The Ultimate Question

for Parents of Children with Learning Disabilities:

Stay the Course

or

Choose Cognitive Change?

By: Howard Eaton, Ed. M.

***The Question*:**

Should my child with a learning disability attempt to improve brain functioning or try to survive through core academic subjects?

If this opportunity exists for a parent, and I am aware that such options do not exist for most parents at this time either due to financial constraints or availability of programs, then this question should be considered. This is such an important question for the future of that child. Another way to reframe the question would be, do I focus on trying to get my child through an academic curriculum with extensive supports, or give them improved neurological functioning for increased independent functioning.

My experience over the last 30 years in reading about brain science, implementing cognitive intervention programs, and being involved in school-based strategies for children with learning disabilities provides me with a breadth of knowledge, and the answer seems obvious to me. First, improve brain functioning or cognitive capacities. Focus on developing brain functioning over trying to have your child survive such subjects as Chemistry, Physics, Calculus, Geometry, Algebra, Social Studies, Economics, Law and the many other complex subjects.

There is an incorrect assumption that if my child needs to improve brain functioning or cognitive capacities that they must have more severe learning disabilities than other children who have been given this diagnosis. I have been told by parents of children with learning disabilities in Vancouver, that are considering Eaton Arrowsmith School, that our school is really for students with more severe disabilities. That if your child needs the Arrowsmith Program, they must really have brain problems.

This is further from the truth and not based on fact. If your child has been diagnosed with learning disabilities such as Dyslexia, Dsycalculia or Dysgraphia (Reading, Math or Written Expression Disorders) then they have brain-based neurological deficits.[iii] That is the likely reason they are struggling to acquire these achievement skills. There is a lot of research that points to specific cortical and brain network deficits in functioning as a cause for these[iii] disabilities.

What is critical to point out is that these large-scale brain networks are also involved in planning, organizing, memory,[iv] decision making, reasoning,[v] attention, social skills, emotional regulation and self-awareness capabilities.[vi] Thus, if one has dyslexia it is likely you also have working memory deficits, attention control problems, possible social skills deficits, and reasoning problems when it comes to reading comprehension and math problem solving, to name a few additional issues faced by your child other than just sounding out letters to read words. The brain is complex and so is your child's struggles. If your child struggles to decode words, it is more common than not that they will also struggle with some of the issues noted above as they progress in school. Two children diagnosed with a reading disorder will have some similar yet unique cognitive deficits that will results in highly specific learning related problems.

What does it mean when one states cognitive capacities can be improved? If indeed, school success can be partially attributed to strengths in cognitive functioning, and research on working memory has confirmed this [vii], then it seems obvious an attempt should be made to do just that.[vii] If my child has a learning disability due to neurological weaknesses, then I should want to reduce the impact of this problem. To my puzzlement, even with financial concerns a non-factor, some parents choose curriculum engagement over cognitive capacity improvement. That is, they want their child to move through the core curriculum with a variety of options in place such as small classes, resource room support, tutoring, accommodations and use of technology. To miss the core curriculum is far more concerning. The question is why is that the case?

I believe there are a few reasons for this line of reasoning. First, it is hard to understand neuroscience and the literature coming from the field. Science writers like Dr. Norman Doidge and his book, *The Brain That Changes Itself* [ix], has made neuroplasticity and implications for intervention innovation understandable to thousands around the word. Yet, for most parents of children with learning disabilities the brain and how it functions is not a part of their knowledge base. For many of us, what we don't understand we fear. What we fear we avoid. Second, as the sayings go, same old same old, or old habits die hard. Parents are used to the school core curriculum model. One should be doing Science, Social Studies, Mathematics and English if enrolled at a school. If my child is not engaged in the core curriculum then they may never graduate from high school. If they miss one or two years of Science or Social Studies, they will never make it up and might not get to college. Third, psychologists that conduct psycho-educational assessments are also learning about neuroscience and research being published on brain functioning, neuroplasticity and learning disabilities and/or ADHD. Parents and teachers should realize that many are still in the accommodation/strategy paradigm when it comes for finding ways to bypass learning disabilities. Some are waiting for research, as outlined below, to feel more confident that intensive cognitive intervention should be recommended for children with learning disabilities. Thus, psychologists still might recommend schools or support programs that focus on compensating for the child's cognitive weaknesses over directly improving them with intensive intervention. Finally, there is a focus on improving achievement skills for children with learning disabilities. This makes sense as one needs to learn to read, write and perform mathematical operations in life. Most achievement skill interventions focus on basic skills such as word decoding, numeracy, spelling, composing sentences or paragraphs. The focus on achievement skill acquisition has made a huge difference in teaching children to read and write. The problem is that these achievement skills are not the only areas of struggle for the student. Planning, organizing, reasoning, attention, comprehension, speed of processing, flexibility of thought, social skills and memory are usually additional complications for that learner.

