

LEAP[®]: The Learning Enhancement Acupressure Program: Correcting Learning and Memory Problems with Acupressure and Kinesiology.

By Dr. Charles T. Krebs
Melbourne Applied Physiology, Pty Ltd
P.O. Box 173, Learmonth, Victoria
Australia 3352

ABSTRACT:

The Learning Enhancement Acupressure Program, or LEAP[®], has been developed since 1985 in conjunction with clinical psychologists, speech pathologists, neurologists and other health professionals, as a very effective program for the correction of most learning difficulties. LEAP[®] is based on a new model of learning integrating recent concepts in neurophysiology of the brain and uses highly specific acupressure formatting to address stress within specific brain structures. The application of specific non-invasive acupressure and other energetic techniques can then resolve these stresses resulting in a return to normal function.

In the LEAP[®] model of learning Gestalt and Logic functions are not simply localised in the right or left cerebral hemisphere as in the popular Right Brain/Left Brain model of learning. But rather, each type of conscious brain function or process appears to have a cerebral "lead" function that is either predominantly Gestalt (Visuo-spatial, Global) or Logic (Linear, Sequential) in nature. These cortical "lead" functions provide a "point of entry" into a widely distributed system comprising many subconscious cortical sub-modules in both hemispheres and many subconscious subcortical modules throughout the limbic system and brainstem.

While the Gestalt and Logic "lead" functions are conscious, these functions are dependent upon many levels of subconscious sensory processing at many levels within the nervous system. While this processing through multiplexing and parallel processing at many different levels is highly efficient, it means that brain processing is "time bound". Since many components of any mental function are performed in many different parts of the brain, and often at different speeds, coherent output in the form of "thinking" requires integration and synchronisation of all of these separate processes.

Loss of integrated brain function, termed loss of Brain Integration in LEAP[®], thus results in the loss of a specific mental capacity, the ability to perform a specific type of mental task. When these specific mental capacities are required for academic performance, their loss can result in Specific Learning Disabilities.

Specific Learning Disabilities (SLDs) arise in this model by either lack of access to specific subconscious processing modules, either cortical or subcortical, or the de-synchronisation of neural flows in the integrative pathways linking processing modules. Thus to resolve SLDs, you need only "open up" access to the "blocked" processing modules or re-synchronise the timing of information flow between them to re-instate integrated brain function.

The LEAP[®] program provides an integrated acupressure protocol using direct muscle biofeedback (kinesiology) as a tool to identify "stress" within specific brain nuclei and areas that have "blocked" integrated function. The application of the LEAP[®] acupressure protocol using acupressure and other energetic based techniques to re-synchronise brain function resolves learning and memory problems in a high percent of cases.

HISTORY OF SPECIFIC LEARNING DIFFICULTIES.

Difficulties with learning academic tasks such as reading, spelling and mathematics have been recognised for over a century, with Kussmaul in 1877 ascribed as the first person to specifically describe an inability to read, that persisted in the presence of intact sight and speech, as word blindness.¹ The word *dyslexia* was coined by Berlin in 1887.² Within a decade a Glasgow eye surgeon James Hinschelwood (1895) and a Seaford General Practitioner Pringle Morgan (1896) observed students who were incapable of learning to read and hypothesised that this was based on a

failure of development of the relevant brain areas which were believed to be absent or abnormal. This model was based on the assumption that developmental dyslexia (congenital dyslexia) was similar in form to acquired dyslexia, which is dyslexia due to brain damage after a person has already learned to read. Deficits in other types of learning, such as mathematics, would also result from some other underlying brain damage or abnormality.³

Work in the early part of the twentieth century, particularly by Samuel T. Orton in the 1920s and 1930s suggested that learning difficulties such as dyslexia were not based on anatomical absence or abnormality, but rather it was delay in the development of various areas that caused these dysfunctions. This belief was largely ignored until the 1960s when it was revived by a growing interest in neuropsychology. However, more recent developments in neuropsychology and neurophysiology support the hypothesis that dysfunctions within the brain, both anatomical and developmental, may be causal in many learning problems.⁴

It was not until 1963, in an address given by Samuel Kirk, who argued for better descriptions of children's school problems that the term "learning disabilities" originated. Since that time there's been a proliferation of labels that attempt to dissociate the learning disabled from the retarded and brain damaged.

