaviors, filled out by teachers and parents, is useful.

Inadequate dosage is a common error. Initial, moderate levels of improvement should not determine dosage. Titration should continue until *optimal* improvement is noted. As adolescents approach adulthood, some require a reduced dose. Because of their adult-like maturational changes, the pharmacodynamics of their metabolism (eg, more sensitive receptors or less active dopamine reuptake or elimination systems) allow equivalent serum levels at lower doses.[21] In addition to the usual side effects, others like fatigue, dysphoria, euphoria, restlessness, and irritability may indicate when the adolescent might benefit from this lower dosage.

Medication only should be initiated once other appropriate interventions have been instituted. Some adolescents require medication only during school hours or for long study sessions. Others prefer taking it on a year-round, daily basis. Regarding the long-term use of medication, a reevaluation should be undertaken about 4 weeks after a new school year begins. The positive effects of the medication are most noticeable when the adolescent is in a situation requiring focused, sustained attention and productivity. Successful management of medication requires frequent and regular assessment by teachers, parents, and the physician.

Several other medications, as well as other "controversial therapies," have been described but are not as effective.[22]

Advocacy and Follow-up are critical to an improved outcome. The pediatrician, or another member of the interdisciplinary team, must monitor progress, coordinate other needed services, assess the quality and effectiveness of recommendations, and encourage compliance. Periodic reassessment is essential. Pharmacotherapy requires more frequent follow-up while the dosage is being adjusted. Although much follow-up, reassurance, and answering of questions can be done by telephone, the adolescent and the family should be seen together on a regular basis. Adolescents should be able to telephone and occasionally visit the physician alone.

SUMMARY

Attention deficits may persist through childhood and into adolescence or they first may become manifest in adolescence. Their manifestations are often more subtle but severe enough to exact a significant toll on academic performance. Associated learning disabilities, behavioral problems, and affective dysfunction, especially low self-esteem, are frequent concomitants or complications. On the other hand, some traits (such as creativity) of attention deficits may serve as redemptive features.

Evaluation necessitates a systematic gathering, synthesis, and interpretation of a vast amount of information as well as direct testing and observation. Compensatory strengths and other positive attributes should be elicited and mobilized.

Management should be individually tailored to the adolescent's specific needs and resources and implemented in a stepwise fashion. Intervention is usually multimodal, because attention deficits invariably affect several areas of function: academic, behavioral, social, and emotional. Management might include educational interventions, counseling, cognitive behavior therapy, behavior modification, and pharmacotherapy. Management should always include demystification, construction of a functional profile, specific advice-giving, encouragement, advocacy, and long-term follow-up, roles for which the pediatrician is especially qualified.

With increased awareness of the plight of adolescents with attention deficits, the pediatrician, working closely with other professionals, has an extraordinary opportunity to minimize the accusations, suffering, and maladaptive, self-destructive behaviors that have been so much a part of the adolescent's condition in the past. As we become more sensitive to the effects of endogenous dysfunction during adolescence, it will become increasingly possible to redeem the struggling young people in their own eyes and in the eyes of important adults in their lives.

Optimal evaluation and treatment is likely to be taxing, time-consuming, and expensive for all involved. However, the price of neglect, false attributions, and failure will be far higher.

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EDUCATIONAL OBJECTIVE

124. The pediatrician should have appropriate acquaintance with the growth and development features of children receiving home total parenteral nutrition (Recent Advances, 87/88).

Total Parenteral Nutrition at Home

Somatic Growth and Developmental Functioning in Children Receiving Prolonged Home TPN. Ralston CW, et al. *J Pediatr* 1984;105:842.
Nutritional Status During Home Parenteral Nutrition. Dahlstrom KA, et al. *J Pediatr* 1985;107:219.
Survival in Very Short Small Bowel Syndrome. Dorney SFA, et al. *J Pediatr* 1985;107:521.
Long-Term Home Parenteral Nutrition in Pediatrics: 10 Years Experience in 102 Patients. Vargas JH, et al. *J Pediatr* 1987;6:24.

The use of total parenteral nutrition in pediatrics has changed significantly since the early 1960s when Dudrick successfully alimented a malnourished infant via a centrally placed catheter. Development of flexible, pediatric-sized catheters and improved total parenteral nutrition formulas have permitted nutritional rehabilitation and maintenance of children with gastrointestinal disorders. Home parenteral nutrition in children with long-term requirements has also gained acceptance.

Infants and children recommended for home parenteral nutrition are those who cannot be enterally fed for a prolonged or indefinite period of time or those in whom enteral nutrition is deemed inadequate to sustain normal growth. These are most often children with short bowel syndrome, intestinal pseudoobstruction, and inflammatory bowel disease.

The feasibility of administering total parenteral nutrition in the home setting is dependent upon the reliability of the primary caretaker who will be faced with the task of maintenance of the catheter. The patient should have had stable fluid and electrolyte status and proven weight gain while hospitalized. Prior to discharge, the patient is gradually adapted to a cyclical nocturnal infusion. This provides greater freedom to the caretaker and enables an older child to attend school. The evaluation of smaller, less cumbersome infusion systems has also permitted greater mobility to the infant and younger child.

Complications may arise with the most meticulous technique, and the ability to recognize them promptly is important. In their review of 102 patients receiving home parenteral nutrition during a 10-year period, Vargas et al reported that three deaths related to catheter sepsis could have been prevented had the caretaker sought medical attention soon after the onset of fever. Other complications include mechanical difficulties with catheters, cholelithiasis, and metabolic disorders, including liver dysfunction which may be a significant source of morbidity, particularly in the small infant.