It is very difficult to direct a parent away from the lines of thought above. Nevertheless, let me try put forth a few reasons as to why parents, and even psychologists, could consider the origin of their apprehension, and not focus on worrying about missing curriculum or core subject matter for a few years of cognitive capacity intervention. I want to address important large-scale brain networks that the Arrowsmith Program appears to be improving, and the impact this has on a child's ability to engage at school independent of all the educational supports they might currently have in place on their individual education plan.

Large - Scale Brain Networks

Your child moves through their environment taking in sensory information. The brain has developed over thousands of years to sense, attend to, process, memorize and understand sensory stimuli. For example, when your child first observes a bird they see it, hear it, might feel it (poor bird), possibly smell it, and then relate that bird to all the other birds they might come across. Your child's brain must see patterns or relationships between the various birds observed to understand complex relationships. Then, if they come across a dog, or cat, they need to distinguish those animals from birds as related to whether they fly, how heavy they are, or if they have claws or not, or what they eat. Categories and relationships begin to form in their brain. Their brain has unique cortices to process sensory information and then what one calls association areas (most developed parts of the cerebral cortex) to integrate or relate this information to each other. That is, various sensory information is moved in the brain through networks to these association areas. There this sensory information is compared, analyzed and more deeply understood by the brain. It is a complex task, and if these cortices are not connected effectively then uncertainty or confusion would arise. These association areas are theorized by some neuroscientist to hold our sense of self-awareness or consciousness.

These sensory cortices and association areas are also managed by the frontal cortex, that helps direct behaviour and considered to be a conductor of the brain. If the frontal and parietal lobe network is disrupted, then the brain struggles to engage in learning activities. Large-scale brain networks are involved in all this remarkable activity of the brain. Clearly, one could imagine if the brain networks were not operating at peak performance how learning in a classroom setting, or engaging in a social interaction, could easily result in failure to understand.

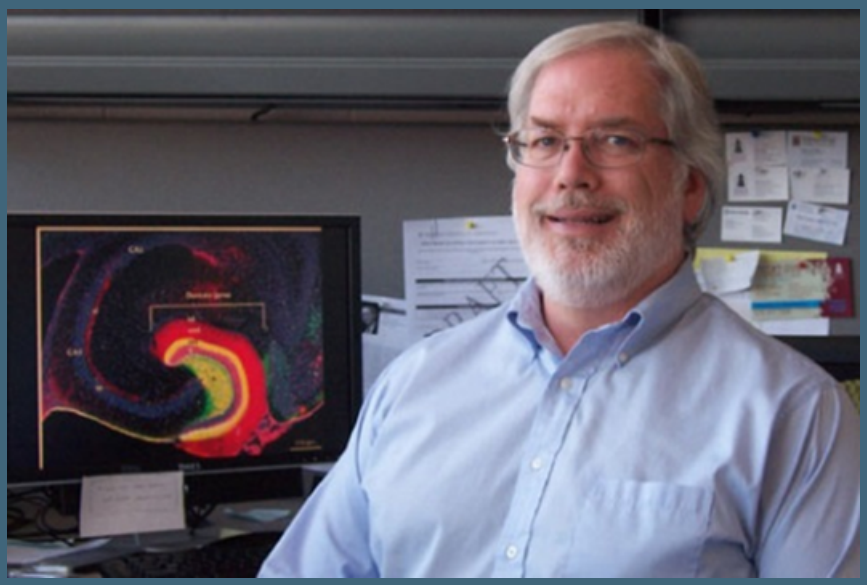
Now place a child with dyslexia, who most likely has large-scale brain network connectivity problems [x], in a classroom to learn a core academic subject like social studies. In specialized schools for learning disabilities one may have small class sizes. For example, there might be one teacher for five students. As well, the teacher has been trained to write most of what they say on the white board. They may also help the students understand the main ideas, by writing down those main ideas on the board and saying to them, "These are the main ideas that I need you to know." Still, that child, whose large-scale brain networks are not efficient, must try to make sense of the relationships being presented. In social studies, they might be comparing various countries to each other, types of governments, foods, arts, geography, and need to find patterns or relationships within the information given. What I have observed, is that children with learning disabilities are given so many scaffolds and supports that they end up being told what to study, how to study it, and how they will be tested to allow them to survive the exam.

