# ReadLS

## A quick overview of the science behind the program

# UNDERSTANDING BRAIN PLASTICITY

For years, the scientific community maintained that once our brains have formed they cannot be changed. Our brains were compared to machines. It was thought that after we reach a certain developmental age, we have what we have and are stuck with it.

This is referred to as the brain being "hardwired": like a computer. A computer will only have as much memory as you give it. If it runs out of memory, or if something stops working, it will not replenish itself.

Likewise, the scientific community believed for years that if a part of the brain doesn't develop properly during those key formative years, or if it gets damaged (say, through a head injury or a stroke) it was irreparable. We were stuck with what we had.

**We now know that this is not true.**

When we refer to a brain as being "plastic", what that means is that it is actually malleable. It is NOT hardwired, and it has the ability to change constantly throughout our lives (for better or worse).

## WHAT ARE NEURONS?

In order to understand how the brain is plastic, we first have to understand neurons and what they are.

A neuron is an electrically excitable cell that processes and transmits information by electrical or chemical signaling. Chemical signaling occurs via synapses, specialized connections with other cells. Neurons connect to each other to form networks. Neurons are the core components of the nervous system, which includes the brain, spinal cord, and peripheral ganglia.

So in essence, one can think of neurons as wires in the brain that transmit information from one location to another.

Every time we learn something, a connection between neurons is made to pass along the information. The more we repeat that task, the stronger the connection becomes. Every time we FORGET something, a connection is broken.

Donald Hebb, a Canadian neuropsychologist coined the phrase "Neurons that fire together, wire together" in 1949.

# UNDERSTANDING ReadLS

With a basic understanding of what brain plasticity is, we can begin to understand ReadLS. ReadLS is a program which uses brain plasticity to create connections that are responsible for proper reading and comprehension that might not exist in children with poor reading skills.

A couple of key terms that we need to understand before moving forward:

- **EXECUTIVE FUNCTION**

  *The executive function is like a neural management committee of cognitive processes, taking inputs from various areas. It decides when to direct attention to something and when to direct conscious "thinking power" to that something. The Executive function is responsible for directing concentration so that attention and "thinking power" are sustained.*

- **WORKING MEMORY**

  *This has been described as 'the white board of the mind'. This is the conscious part of the brain, where all learning takes place, and where all problems are solved. We use working memory every day. It is the ability to keep information in your mind for a short time. Studies show that a deficit in working memory often leads to difficulties in school.*

- **COGNITION**

  *Cognition is the "thinking power" used in working memory.*

- **COGNITIVE PATHWAYS**

  *These describe the pathways when Executive function, Working memory and Cognition are ALL employed. These are conscious pathways used for learning and problem solving, which require processing in working memory.*