In recent studies reported in the pediatric literature nutritional status, growth, and development during home parenteral nutrition have been assessed. Adequate somatic growth and developmental performance has been reported in these children, many of whom underwent prolonged hospitalization. *(L. McLoughlin, MD, Children's Hospital of New Jersey)*

ARTICLES

Schools in Which All Kinds of Minds Can Grow in All Kinds of Good Ways

Dr. Mel Levine

As we discover more and more about how students learn and how different minds learn differently, our schools have a golden opportunity to increase the proportion of their students who experience true academic success. Armed with these new insights into brain function, educators can help all children and adolescents develop their unique strengths while overcoming the negative effects of their weaknesses. In doing so, they will have created schools for all kinds of minds. Let us consider some prominent features of such optimal educational environments:

- Teachers would be well trained in how learning works and would be knowledgeable about the specific brain functions that are critical for the age group and/or subject matter they teach.
- Teachers would have learned about the revealing signs of specific differences in learning, how to identify these in the classroom and how to manage students with learning problems more effectively.
- Teachers would be trained to "diagnose" students' strengths and special affinities (areas of strong interest), so as to make sure that these positive qualities are being recognized, celebrated, and enhanced.
- Students would be learning about learning while they are learning; they would study the different brain processes and acquire the terminology needed to think about and understand their own minds.
- All students would be expected to select a topic and study it as an independent study activity (with a mentor) for at least 3 years; in this way they would experience "expertise" and gain from its positive effects on mind and skill development.
- Students could be evaluated in more than one way; they could choose from various forms of testing or other assessment modes to demonstrate what they have learned or accomplished.
- Classrooms would offer an atmosphere in which it is safe to make mistakes and take some risks in one's thinking and expression; public humiliation of students would not take place.
- Parents and schools would be close partners in educating students; their specific educational roles would be well defined.
- Every classroom would target the strengthening of some specific brain functions (such as attention controls, higher thinking abilities, or problem solving skills).
- Peer pressure would be reduced, and students would be taught about social cognition.
- Verbal and physical abuse of students by other students would be considered a significant offense.
- All students would be held accountable for being productive, for having a high level of academic output, although not every student would be expected to produce the same "products."
- Struggling children would not be burdened with diagnostic labels but instead their profiles of strengths and weaknesses in relevant neurodevelopmental functions and academic learning would be determined and managed effectively in school.
- There would be a stress on inclusion of students with learning problems in regular education settings, but some pullout services would still be required for a small number of children.
- Schools would be flexible in their curricular requirements, offering accommodations as needed.
- Students who benefit from accommodations could be expected to compensate by performing additional work in an area of their strength or affinity.
- While there would be a concerted stress on raising academic standards for all students, such standards would not be met or demonstrated in exactly the same manner by all students in the school.

The features delineated above are attainable. Some schools are already moving swiftly in these directions. Implementation requires strong support from parents, building principals, and school boards. In some communities a public school might seek the needed waivers from certain existing regulations in order to establish a demonstration model of a school for all kinds of minds. In some instances, a charter school might be based on this model.

We are talking about a strongly humanitarian movement in education. We would be acknowledging that our society desperately needs diverse kinds of minds among its adult population. We want no child to feel hopeless because of the way his brain is wired. We are hoping that every single student can see abundantly rewarding possibilities for her kind of mind while becoming an educated person.

Read about the Schools Attuned Professional Development Program

Read about Educational Care for All Kinds of Minds

ARTICLES

A Balanced Summer

Dr. Mel Levine

The upcoming summer vacation should serve as a blank canvas that an artist is about to fill in artfully. What a child or adolescent did and accomplished during an extended vacation says so much about who he or she is and whom she or he is becoming. Consequently, serious thought and planning should be dedicated to making that canvas as meaningful as possible. Like a great painting, a worthwhile summer is one in which just the right balances are achieved. What are these balances?

The first is a balance between entertainment and mind growth - not always derived from the same activities! A child is entitled to some hearty and frivolous rest and recreation (brain refueling and rejuvenation) during the summer months. He should have much to say in selecting such pleasure-deriving activities. Yet it would be a wasteful shame if summer fun sidetracked and stifled the ongoing intellectual growth of a mind being formed. Educational experiences, challenges to a child or adolescent's mind (including ongoing discussion of basic values) must be part of the balance. So it is that family vacations need to include a range of expeditions, missions, and brain nurturing encounters a child can directly experience, read about, and plan for. Incidentally, in part to build time management strategies, a child should be heavily involved in working out vacation itineraries.

Second, there is the needed balance between peer-saturated activities and individual pursuits. Kids should savor the social side of life, perhaps in a summer camp or through a range of athletic activities. But, as well, they ought to be engaging in activities in which they are largely "soloists," person's doing their own special things. Entertaining oneself, building on one's personal affinities through collecting things, constructing models, exercising creativity, taking care of animals, etc. comprise crucial sources of personal development, one that is readily cultivated during the summer months. Vacations should help a child experience the ways in which she is unique in what she does, how she is in fact enticingly different from her classmates. There should be opportunities for adult-supervised activities (such as in sports) but also periods of freedom from the need to comply with adult expectations (such as when engaging in imaginary play). We have to be careful not to over program our kids, especially during those critical summer months.

Third, one should seek a balance between work and play. Children acquire and enhance social skills, conflict resolution capabilities, and problem solving tactics through play. While these are essential, every child should have a chance to gain experience as a worker. Volunteering and/or assuming responsibilities at home or in a parent's workplace represent effective ways to build usable work habits, while studying the complexities of the adult world. Paid jobs during the teenage years exert a potent and durable influence upon developing minds.

Fourth, there should be a balance between self-centered and altruistic activities. Beginning by age 10, children should have the experience of helping others. Communities offer a range of such opportunities (such as in hospitals, nursing homes, and other facilities or agencies). One day a week, or perhaps one entire week of such outreach to people in need, can nurture a sense of reality and charity in a young child or adolescent.

Next September, when that summer canvas has materialized as a finished painting, a child and his parents should be able to glance back with feelings of fulfillment, along with a sense that an attractive pattern of experiences will have some durable influence and will be talked about and thought about for years to come.

ARTICLES

Barely a Gleam of Self-Esteem

Dr. Mel Levine

When a student compares himself to classmates and siblings and somehow arrives at the devastating conclusion that he is hopelessly inferior, daily life can become intensely stressful and intimidating. Such a diminished girl or boy is contending with low or absent self-esteem, with feelings of worthlessness and unworthiness. Negative self-assessments often bring with them a loss of all motivation, profound sadness, and pessimism. Self-esteem is clearly a very precious commodity, one that needs to be salvaged and preserved in all students. Regrettably, some students have lifelong temperamental characteristics that make them especially vulnerable to feelings of inadequacy; they are chronically unsure of themselves. They seem to thrive on putting themselves down. However, in most instances, over time, a student has endured experiences that have eroded self-esteem.