If one can improve the cognitive capacities of brain cortices and large-scale brain networks, then core subject matter could be understood in real time, without all the school-based support. If these brain networks functioning effectively then sensory information could be gathered and transferred to association areas rapidly for understanding. New information could be compared to old information, and comprehension could happen fluidly. This is often not the case for children and adults with learning disabilities. The look of confusion, uncertainty, or embarrassment or fear, is more often the case when they are presented with novel knowledge or complex concepts.

The Research

I would love to write a detailed analysis of all the brain networks. This would result in a 500-page article. So, to be as brief as I can be, I am going focus on three of the most critical large-scale brain networks, the salience, default mode and frontoparietal networks and how the Arrowsmith Program appears to be improving the connectivity of these neurological networks. It is important to note that the large-scale brain networks noted above do not operate in isolation of each other, but in relationship to each other.

If you are a parent of a child with a learning disability you need to be aware that large-scale brain networks and their proper connectivity is key to educational attainment and mental health. You can have a child at a school that teaches the core curriculum in small class sizes, and if these brain networks are operating poorly they will struggle. And, if they don't struggle within that small class environment due to reduced curriculum content and strategy instruction, they will outside of it, as work and college is seldom capable of replicating an 8 to 1 student/teacher ratio instructional design. In other words, problems in brain network connectivity likely stay a problem from childhood to adulthood, as seen in studies on ADHD. So, if your child is struggling with attention, planning, organizing, memory, reasoning and/or social skills they could also experience these problems as an adult.



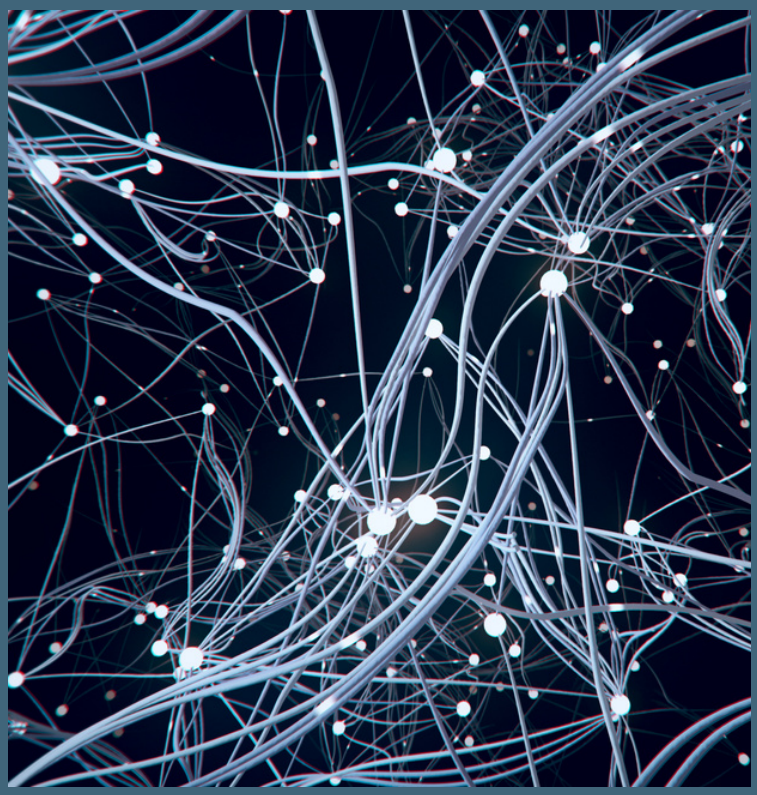
Dr. Greg Rose, Southern Illinois University

Dr. Greg Rose and his colleague, Dr. Jagger-Rickels, from Southern Illinois University were interested in large-scale brain networks and whether an intensive intervention over 6-weeks would improve their connectivity.[xi] There had already been research on brain networks and connectivity as related to ADHD and other learning disorders.[xii] The research was indicating that large-scale brain networks had connectivity dysfunctions as related to these disabilities.[xiii] Thus, the researchers new that large-scale brain networks played a part in effective cognitive functioning, and as a result likely learning achievement. What had not been researched is whether an intensive intervention that targeted brain functioning would improve large-scale brain network connectivity, and did this improvement lead to increases in cognitive capacities such as progressing speed or executive functioning.

