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The Heart Of Learning Disabilities

It's been thought deficits in the brain cannot be reduced, only compensated for. But a Toronto educator aims to prove that's not the case.

Part one of a two-part series

By Norman Doidge

A new system of understanding and treating learning disorders, pioneered by Barbara Arrowsmith Young, a Toronto educator, is showing remarkable results.

The system is of particular interest to doctors because it is based on strengthening weak brain areas, and derives from familiar territory: studies of patients with strokes and brain lesions. It provides hope for significant improvement for those with learning disabilities who have problems with reading, memory, putting thoughts into words, comprehension, logic, mathematics, learning languages, organizational difficulties, clumsiness, impulsivity, attention, speaking smoothly, trouble writing neatly or reading emotions in others.

Learning disorders are one of the most underestimated causes of failure in both school and life. A person can be intelligent but still have a focal learning problem that has a major impact on their life. Many depressed adolescents have undetected learning disorders. Many of us chose a career not because we wanted it, but because we had limited options owing to an area of cognitive difficulty, which was undetected. Some who are stuck in psychotherapy actually have undetected learning disorders.

For those with several areas of dysfunction (which is quite common), life options dwindle rapidly, starting in elementary school. Those whose difficulties are mild may get through elementary and high school, but in university, when the load is increased, suddenly begin to bomb out for reasons they can't explain. "My mind is like a sieve, when it comes to (fill in the blanks)." This new system helps explain these difficulties with great economy.

Young, who founded and directs the Arrowsmith School in Toronto, developed the treatment by putting two lines of research together.

The first is the discovery of neuroplasticity. Even up through the 1980s, medical schools taught that the brain cannot recover from deficits or regenerate itself.

But in a study published in American Psychologist in 1966, Prof. Mark Rosenzweig of the University of California at Berkeley, described an experiment in which he placed rats in both stimulating and cognitively impoverished environments. He found those who had been in the stimulating environments had heavier brains, with better blood supply and greater quantities of neurotransmitters. It was one of the first substantiations of the idea the brain could change its structure with stimulation.

This year's Nobel Prize for Medicine went to Dr. Eric Kandel (PhD), who showed that as snails learned, the branches between their neurons were physically altered and enhanced.

Evidence for neuroplasticity has been coming fast and furious lately. Dr. Fred Gage of the Salk Institute discovered the brain has stem cells deep within it which seem related to the capacity for regeneration.

Neuroscientists have also shown that after amputation the area of the brain that mapped or represented the lost limb gets taken over to be used to map adjacent areas of the body. Thus the brain can reorganize itself structurally. All these findings show the brain has more capacity to recover from deficits than once thought.

The second line of research was the work of Russian physician and neuropsychologist Dr. Alexander Luria who, analysing Russian soldiers wounded in the Second World War, mapped the brain in the 1940s without the benefit of brain scans by precisely correlating location of wound with loss of function. He was also able to analyse complex activities such as reading, or the use of logic, grammar and writing, into their constituent parts.

Arrowsmith Young took Dr. Luria's work and applied it to learning disorders. She realized many patients with learning disorders had deficits in the same areas Dr. Luria's patients did.

Treatment for learning disorders before the discovery of neuroplasticity was generally based on the premise deficits cannot be strengthened, only worked around or compensated for. Those with trouble listening and taking notes were encouraged to tape lectures or hire "note-takers." Those with trouble learning foreign languages were encouraged to drop them.

Arrowsmith Young developed exercises for the 19 areas that lead to the most common learning difficulties. These exercises are the opposite of compensations; they tax the weakened area. Recently, American groups have begun using similar techniques. Thus the Fast ForWord program taxes two areas, probably those related to-to use Arrowsmith Young's way of understanding things-deficits in Broca's area and Wernicke's area of the brain.

What follows are clinical descriptions of learning dysfunctions that underly learning disabilities.

- Problems in motor symbol sequencing: Those with messy handwriting, or who have to print when they write, or who read slowly or with difficulty, or who have laboured speech and trouble getting to the point, or who omit important information, often have a problem here. The deficits stem from an area of the pre-frontal cortex that normally converts sequential symbolic processes into sequential motor actions.

  Such people can do simple movements, but when longer, sequential motor activity is called for, they get overloaded. Thus, they can often type or print neatly enough, because each letter is produced by a few movements at a time. Since each printed or typed letter is made in the same way (except for capitals) long sequences are not required. But cursive writing connects all the letters in a slightly different way, and requires a complex sequence of movements, overloading the memory capacity of the prefrontal cortex. Hence, writing is jerky.

  Reading is slowed because it also involves integrating symbolic sequences with motor movements of the eyes. The reader's eyes must track across the page at the right speed and take in precisely the right-size visual gulps of words. People with weak motor symbol sequencing often misread words because their eyes skip in a jerky way.

  Finally, speech involves converting symbolic sequences into motor sequences. These people sometimes find their thoughts come faster than they can convert them into speech. Often they can't find the right word, so they ramble and talk around the point. Frequently they leave out important information they thought but couldn't put quickly enough into words. Treatment involves sophisticated, high-speed tracing techniques, which isolate the left hemisphere motor region area that controls eye movements.

- Auditory memory for instructions: We once imagined the brain had completely separate areas for perception, memory and reasoning, but that doesn't appear to be the case. Some people have excellent visual memories and can scan a printed list of words and remember them well, but have awful auditory memories. The memory systems for these perceptual systems are different.

  In young children, the auditory memory problem manifests itself as forgetting instructions to do things, especially things not related by meaning, such as things they might need to do to help their parents, or what the teacher said their homework is.

  Parents and teachers have to repeat instructions over and over, and think the child isn't listening, or has ADHD, but the problem is more focal. Parents often think their child is stubborn, irresponsible or lazy. If the child is told to do something and then gets distracted, the instruction will be totally forgotten.

  If the average person can remember seven unrelated things they hear (as in a typical phone number), such people might be able to remember only two or three. They often feel embarrassed about asking others to repeat things over and over, and develop strategies to deal with it in later life (such as compulsive note-taking, Post-its, writing on the hand). In severe cases, they can't follow the story in a song lyric. With effort, they can keep up with others for a while, but then get exhausted. They tune out easily in lectures or classes. While something like methyl-phenidate hydrochlorid e will improve their performance, it is not getting at the root cause: a focal difficulty of a particular kind of memory.

Using various memory exercises, these children can improve, and some who came to the school on drugs for ADHD can go off them, as the underlying learning disorder is treated.

A followup study at the Arrowsmith School showed 80% of students achieved their educational goals. Though some entered the school as many as seven grade levels behind in reading, math and other activities, they caught up to peers.

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