Low self-esteem can be either localized to certain spheres of life or it can be generalized, casting a profound dark shadow over virtually all aspects of a student's existence. Disappointing school performance often results in low academic/intellectual self-esteem, while, in other ways, a struggling student may feel good about herself. Some students endure low social self-esteem, feeling they are not as well liked as their peers or siblings yet feel good about themselves when it comes to other aspects of their lives. Poor athletic performance, concerns about being physically unattractive, or else a sense that you have somehow disappointed your parents culminate in other specific breakdowns in self-esteem. Whether low self-esteem covers many areas or just one part of life, an affected student can become chronically anxious, lose motivation, and manifest serious behavior problems (sometimes trying to cover up feelings of inadequacy). Such a boy or girl simply may give up trying to succeed in life. As one such student lamented to me recently: "I guess I was just born to lose!"

Needless to say, we must do all we can to prevent students from becoming depleted of self-esteem and we need to find ways to restore it in those who have lost it. And when it comes to enhancing self-esteem, nothing succeeds like success. That is, we have to find ways to enable that student to experience and demonstrate mastery. Such visible competency can be thought of as taking the form of tangible accomplishment in four distinct performance arenas:

The Academic/Intellectual Arena
The Social Arena
The Motor Arena
The Creative Arena

Self-esteem is most apt to thrive when a student has a true sense of accomplishment within three out of four of these arenas, although sometimes an individual can derive adequate gratification from being exceptionally proficient in just one. Clearly, no one can reach stardom in every sport or all academic subjects, or at each mode of artistic endeavor, or within every single social clique in the school. The trick is to locate and exploit a particular niche within each arena - a specific motor, intellectual, social, and/or creative pathway along which there can be demonstrable accomplishment. That might entail becoming an expert in computer games, a fantastic Frisbee player, a leader in a scout troop, or a designer of imaginative scenery for school plays.

The following are some suggestions that may help parents and teachers in the important effort to foster positive self-esteem:

- Students crave true (i.e., not false) praise from the important adults in their lives. They are entitled to such positive feedback on a regular basis no matter how poor their grades in school, their behavior, or their athletic abilities.
- Kids need to overhear their parents boasting about them to other adults.
- When students keep making self-deprecatory comments (such as, "boy am I stupid," "I'm the dumbest kid in my class," or "everybody hates me"), adults have to jump in and provide evidence that the assertion is wrong, while trying to coax the student toward thinking about all the things he is good at. Also, it is important to let the student talk through such assertions and have an opportunity to explain in detail why it is he feels this way.
- Grownups need to be very careful of their wording when they criticize a student. Devastating, fatalistic comments, such as "you'll never to amount to anything" are lethal to self-esteem and they seem to stick for an eternity - if you call someone bad often enough, he's certain to turn bad.
- Students should not be compared to their siblings. Parents should make sure that different students in a family have their own unique ways of demonstrating their strengths and earning kudos.
- When a student has learning difficulties and low self-esteem, all caring adults should be striving to help that student feel optimistic about the future. They should help the student appreciate his own strengths and how they will one day enable him to succeed. When kids are struggling, we always have to make sure there's plenty of light at the end of the tunnel. Pessimism about the future goes hand and in hand with low self-esteem, and it can lead to serious behavioral and motivational complications.
- Students whose lost self-esteem stems from disappointing school, athletic, or social performance have to be "demystified" or helped to understand clearly the nature of the difficulty they have had. When they lack a clear

understanding of their shortcomings (and strength), students tend to overestimate the extent of their problems and conclude that they are "dummies," "klutzes," or "social outcasts."

- Schools should find important (prestigious) roles for students with low self-esteem. Responsibility for audiovisual equipment, assistance in the front office, chairmanship of a committee or club or work as an assistant to the football coach are examples of such "cameo roles" that can make a student feel worthy.
- Parents and schools should seek professional help when a student with low self-esteem shows a marked deterioration in behavior and school performance or reveals signs of depression (such as extreme sadness, a loss of interest in things she used to enjoy, and possible thoughts of suicide).
- A student's self-esteem is a revealing barometer of his or her mental well-being and outlook on life. Parents and teachers therefore need to take regular readings of a student's feelings about herself and, when necessary, intervene to reverse any dangerous downward spirals. All students have their own valid reasons to respect themselves, but sometimes kids are crying for help finding those reasons.

ARTICLES

Helping Their Heads to Look Ahead

Dr. Mel Levine

While it is no doubt important to get the most out of the present while you are growing up, there is definite value to helping kids peer into the future and give thought to what may lie ahead for them. How can we create forward-looking children and adolescents?

First, kids need help to cultivate an interest in a complex subject matter called adults; yes, the young need to study grownups. Right now, all too often, children use each other as their exclusive role models. So many of them show little if any interest in adults aside from their compulsory exposure to immediate relatives and teachers. When you invite friends to your home, make sure your kids spend some time with them instead of automatically disappearing to their bedrooms or escaping with their band of acquaintances. Talk to children about adults whom they and you know with an emphasis on what they do in life and what kinds of values they hold.

Children also need exposure to career pathways. They should observe their parents and others at work. Mothers and fathers should always share work conflicts, challenges, triumphs, and concerns with their kids at the dinner table and while riding in the car. Let your kids share in your career. Give them a chance to serve as your consultants. Children who are likely to attend college should start visiting colleges early – even by age 12! If you have a friend or relative in college, try to get your son or daughter an invitation to visit the campus, attend some lectures, absorb the atmosphere of a dormitory, and witness some collegiate sporting events. Students who savor directly the romance of college life acquire a vision of their future that can help motivate and energize their years in secondary school.

Parents and teachers have many lessons to teach children and adolescents so that they can acquire the habits of mind that will prepare them for the future. Beyond the conventional academic skills and areas of knowledge, students need to be primed and experienced in a range of behaviors and insights that are potent ingredients of success in the adult world. These include the following:

Collaborating effectively with peers/co-workers
Brainstorming and coming up with original ideas and solutions
Understanding, rather than simply memorizing, what you are learning
Knowing how to cultivate positive relationships with those for whom you work (teachers now, bosses and supervisors eventually)
Having a sense of when and how to take risks
Being able to evaluate yourself
Staying focused
Thinking critically
Communicating effectively
Knowing how to prepare for an upcoming challenge or event
Systematic (i.e., not impulsive) problem solving
Finding the fitting niche in which you can succeed while understanding your own strengths and limitations
Parents and teachers can examine this list and then program experiences and have some discussions about these ingredients, all of which can be integrated into daily life at home and in the classroom. We don't want the requirements of adult life to take any person by surprise. Therefore, a key role of education and of life at home consists of helping children and teenagers see the coming attractions of adulthood, so that they discover what life is likely to be like some day. We must then prepare them to be up to it and up for it, ready and waiting for that which lies ahead!