The Arrowsmith Program was selected as the focus on the intensive intervention. To reduce the length of the study the 6-week Symbol Relations reasoning program was selected for research. The students would be children with learning disabilities.

Dr. Jagger-Rickels presented research at two major conferences in North America. What they found in their pilot studies was that children with learning disabilities have brain network connectivity problems. That is, the major brain networks responsible for executive functioning or attention control regulation showed hyper-connectivity concerns. More importantly, their research was showing that the Arrowsmith Program was changing this connectivity dysfunction and transforming the brain network activity to improved functional connectivity with related improvements in the cognitive abilities that these brain networks are associated with such as processing speed and cognitive efficiency. In other words, the children with learning disabilities show cognitive capacity improvements related to how quickly they could analyze information and how accurately they could do so at the same time.

Dr. Jagger-Rickels stated in their presentation that, *"Participants in the six-week Cognitive Intensive Program (CIP) improved their performance in the Symbol Relations Task that were correlated with changes in resting-state brain connectivity. The most notable change was increased connectivity between the Default Mode (right lateral parietal) and the Salience Networks (bilateral rostral Prefrontal Cortex, bilateral Anterior Insula, right Supra-marginal Gyrus, and the anterior cingulate), and the Frontoparietal Network (right lateral Prefrontal cortex)."*



There is a lot of brain jargon here, but the take home message is critical. The Arrowsmith Program is changing large-scale brain networks by increasing their connectivity. Problems with brain network functioning is being observed on achievement and behavioural measures that cause school failure. For example, poor connectivity in the salience network is associated with weak reading comprehension. Struggles in math problem solving is associated with functional hyperconnectivity in brain networks. Children with attention deficit/hyperactivity disorder (ADHD) show altered functional connectivity in default mode and frontoparietal networks.

TCDSB Study: One Example of Arrowsmith Program Impact

This improved connectivity between large-scale brain networks has an impact. One of the most significant program reviews was undertaken by the Arrowsmith Program and the Toronto Catholic District School Board (TCDSB) that highlights how improved brain network functioning can impact academic engagement, reduce academic supports and improve school-based outcomes.[xiv] In September 1997 the TCDSB started implementing the Arrowsmith Program and over a few years it was available in seven schools.

In 2007 TCDSB teachers and parents were asked to complete questionnaires and data was collected on a sample of 64 students who had received resource or learning support prior to entering the Arrowsmith Program. Of the 64 students, 36 (56%) of them received 4 to 8 periods a day, or 50% to 100% of their day was in resource room support. Those students selected for the Arrowsmith Program tended to have severe learning disabilities. Another 23 elementary students received 1 to 2 periods a day of resource room support or 36%. The other students were waiting for support or had not been identified yet. All of them required some form of resource room support (100%).

Given the extent of support required for these elementary students the following is a remarkable finding from these 64 students at the TCDSB. Data was collected on 42 of the 64 original students that had engaged in the Arrowsmith Program. Prior to starting the Arrowsmith Program 45% of them required 4 to 8 periods a day of resource support (19 children). After the Arrowsmith Program of those 42 children only 5% of them required that level of support (2 out of 42 children). In another statistics, of those 42 followed before and after the Arrowsmith Program 100% (all 42 children) all required resource room support before implementation of the Arrowsmith Program, and after implementation 69% (29 out of 42 children) did not require any resource room support. How is this possible?

One should be immediately curious as to why an intensive intervention program that does not teach specific achievement skills or strategy instructions could eliminate the need for resource room (learning support) for such a large percentage of children? What Barbara Arrowsmith-Young, and now neuroscientists are discovering, is that the Arrowsmith Program is improving brain functioning, thereby giving children the cognitive capacities to engage in school-based curriculum independent of special education teachers, technology, strategy instruction or resource room support.