Definitions

In the context of this synopsis, Specific Learning Disorders or Disabilities (SLDs) relates to problems with physical co-ordination and acquiring the academic skills of reading, writing, spelling and mathematics including both Dyslexia and Attention Deficit Disorder (ADD) with or without hyperactivity. ADD with hyperactivity is now commonly called Attention Deficit Hyperactivity Disorder (ADHD) or hyperkinetic disorder in Europe. Historically, Dyslexia has been widely defined in terms of deficits in the areas of reading, spelling and language. However, more recent conceptualisations have included a definition that also encompasses a wide range of problems, including clumsiness and difficulty with rote learning.⁵ Fawcett and Nicolson have also challenged the prevailing hypothesis that Dyslexia is merely a language based problem, suggesting that it might be a more generalised deficit in the acquisition of skills.⁶

The term Dyslexia is not defined in the DSM IV (1994) although it is still commonly used in literature discussing various learning difficulties. The term Learning Disorders (DSM IV) currently encompasses various types of learning difficulties including dyslexia and Attention Deficit Disorder (ADD). Learning Disorders are defined in the DSM IV as being essentially a persistent pattern of inattention and/or hyperactivity-impulsivity that is more frequent and severe than is typically observed in individuals at a comparable level of development. The performance of these individuals on standardised tests for reading, mathematics, or written expression is substantially below, more than 2 standard deviations (SDs), same age peers even though their IQ scores are average or above average.⁷

Incidence

Frequently, children diagnosed as learning disabled are also inattentive and deficient in linguistic skills, most often in reading.⁸ Rutter and Yule examined a large population of children from a number of different studies and found 3.5% of Isle of Wight 10-year-olds, 4.5% of 14-year-olds and over 6% of London 10-year-olds showed reading difficulties.⁹ Gaddes looked at the proportion of children with learning disorders in various studies in both North America and Europe and found that the need for special training for learning disorders ranged between 10-15% of the school age population.¹⁰ However, estimates of the prevalence of learning disorders for broad age ranges is problematic because a learning disability is an emergent problem that is often not evident until later years in schooling. Using the criteria of defining learning disorders as being two years behind on standardised tests, less than 1% of 6-year-olds are disabled, 2% of 7-year-olds and so on until at age 19, 25% would be classified as learning disabled. So these children fall progressively behind as they mature and the complexity of work increases.¹¹

In an address given by the Australian Federal Schools Minister, Dr David Kemp, in October 1996, Kemp stated that a study of 28,000 students in four surveys in Australia found 30% of year 9 students lacked basic literacy skills. This high incidence of learning disorders in school children indicates a need for effective treatment. Studies in other countries, both English, French and German support these figures, so specific learning difficulties, which cover all types of learning disabilities from dyslexia, reading problems, ADD to ADHD, probably represent greater than 15% of school-aged children, and may be as high as one third of all school-aged children.

Causes

Currently hypotheses concerning learning disorders suggest that they are primarily the result of one or more of five major factors; 1) structural damage, 2) brain dysfunction, 3) abnormal cerebral lateralisation, 4) maturational lag and 5) environment deprivation. While none of these theories is unequivocally supported by current data, all of these factors may contribute in varying degrees to learning disabilities.¹²

Brain damage and overt brain dysfunction would appear to account for a relatively small percentage of children with learning disorders. The great majority of other children with learning disorders do not typically show many of the neurological symptoms associated with brain damage in adults. For instance, EEG and CT studies have not shown structural damage and abnormal EEGs correlated with known brain damage are not consistently observed in children with learning disorders.¹³ Rather than direct brain damage, there is evidence that abnormal physiological or biochemical processes may be responsible for malfunction in some part of the cerebral cortex. Electrophysiological recording studies have associated specific high frequency EEG and AEP (averaged evoked potentials) abnormalities with various types of learning disorders.¹⁴ Recent studies with SSVEP (Steady state visual evoked potential) have shown that children diagnosed with Attention Deficit Disorder demonstrate similar abnormal SSVEP patterns when compared to normal subjects while performing the same cognitive task.¹⁵ The brain dysfunction hypothesis suggests that the dysfunction may be a consequence of defective arousal mechanisms resulting in some form of inadequate cerebral activation.¹⁶

This is supported by studies of children with learning disorders that show they have difficulty on continuous performance tests requiring attention and low distractibility; had slower reaction times to stimuli, and increased errors due to impulsivity on tests of visual searching.¹⁷ Douglas proposed that the deficits on these tasks resulted from inadequate cerebral activation. Learning disorders of some types at least, do improve with drugs like amphetamines that cause cerebral activation via increasing subcortical arousal. In fact this is the basis of treating hyperactive children with Ritalin.¹⁸

An alternative model of learning disorders is based on recent neurophysiological findings that suggest it is the timing and synchronisation of neural activity in separate brain areas that creates high order cognitive functions. Any loss or malfunction of the timing mechanism may cause disintegration of neural activity and hence dysfunction in cognitive tasks.¹⁹ Clearly, brain dysfunction due to inadequate cerebral activation may indeed lead to disruption of the timing and synchronisation of neural flows, and thus these two hypotheses may just be different aspects of the same process.