Read about ways to help students communicate ideas fluently
Read about ways to help students brainstorm ideas

ARTICLES

Recognizing Strengths and Affinities

Dr. Mel Levine

Sometimes in our haste to help children and adolescents overcome their weaknesses, we neglect the careful detection and cultivation of their strengths. Yet, in the adult world what counts most is the strength of an individual's strengths. Therefore, any student's educational planning needs to include measures to mobilize and enhance individual assets of the mind. And every kid has these! They await discovery.

Different forms of strength can be found. A child may reveal certain highly developed neurodevelopmental functions. For example, she or he may be particularly effective with language, motor coordination, or certain aspects of memory. Other children show very advanced higher thinking, as revealed in their creativity, the way they form concepts, or the astute quality of their critical thinking. There are students who exhibit remarkable strengths in their social cognition; they are true "people persons," which will carry them far in any career they select as an adult.

It is up to teachers and parents to make sure that students with good language skills get plenty of opportunities to develop verbally through public speaking and writing. Kids with great spatial capacities need opportunities to advance their artistic or mechanical aptitudes. Highly creative children must never have their original thinking stifled in any way - to the contrary, they deserve many opportunities to pursue their uniqueness and dream up novel ideas. Finally students with great social skills need opportunities to become leaders.

Some children display strengths in specific skill areas, such as sports, music, writing, or mathematics. These individuals must be able to pursue advanced courses whenever possible. When a child has learning difficulties, the pursuit of a strength can go far to alleviate anxiety and prevent the onset of low self-esteem due to academic underachievement. In other words, your strengths can keep you afloat when you are struggling to overcome the effects of your weaknesses. Strengths also have implications for choosing careers, avocations, and even courses in secondary school.

Because of their critical importance and enormous potential for redeeming a child, strength delineation and management should be part of every educational plan for every student. Nothing is more tragic and wasteful than a strength that goes unrecognized and unutilized throughout childhood, especially if that child is having trouble succeeding in school.

A child's affinities are also vital. An affinity is an area of knowledge toward which a student feels a strong attachment. An affinity should be distinguished from a recreational interest (such as football or horseback riding). Examples might include prehistoric animals, politics, medieval history, space, or computers. It is important for every child to develop at least one area of intellectual passion and nearly obsessive interest. Ideally, such intense commitments should last for years (at least they shouldn't change weekly).

Affinities should evolve into domains of expertise. Every kid should be an expert at something. Depth in an area of knowledge can yield remarkable benefits. For example, it has been shown that the best way to learn how to read well is to read about something you know a lot about. Similarly, writing skills can grow if a student keeps writing within his domain of affinity and expertise.

Parents can help uncover and nurture a child's affinities. They can arrange for trips, magazine subscriptions, and home-based projects that focus on a child's affinity. They can share a child's interest and allow her to discuss it in the car and at the breakfast table. Most of all, they can display open pride in their child's expertise in the chosen area.

Schools should also encourage the acquisition and growth of affinities. All children should have delineated topics they can pursue in depth over time. Such pursuits can lead to term papers and projects. A child should experience the satisfaction of knowing that he quite possibly knows more about his topic than any member of the school's faculty! Such mastery does wonders for academic self-esteem while allowing children to experience the feeling and the intense satisfaction that comes with being a true scholar, a person who possesses knowledge in depth.

So it is that both strengths and affinities are crucial characteristics of an individual child. However, in so many cases they do not come forth and grow automatically. Instead, the adult world needs to conspire with children to help them find and exploit their assets. Then teachers, parents, peers, and the students themselves can celebrate and enjoy the remarkable diversity of all kinds of minds.

ARTICLES

Raisin' Brain: Maintaining Homes for All Kinds of Minds

Dr. Mel Levine

School is not the only arena in which children's minds need to be nurtured and expanded. Equally vital is the kind of education and brain building that a student undergoes at home. Parents can do much to establish a domestic milieu that helps every child to develop his or her very special and sometimes very specialized kind of mind. How does this get accomplished? Let's take a look at some of the measures parents can take to foster optimal intellectual development, to be highly effective at "raisin' brain."

First, parents need to become mind readers - not in the supernatural way, but in a more practical down to earth manner. They need to monitor with care and open-mindedness their child's development over the years, so that they can come to know her or his particular strengths, shortcomings, and areas of talent and natural inclination. Children most often possess minds that differ substantially from those of their siblings; so each child needs to be observed and thought about as the possessor of a uniquely wired brain. As they gain insights into their children's distinct profiles, mothers and fathers can strive constantly to help each child strengthen strengths at the same time they are seeking to shore up any important gaps or areas of dysfunction.

Parents need to instill intellectual content into home life. While children require time for rest and recreation, welcome respites from the rigor of school, it is also important that there not be a huge gulf between the cognitive content of school and the home. For example, there can be a wide difference between language use at home and school. It can be helpful for parents to encourage the use of good literate language abilities at home, just as they receive emphasis within the classroom. So a family can have a rule stipulating, "in this home, we always speak in full sentences - no single word responses, grunts, or verbal "cop-outs" such as "stuff" and "thing."
Life at home should include opportunities to discuss issues in the news, to share opinions, to elaborate on daily experiences and, in so doing, to be building and refining thinking and verbal communication skills.

An optimal home for all kinds of minds is one in which life is not so totally structured (i.e., kung-fu Monday, oboe Tuesday, soccer Wednesday and Friday, etc) that imaginary play, brainstorming and downtime to entertain oneself are eliminated totally from the life of a kid. The active pursuit of some totally liberated time is a much-needed part of healthy brain growth. Also, parents should see to it that their children are not being overdosed with what I like to call "visual-motor ecstasy," a range of activities that entail exhilarating rapid movement, tend to be nonverbal, and are mostly devoid of any intellectual enrichment. These intensely stimulating pursuits have their place, but they can be detrimental when they dominate the home lifestyle of a child. Equally deleterious are excessive exposures to TV and the Internet.

Parents need to develop close collaborative relationships with their child's school, so that what is being learned at school can be reinforced at home. Parents of children who are struggling with certain academic demands need to have an open line of communication with teachers, so they can ensure that the school has a firm grasp on the educational needs of the child, while the school can feel that parents are aware of what is being done support the child in the classroom. Sometimes a parent needs to advocate vigorously for a struggling student whose educational care seems inadequate.