Summary

In summary, based on research on brain networks and relationships to a variety of learning and mental health problems [xv] I highly recommend improving brain network connectivity before engaging in an intensive core curriculum program. If a child with a learning disability has a brain that struggles to communicate within and between brain regions, thereby making attention, planning, organizing, memory and reasoning problematic why not address this issue head on, first. Pilot research from Jagger-Rickles & Rose is highlighting the fact that the Arrowsmith Program within a 6-week intensive intervention is improving the connectivity of three of the large-scale brain networks for children with learning disabilities. In short, it appears that large scale-brain networks can improve connectivity and thereby significant improving cognitive functioning that would have a direct impact on school engagement and success as seen in the TCDSB review. In short, improve brain network connectivity, and then challenge it with curriculum. If schools would implement programs like Arrowsmith it is inevitable that books like, *The Survival Guide for Kids with LD* and *Survival Guide for College Students with ADHD or LD* would become obsolete. Enjoying school, versus surviving school, is our goal for children and adults with learning disabilities.

Connect with us to learn more.
Eaton Arrowsmith Center for Neuroeducation offers the Arrowsmith Program online with teacher-guided classes and in person in Vancouver BC, and Redmond WA.

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Works Cited

i Rosenberg-Lee, M., Ashkenzai, S., Chen, T., Young, C. B., Geary, D. C., & Menon, V. (2015). Brain hyper-connectivity and operation-specific deficits during arithmetic problem solving in children with developmental dyscalculia. *Developmental science, 18(3)*, 351-372.

ii Van Hoorn, J. F., Maathius, C. G., & Hadders-Algra, M. (2013). Neural correlates of paediatric dysgraphia. *Developmental medicine and child neurology, 55(4)*, 65-68.

iii D'Mello, A. M., & Gabrieli, J. D. E. (2018). Cognitive neuroscience of dyslexia. *Language, speech, and hearing services in schools, 49(4),* 798-809.

iv Santangelo, V., Bordier, C. (2019). Large-scale brain networks underlying successful and unsuccessful encoding, maintenance, and retrieval of everyday scenes in visuospatial working memory. *Frontiers in psychology*, *10:233.*

v Sevinc, G., Gurvit, H., & Spreng, R. N. (2017). Salience network engagement with the detection of morally laden information. *Social cognitive and affective neuroscience, 12(7),* 1118-1117.

vi Bressler, S. L., & Menon, V. (2010). Large-scale brain networks in cognition: emerging methods and principals. *Cognitive sciences, 14(6),* 277-290.

vii Simone, A. N., Marks, D. J., Bedard, A. C., & Halperin, J. M. (2018). Low working memory rather than adhd symptoms predicts poor academic achievement in school-aged children. Journal of abnormal child psychology, 45(6), 277-290.

viii Chalmers, K. A., & Freeman, E. F. (2018). A comparison of single and multi-test working memory assessments in predicting academic achievement in children. *Journal of psychology: interdisciplinary and applied, 152(8)*, 613-629.

ix Doidge, Norman. *The Brain That Changes Itself: Stories of Personal Triumph from the Frontiers of Neuroplasticity*, New York: Penguin Group, 2015.

x Zaric, G., Correia, J. M., Fraga Gonzalez, G., Tijms, J., van der Molen, M. W., Blomert, L., & Bonte, M. (2017). Altered patterns of directed connectivity within the reading network of dyslexic children and their relation to reading dysfluency. *Developmental cognitive neuroscience*, 23, 1-13.

xi Jagger-Rickels, A. C., & Rose, G. M. (2018) 'Exploring the Relationship Between Improvement in an Intensive Learning Intervention and Changes in Resting state Functional Connectivity', paper presented to Sixth Biennial Conference on Brain Connectivity in Montreal, 26-28 September, presented 27 September 2018.

xii Sripada, C., Kessler, D., Fang, Y., Welsh, R. C., Prem Kumar, K., & Angstadt, M. (2014). *Disrupted network architecture of the resting brain in attention-deficit/hyperactivity disorder. Human Brain Mapping, 35(9)*, 4693-4705.

xiii Jagger-Rickels, A. C., Rose, G. M., & Kibby, M. Y. (2019) 'Effect of Comorbid Learning and Neurodevelopmental Disorders on Resting-state Functional and Effective Connectivity in Adolescents', poster presented to Cognitive Neuroscience Society Annual Conference in San Francisco, 23-26 March, viewed 26-28 March 2019.

xiv Arrowsmith Program. (2007). *Report on the effectiveness of the Arrowsmith Program in the Toronto Catholic District School Board (TCDSB)*. January 25, 2007.

xv Geiger, M. J., Domschke, K., Ipser, J., Hattingh, C., Baldwin, D. S., Lochner, C., & Stein, D. J. (2016). Altered executive control network resting-state connectivity in social anxiety disorder. *The World Journal of Biological Psychiatry, 17(1)*, 47-57.