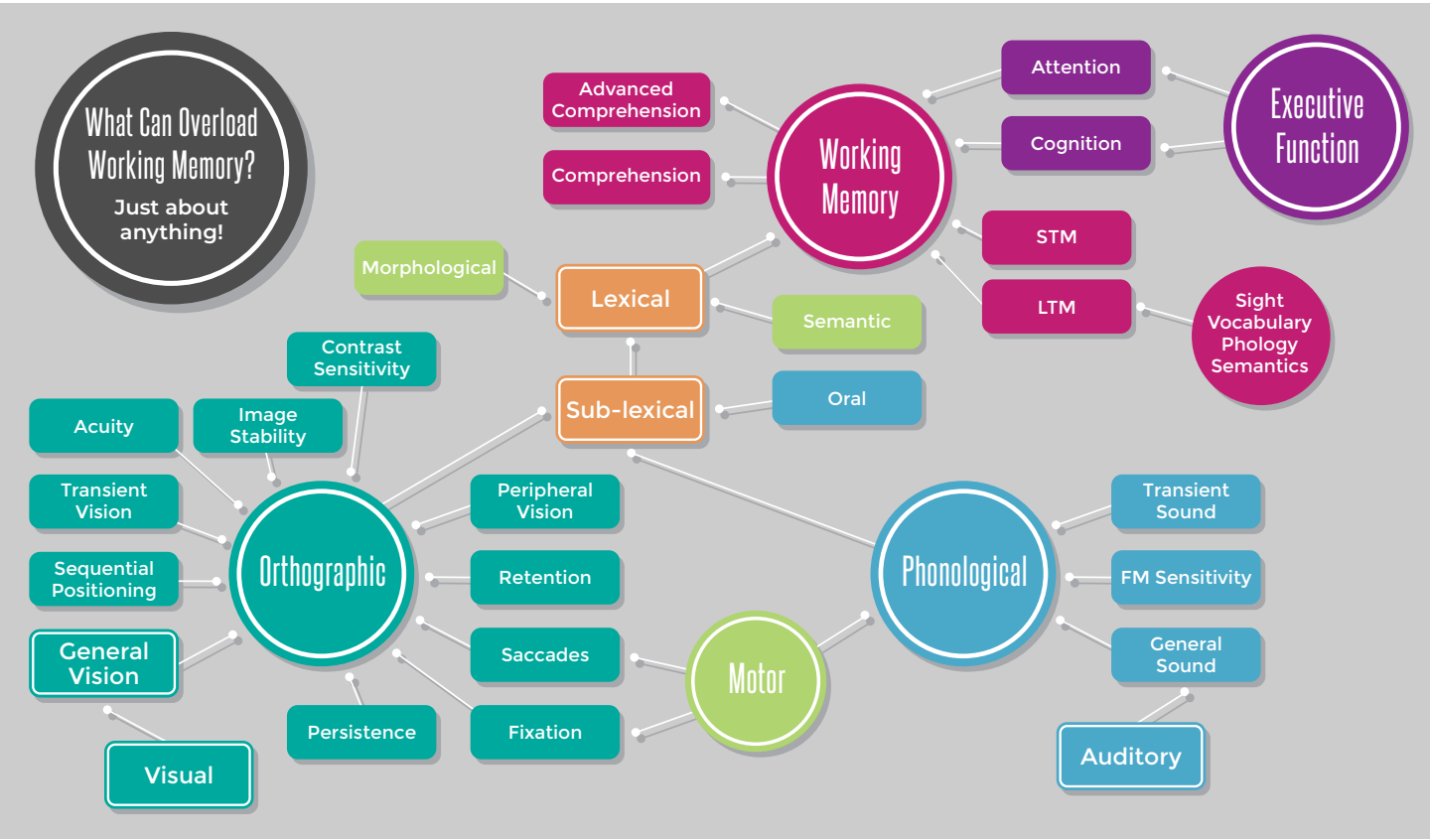
- **BEHAVIOURAL PATHWAYS**

  *When something is learned and mastered by the cognitive pathways, that something is shifted down into the sub-conscious as an automatised skill or piece of knowledge, which can be used when required. That is, the behavioural pathways supply automatised material to the cognition process, WITHOUT HAVING TO BE PROCESSED IN WORKING MEMORY. This frees working memory capacity, so that more difficult skills can be mastered. If students, for example, have automatised basic reading skills, this then frees their working memory capacity so that more difficult skills can be mastered, such as comprehension.*

- ## THE DUAL ROUTE TO READING

  *Beginner readers use a different part of the brain to learn to read than skilled readers do when processing text. Beginner readers use the parieto temporal area of the brain to learn to read. When learning to read, students have to decode and identify each word individually, which causes them to read slowly, one-word-at-a-time. On the other hand, experienced readers use different neural pathways to read: the occipto temporal area of the brain. Skilled readers have automatised all the basic skills needed for reading, and can go directly from what their eyes see to meaning.*

  *This is the epicenter of the ReadLS philosophy. Those readers who get stuck at the parieto temporal stage, are stuck for neural reasons and will never be able to read fluently. Their working memories are permanently overloaded with lower order skills that they just can't automatise. And thus, they can't make the transition to becoming a skilled reader.* ***ReadLS*** *has been developed to help these readers create new neural pathways and transition to becoming skilled readers.*



## The ReadLS Cognitive Therapy was designed with these priciples in mind. Each gameplay addresses the following:

- **Swizerland - Right to left/ left to right targets:**
  Saccadic eye movement, tracking and conversion. Rotating octogon forground addresses vestibular component and interacts with ocular eye movement and orientation. This targets the central vision and peripheral vision as well (together). Because the octogons are working in front of the bees, visual perception composure, (visual closure) is targeted. Visual closure is required for speed reading.

- **Morocco**
  Saccadic eye movement, eye tracking, visual closure, visual discrimination, visual placement.