The list below delineates some of the most important roles parents play in maintaining a home that is most suitable for "raisin' brain":

SOME FEATURES OF PARENTS WHO ARE MOST EFFECTIVE AT RAISIN' BRAIN

- Parents who are learning about neurodevelopmental function in general and are vigilant and responsive to their own children's emergent profiles.
- Parents who serve as the principal early detectors of dysfunction.
- Parents who act as benevolent taskmasters, teaching their kids how to work.
- Parents who find and nurture individual strengths and affinities in their children.
- Parents who advocate for kids without "fighting all their battles" for them.
- Parents who operate as interested and concerned "sounding boards" for their children.
- Parents who collaborate and communicate actively with schools.
- Parents who model some form(s) of intellectual activity for their children (e.g., reading, writing, going to

museums).

- Parents who can be overheard boasting about each of their kids on a regular basis.
- Parents demonstrate both love and respect for their children.
- Parents become educated consumers of their children's education as well as any interventions that are ever deemed necessary.
- Parents provide an intellectually stimulating atmosphere, so that language, literacy, and higher cognition are strengthened at home as well as in school.
- Parents who help their children develop efficient organizational/strategic tactics for academic and other forms of work output.
- Parents who are very careful to treat siblings as individuals, people who are expected to differ from each other in their strengths and weaknesses.
- Parents who serve as sensitive schoolwork consultants to kids without doing their work for them.
- Parents who establish a lifestyle that balances freedom with responsibility and structure with opportunities for spontaneous self-expression.

None of these roles is entirely easy to accomplish. Yet, in the long run, the effort pays off, as parents are able to take genuine pride in their children's unique strengths and accomplishments.

THE WALL STREET JOURNAL.

THURSDAY, SEPTEMBER 2, 1999 INTERNET ADDRESS: http://wsj.com

*This week Mobil is donating its space to **All Kinds Of Minds**.*

Misunderstood minds

Ricky is a sixth grader with a brilliant imagination and advanced language skills, but he can't write. That's because he has trouble handling spelling, punctuation, grammar, letter formations and facts all at once with a sheet of paper in front of him. Adults call him lazy, and he is fast becoming a "bad" boy.

Then there's Beth, a bright kid who gets stymied by sequences of anything—multistep instructions or math problems, or even presenting her ideas when she talks or writes. Her classmate Wendy is an effervescent red-haired girl of many talents who nevertheless endures constant frustration because she has serious problems remembering what she has read, even though she can understand the content quite well. As she puts it: "Whenever I read, each sentence erases the one that went before it."

These are examples of children with normal or superior overall cognitive ability who are contending with differences in the wiring of their brains, subtle but important neuro-developmental variations that impede their learning productivity and enjoyment of education. In addition to deficiencies in basic skills—such as reading, writing or mathematics—some of the manifestations are less obvious. The kids may have difficulties managing time, expressing ideas in language, remembering facts or problem-solving methods on a test, understanding key concepts or gaining social acceptance from peers.

What's common, however, is that these struggling kids are often misunderstood by the adult world. Learning differences like these plague millions of children throughout America. But parents, teachers and the students themselves often have little or no insight into the reasons why the children are failing or how to manage their difficulties. So the children face daily public humiliations for the way they are wired, even though relatively easy and cost-effective means are available to help them.

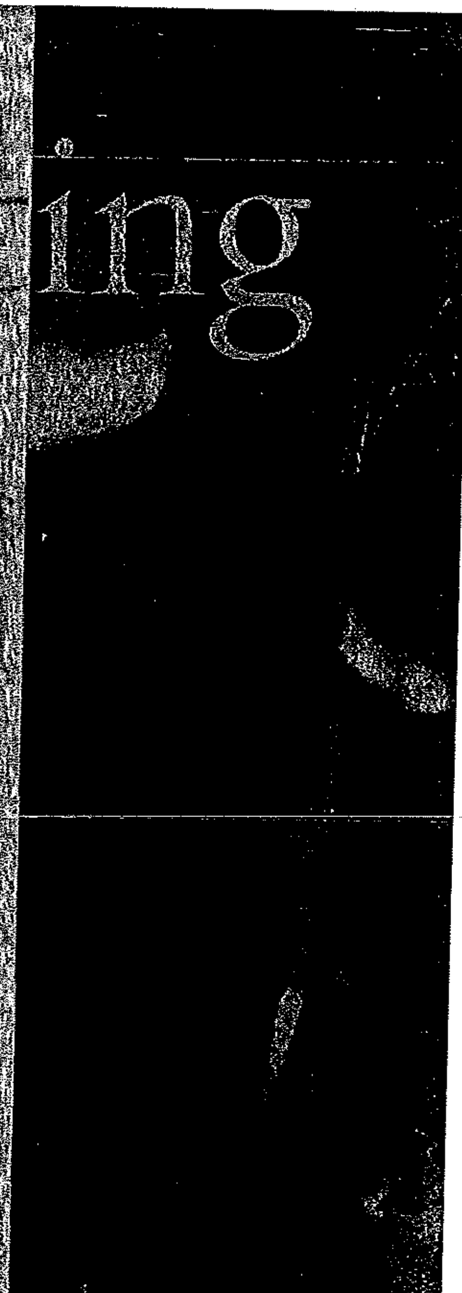
A non-profit Institute, *All Kinds Of Minds* was founded in 1995 to apply the latest neuro-developmental research to the understanding and management of differences in learning. The Institute provides families and teachers with a framework—a common language and tools—to enable this large, needy and highly vulnerable segment of America's schoolchildren to become more successful learners.

Throughout the country, this Institute is working to provide parents with the best assessment techniques and to train classroom teachers to help kids with learning differences. We strive to ensure that children receive the individualized education that will help them enhance their innate strengths and overcome difficulties they may have encountered in school. Please come visit our Web site at **www.allkindsofminds.org** to learn more.

As we approach the last academic semester of the 20th century and the first of the new millennium, recent scientific advances have provided us with a radically new understanding of variations in brain function. We must now apply that knowledge to help all kinds of minds contribute to our society in all kinds of constructive ways. We must acknowledge and celebrate this diversity of minds and usher in a new era of neuro-developmental pluralism.

Dr. Mel Levine
*Founder and Co-Chair **All Kinds Of Minds***

Celebrating Diverse Minds



Many faltering students have specialized minds—brains exquisitely wired to perform certain kinds of tasks masterfully.

Mel Levine

A distraught mother recently sent me this e-mail: "Every morning when I send Michael off to school, I feel as if I'm sending him to jail. He can't spell, he forgets his math facts even after we study them together, his handwriting is hard to decipher, and he is hopelessly absent-minded. The other kids see his failures and say that he 'works like a mental case.' All day, he faces nonstop criticism from his teacher. She scolds him in front of his classmates for not trying. And you know, his teacher's right. He's not trying—he's scared to try. He's decided that if you're going to fail, it's better to fail without trying.

"He can fix absolutely anything that's broken and he is brilliant when he plays with his Legos. I can't believe the complicated things he makes. He is convinced that he is hopelessly dumb, and he worries about school all the time. A lot of nights, Michael cries himself to sleep. We are losing this darling boy and he is such a beautiful child, such a decent kid. Please help us."

We have all heard the success stories of Albert Einstein, Thomas Edison, Steve Jobs, and Charles Schwab—accomplished adults whose minds failed to fit in school. But what becomes of those whom we never hear about—students like Michael, who give up on themselves because they lack the kinds of minds needed to satisfy existing criteria for school success?

For more than 30 years, my work as a pediatrician has been dedicated to such out-of-step children and adolescents. Although some of them have officially acknowledged collisions with word decoding or attention, many contend with more elusive differences in learning. These students may have trouble organizing time and prioritizing activities, communicating effectively, grasping verbal or nonverbal concepts, retrieving data precisely and quickly from long-term memory, recognizing and responding to recurring patterns, or assimilating fine detail.

Such insidious dysfunctions can constitute daunting barriers, especially when they are not recognized and managed. Most important, these breakdowns can mislead us into unfair

Stifling unfairly accusing, and even undereducating students thereby stifling their chances for success at school and life.

The Challenge of Disappointing School Performance

Many faltering students have specialized minds—brains exquisitely wired to perform certain kinds of tasks master-

fully, but they do poorly when it comes to meeting other expectations. A student may be brilliant at visualizing but dull at struggling to put it into words. Her classmate may reveal a remarkable understanding of people but exhibit little insight about scientific structures. Within every student's intending-to-understand differences, an appreciation of strengths and their possibilities already exists in which her or his mind has been amply equipped to thrive. In the e-mail from Michael's mother, the clue to his initially dim specialization poetically jumps out at you: "He can fix absolutely anything that's broken." Michael's mechanical brilliance gets eclipsed by the focus on what he can't do.

I love to spend time explaining my students like Michael, who feels depleted

and diminished (and perhaps even demolished) by the experience of school. I talk to him about the different careers in which he could readily succeed given the abilities he already possesses. I feel as if I have stepped inside a shadowy passageway suddenly illuminated, as revealed by a newly radiant facial expression. I can't help but conclude that the real challenge for schools rests more with identifying and fortifying individuals' strengths than with caulking academic crevices.

My long-term experience working at the interface between pediatrics and education has allowed me to synthesize the body of research on neurodevelopmental function and variation (Levine & Reed, 1999) and to construct a framework for understanding the enigma of disappointing school performance. Three factors play major roles:

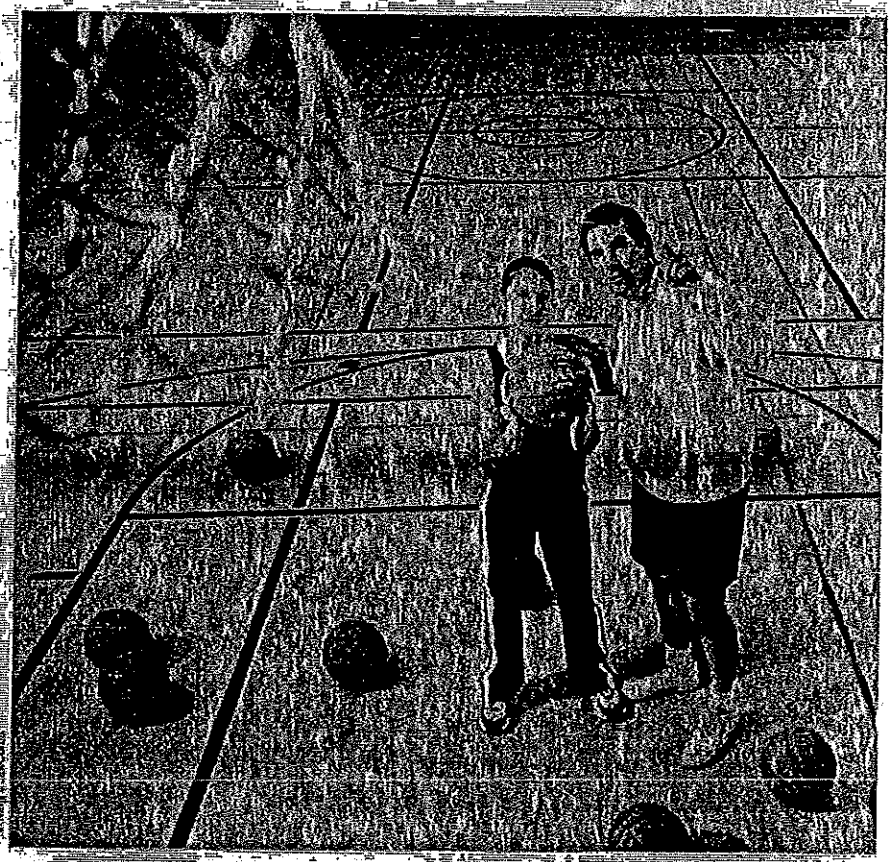
- The traditional paradigms for understanding learning differences focus on exposing and fixing deficits, often neglecting the latent or blatant talents within struggling learners.
- Instructional practices and curricular choices fail to provide educational opportunities for diverse learners and to prepare them for a successful life.
- Because knowledge about learning emanating from the explosion of insights from brain research is not yet part of teacher preparation and professional development, most educators lack the expertise to understand and support their students' diverse minds.

To stem the tide of needless and wasteful failure facing thousands of kids, we need to take robust action on three fronts: broadened student assessment, curriculum reexamination, and professional development for educators.

Broadened Student Assessment

The methods that schools typically deploy to assess students with learning problems are not up to the task. The discrepancy formulas used to determine eligibility for specialized assistance have been shown repeatedly to have serious flaws (Kavale & Forness, 2000).