- **Canada – Auditory processing speed, response speed.**
  Auditory processing speed refers to how the brain registers information and sends that information to the cortex. The response speed is how we respond to the message that reached the cortex. Auditory and visual cues target visual and auditory attention and visual closure, movement works on the ocular vestibular interaction.

- **Egypt – Visual components plus blended contrast.**
  Moving text targets the vestibular ocular interaction with timing, while searching works on tracking. The busier the background becomes the more we are working on blended contrast with the same element on visual closure.

- **Scotland – Decoding of the auditory and visual**
  Delayed timing gives the brain time to catch up with what has to be decoded, and put it together. Visual foreground, visual background, and visual memory.

- **Australia – Active working memory, increased working memory**
  Cognitive manipulation with simultaneous contemplation works the overlay into cognitive flexibility. Targets the automaticity of decoding skills, (auditory and visual)

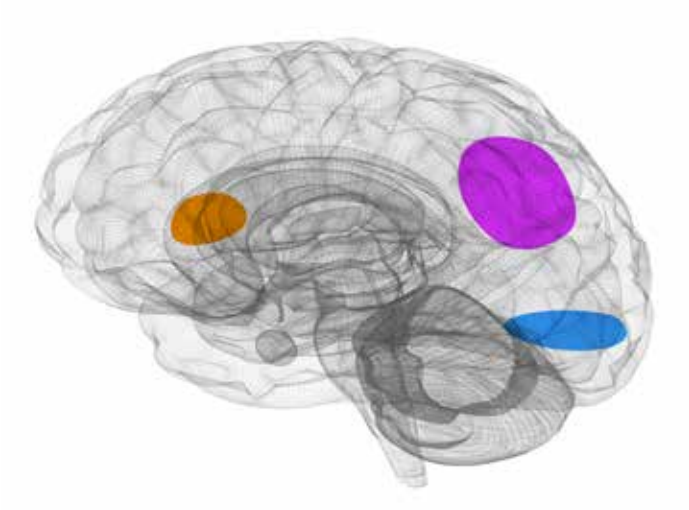
  Visual cues for younger students create an overlay from the right to the left side of the brain and provides an easier transition to lexicon, which will create more meaning and make it easier to bridge from picture thinking to lexicon thinking.

- **China – Auditory processing**
  elongated words provides the opportunity to process the individual components of a word and then close the sounds to formulate complete words.

- **Holland**
  Visual closure, working memory, word attack, word recognition, decoding, coding and comprehension.

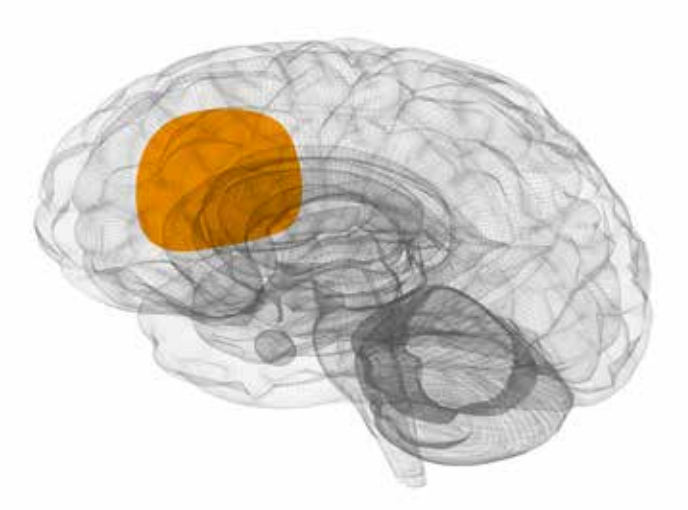
For brevity and convenience, ReadLS uses ‘Dyslexic’ to describe somebody who is ‘resistant to tutoring’, and who persistently fails to achieve reading fluency with good comprehension, with or without a diagnosis.

## TYPICAL



- Broca’s area, Inferior frontal gyrus (articulation/word analysis)
- Parieto-temporal (word analysis)
- Occipito-temporal (word form)

## DYSLEXIC



- Broca’s area, Inferior frontal gyrus (articulation/word analysis)

At left, typical readers activate neural systems that are mostly in the back of the left side of the brain; at right, dyslexic readers under activate these reading systems in the back of the brain and tend to over activate frontal areas.

Ref.: Sally Shaywitz M.D., “Overcoming Dyslexia”

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