Moreover, testing that merely generates a label, such as LD or ADD, accomplishes little. These vague labels do not suggest specific approaches to remediation; instead, they pessimistically imply a relatively permanent pathological condition. What a colossal self-fulfilling prophecy! Most important, diagnosis spawned from a deficit model fails to take into account the most important feature of a student—his strengths.



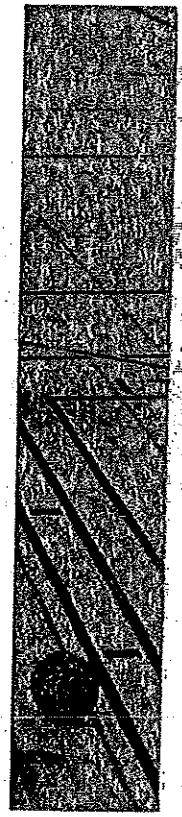
Smokescreen Labels

Phillip's parents reported that he seemed to generate about two highly original and unorthodox ideas per minute. His teacher described this irrepressible 4th grader as a brilliant conceptualizer, always coming up with creative analogies. When the class studied terrorism, Phillip compared suicide bombers to strep germs that make you sick and then die in your throat.

But Phillip's day-to-day performance in school was disappointing. When he listened or read, Phillip missed or forgot much of the information he was expected to absorb. He would tune out and become fidgety during extended explanations or directions. His parents sought help from their son's pediatrician, who diagnosed ADD and prescribed a stimulant medication. This treatment helped, but not much.

It turns out that Phillip owned the kind of mind that becomes enthralled with the big picture and rejects fine detail. Consequently, in math he mastered the concepts readily but couldn't be bothered to notice the difference between a plus sign and a minus sign (a mere detail). His writing was creative and amusing but sparse on specific information. In subject after subject, Phillip's overall understanding far exceeded his handling of the details.

Like Phillip, many kids with problems don't ooze easily into categories. Students with his kind of detail intolerance often



get diagnosed with ADD or accused of not really trying. In Phillip's case, the label ADD was a smokescreen that obscured people's view of his remarkable strengths and stopped them short of managing his specific weakness in detail assimilation. Phillip improved markedly after his teacher began encouraging him to make detail thinking a separate step in any activity he undertook—scan first, get the big picture, have some great ideas, and then revisit the material to vacuum up the important details.

Incidentally, society desperately needs big-picture people who can collaborate meaningfully with administrators who thrive on detail. So let's take care not to disparage or discourage the flourishing of Phillip's kind of mind.

> "I look forward to the day when our schools offer every student the opportunity to become a leading expert on a chosen topic."

Assessment for Diverse Minds

In addition to rethinking the assessments used to diagnose learning problems, schools need to design regular tests and quizzes so that different kinds of minds can show what they know in different ways. Teachers should be careful not to tap exclusively rote memory or straight regurgitation of skills and knowledge. They should often allow students to use notes and encourage them to take as much time as they need to respond to questions. It makes more sense to limit space than time—for instance, telling students, "You can't write more than two pages, but you can take as long as you want to do so."

High-stakes testing can pulverize many mismatched students. How commonly does end-of-grade testing discriminate against certain kinds of minds? Frequently. As a clinician, I encounter many students who have difficulty performing on multiple-choice tests or operating under timed conditions. These students' dysfunctions in certain skill areas are more than outweighed by their assets in other domains, but standardized testing never gives them the opportunity to exhibit their strengths.

On entering the medical profession, we take an oath that in our practice we will first of all "do no harm." I offer five suggestions (see "Do No Harm" Testing Practices, p. 17) to my professional colleagues in education so that they may strive for testing practices that do no harm to students with different kinds of minds. We need to advocate for the elimination of testing practices that inflict needless damage and unfair humiliation on so many students.

Curriculum Reexamination

It's ironic that at the same time that neuroscience is telling us so much about differences in learning, we are imposing curriculum standards that offer our students fewer learning alternatives than ever before. If we aspire to meet the challenge of leaving no child behind, we must provide diverse learners with diverging pathways that lead to their success. Such roads should maintain rigorous performance standards, while permitting innovation and creativity in curricular choices and allowing early, highly specialized minds to envision and prepare for productive adulthood.

For example, children like Michael, with his impressive mechanical aptitude, should not be sentenced to wait until adulthood to experience success.

We should encourage, not constrain, the development of manner schools and vocational education opportunities. I look forward to the day when thousands of students pursue a vocationally oriented curriculum that does not put a ceiling on their aspirations.

While studying auto mechanics (and the physics that is a part of it), a teenager should learn the ins and outs of various related careers. She or he should see the possibility of someday climbing the corporate ladder at Ford Motor Company, owning a repair business franchise, designing solar-powered engines, or managing the service department of a dealership. In this way, no one gets written off or limited because of the nature of his passions or the specialized apparatus of her mind.

Many schools have worked against odds to provide educational experiences that involve all students in conducting independent study projects in their area of personal affinity and ability. One school, for example, asked all 3rd grade students to pick a country and become the school's leading expert on that nation. The projects carried over from 3rd through 5th grade, and the students traversed content areas as they studied their country's culture, history, language, animal life, government, and music. They did art projects and wrote reports on their country.

Students learned how it feels to know more about something than anyone around, including their teachers and parents. They became valued consultants on particular countries when the newspaper reported a current event in their country, they were asked to provide some commentary in class—a great vitamin for intellectual self-esteem!

Another school pursued a similar strategy during students' three years in middle school. Students selected any topic from a list for long-term pursuit across disciplines. They found experts in the community to assist them with their topics. Any student who did not want to claim one of the listed topics could submit one of his or her own choosing.

I look forward to the day when our schools offer every student the opportunity to become a leading expert on a chosen topic—one that harmonizes with his or her kind of mind—and to share that expertise with the community through Web sites, community-based projects, and other venues. Such a practice would give students a powerful experience of success, as well as cultivate their appetite for systematic research and focused, in-depth knowledge.

While advocating ardently for flexibility in achieving the educational aims of schooling, we can still preserve student accountability. No student should be permitted to work, study, or produce less than his or her peers. But we should never insist that everyone put forth identical output.

"If we aspire to meet the challenge of leaving no child behind, we must provide diverse learners with diverse pathways that lead to their success."

Professional Development for Educators

In medical practice, highly specific knowledge of the individual needs of a patient is indispensable when selecting the best treatment. This holds true in all "helping" professions—especially in education.

Teachers are in an excellent position to observe, interpret, and celebrate all kinds of minds on a daily basis. Newly acquired knowledge emanating from neuroscientific and education research can empower educators to observe and understand students' minds. Most of the phenomena that determine a student's individual strengths, shortcomings, and preferred ways of learning and producing cannot be found on any test that a clinician gives. Classroom teachers enjoy exclusive screenings—if they pay attention and know what to look for.

Becky

Eight-year-old Becky is an accomplished origami creator, a deft modern dancer, and a gifted mathematician. She thrives on science and computers. Yet in school, this girl appears shy, passive, and eternally anguished. Becky has accurate spelling, but she dislikes writing and avoids it. Becky's teacher, Mrs. Sorenson, having been educated to observe neurodevelopmental phenomena, has noticed that Becky seems to struggle and falter when called on in class. Recently, the teacher led a discussion on whether animals have feelings as people do. She called on Becky and the following dialogue ensued:

Becky: My puppy feels, uh, things like happy and, um, sad.

Mrs. Sorenson: Becky, what makes her happy or sad?

Becky (after a long pause): Different things.

Mrs. Sorenson: Such as?

Becky: Like a dog, uh, basket.

Mrs. Sorenson: Do you mean a dog biscuit?

Becky: Yeah, like that.

Becky's reading comprehension is more than a year above grade level. Yet she has trouble with word finding, shows pronounced verbal hesitancy, puts forth only simple or incomplete sentences, and fails to use verbal elaboration. The same phenomena are conspicuous in her writing. Becky has strong receptive language but markedly weak expressive language—she understands better than she talks. No wonder she's so shy, self-conscious, and passive! Language output plays a vital role in school success. Verbal communication affects writing, class participation, social success, and the control of emotions and behavior.

Becky could fall through the cracks because we do not have valid tests of language production. For example, the WISC (the commonly used IQ test in her age group) does little to capture expressive language fluency. In fact, by far the best test of expressive language is a classroom teacher who knows what to listen for in gauging the adequacy of a student's verbal output, and who understands the everyday classroom phenomena associated with breakdowns in language production.

Bruce

Here's another example of the role that teachers can play in detecting learning differences. Bruce was disruptive in most of his 7th grade classes. He fashioned himself as an entertainer and often disengaged from classroom activities. Mr. Jackson, a social studies teacher knowledgeable about early adolescent development and learning, made the astute observation that Bruce often appeared confused about dates and about the sequences of events in the various historical periods that they studied. Mr. Jackson also noted that Bruce often looked distressed when given directions.

On one occasion, Mr. Jackson told the class:

> This morning I want you all to open your books to page 47, read the first three paragraphs, and study the diagram at the top of the page. And when you're finished doing that, read and think about the first two questions at the end of the chapter. I'm going to give you 10 minutes, and then I'll be calling on you to discuss the questions.

Bruce seemed to hear only something about page 47 (or was it 57?). His teacher suspected rightly that this boy was having problems processing sequences—sequential directions, chains of events in history, and multistep explanations. His weak temporal-sequential ordering accounted for his problems in social studies and in math. This insight enabled teachers to give Bruce strategies to manage his sequencing problems: taking notes, whispering sequences under his breath, and picturing sequences in his mind. His behavior and demeanor in class improved dramatically.

Although continuing education programs abound to help teachers stay abreast of their content, we have found few comprehensive programs devoted to helping educators deepen their expertise in the science of learning. Our

"Do No Harm" Testing Practices

1. Testing can help elevate education standards, but not if it creates larger numbers of students who are written off as unsuccessful. When a student does poorly, determine which link in the learning chain is uncoupled. Always have constructive, nonpunitive contingency plans for students who perform poorly on a test. Testing should not be an end in itself, but rather a call to action.

2. Not all students can demonstrate their strengths in the same manner. Allow different students to demonstrate their learning differently, using the means of their choice (portfolios, expert papers, oral presentations, and projects, as well as multiple-choice tests).

3. Never use testing as justification for retaining a student in a grade. Retention is ineffective and seriously damaging to students. How can you retain a child while claiming you are not leaving anyone behind?

4. Some students who excel on tests might develop a false sense of security and confidence, failing to realize that adult careers tap many abilities that no test can elicit. Take care to nurture vital capacities that are not testable.

5. Avoid the hazard of teachers teaching to the tests because your work or school is being judged solely on the basis of examination scores. Teachers should never have their students rehearse or explicitly prepare for tests. Testing should be unannounced. Good results on such tests should be the product of the regular, undisturbed curriculum.

—*Mel Levine*

not-for-profit institute, All Kinds of Minds, has developed a professional development and school service model called Schools Attuned to help experienced classroom educators become knowledgeable about neurodevelopmental function and variation.[1] Participating teachers learn to analyze how their own instructional delivery and content taps specific aspects of memory, attention, motor function, language, and other areas of brain function. They are guided to observe everyday classroom phenomena that open windows on relevant learning processes (Levine, 1994).

Equipped with their Schools Attuned training, teachers lead a coalition involving the student, parents, and other adults in the school to unmask the specific learning profile of a struggling student. With help from professionals trained as neurodevelopmental consultants, whom we call profile advisors (usually school psychologists or special

> Testing that merely generates a label, such as LD or ADD, accomplishes little.

educators), teachers become the primary detectors of student strengths, weaknesses, and content affinities. The teachers then infuse their insights into their daily group instructional strategies and lesson designs. Frequently, a strategy that they develop to help a particular struggling student benefits the entire class. It's called excellent pedagogy.

Schools Attuned teachers are also committed to making sure that all of their students learn about learning while they are learning. Through a process called demystification, they help students whose neurodevelopmental profiles do not currently mesh with expectations to learn about their own strengths and weaknesses and acquire the terms for the specific processes that they need to work on. With profile advisors as their consultants, regular classroom teachers take the lead in formulating management plans for those students.

Where We Need to Go

The core theme of K–12 education in this century should be straightforward: high standards with an unwavering commitment to individuality. In proposing that educators reexamine assessment, curriculum, and the role of teachers, I am advocating neurodevelopmental pluralism in our schools—the celebration of all kinds of minds. Such an ethos will be the most effective and humane way of realizing our commitment to leave no child behind. ■

[1] More information about the Schools Attuned program and All Kinds of Minds is available online at www.allkindsofminds.org.

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