This model supports the approach in the Learning Enhancement Advanced Program (LEAP[®]) that Dr. Krebs developed in the late 1980s early 1990s.²⁰ In the LEAP[®] Model, Specific Learning Disorders are based on the disruption or loss of timing and synchronisation between the neural activity in the diverse brain regions, both cortical and subcortical, that must be synchronised in order for successful integration to produce normal cognitive activity. *Learning disorders would arise in this model from a lack of integration of functions that occur simultaneously in separate brain regions.*

If the brain does integrate separate processes into meaningful combinations we call 'thought' or cognitive ability, then the main risk is mis-timing or loss of synchronisation between these

processes. To quote Damasio “any malfunction of the timing mechanism would be likely to create spurious integration or *disintegration*”.²¹ For synchronous firing of neurons in many separate brain areas to create cognitive functions would require maintenance of focused activity at these different sites long enough for meaningful integration of disparate information and decisions to be made.

THE LEAP[®] MODEL OF LEARNING:

From a review of the major brain structures and the workings of learning and memory in the neurological literature, it is clear that both memory and learning do not involve a single, global hierarchical system in the brain. But rather, learning involves interplay between many inter-linked sub-systems or modules.²² Also, the timing and synchronisation of information flow between these sub-systems and modules appears to be critical to the success of learning and coherent cognitive function.

However, the sub-systems or modules underlying both learning and memory are both conscious and subconscious with most of the early leveling processing being totally subconscious, and only the highest levels of neural processing reaching consciousness. Yet, it is indeed these conscious modules that initiate and direct the processing to be done by the subconscious modules, as both learning and memory require “conscious” effort to occur. This means that the memory and learning processes can be disrupted at both the conscious and subconscious levels, depending upon which neural substrates or integrative pathways are disrupted.

Sensory processing of all types is initially a relatively linear chain of neural impulses originating from a generator potential of the sensory receptor, and following a chain of neurons into the Central Nervous System (CNS) and brain. However, this initially linear stream of nerve impulses, the data of the CNS, rapidly becomes divergent and multiplexed at higher levels of cortical processing. Conscious perception only arises at the highest levels of these multiplexed data flows as they are re-integrated back into unified conscious perception by the cortical columns directing all conscious brain activity.

Thinking and other cognitive abilities rely upon all of the preceding levels of subconscious sensory processing, which are predominately bilateral initially, but which become progressively asymmetrical and lateralised with increasing levels of conscious awareness. Sensory information is processed initially as neural flows of increasing complexity that generate preverbal images and symbols, but becomes increasingly defined by language in higher level cognitive processes. And language by its very nature is based upon abstract representations of external reality (called words), that follow linear rules (grammar), and word order linked to meaning (syntax). Hence it is predominately sequential and linear in form, which permits analytical evaluation of the thoughts generated following rational rules of Logic. From the perspective of Logic, the world is interpreted as parts that can be constructed into a whole via deductive reasoning.

Sensory and other mental data not suitable for language-based rational processing is processed via visuo-spatial image and symbols that permit global, holistic comprehension of the whole and is inherently non-rational.²³ This global, simultaneous, non-rational visuo-spatial processing has been termed Gestalt (German for pattern or form), with the meaning of the whole extracted via inductive reasoning. From the Gestalt perspective, the world is seen as a “whole” with intuitive understanding of the properties of the whole. There is no rational analysis of “Why?”, it just “Is”.

In the LEAP[®] Model of Learning, it is recognized that most of the lower level linear sensory processing occurs below conscious perception, that is either subcortical, being processed in the brainstem or other brain nuclei like the hypothalamus, thalamus, basal ganglia, etc., or is palaeocortical and limbic. Even the basal levels of cortical processing are largely bilateral and subconscious, and thus occur outside of conscious perception. All higher level cortical processing, which may become conscious, is thus reliant upon maintenance of integrated function and neural flows at these subconscious levels.

However, the more overtly cognitive components of learning rapidly become lateralised with processing dominated by activation of cortical columns, the functional units of the neocortex, in one hemisphere of the brain or the other. In right-handed people, Logic processing typically activates cortical columns in the left hemisphere, that then process the data in a linear analytical way, while activation of cortical columns in the right hemisphere process data in a Gestalt, visuo-spatial way. Thus, at the highest levels of conscious neural processing underlying cognition and thought, whether that “thought” be verbally based language of Logic, or global intuitively based “knowing” of Gestalt, the neural processing is highly lateralised and is predominately processed in the right or left hemisphere.

The neural substrates for all “conscious” functions therefore are cortical columns of the neocortex (Fig. 1). Conscious activation of a cortical column acts to initiate a cascade of neural flows that rapidly spread to other cortical areas both conscious and subconscious in both hemispheres, and also into many subcortical structures as well. These consciously activated cortical columns initiate either Gestalt or Logic functions depending in which hemisphere they are located. In LEAP[®] we term cortical columns activating Logic functions, Logic “lead” functions, and those activating Gestalt functions, Gestalt “lead” functions. These “lead” functions provide points of entry into an inter-linked set of cortical and subcortical modules that then perform our mental functions.

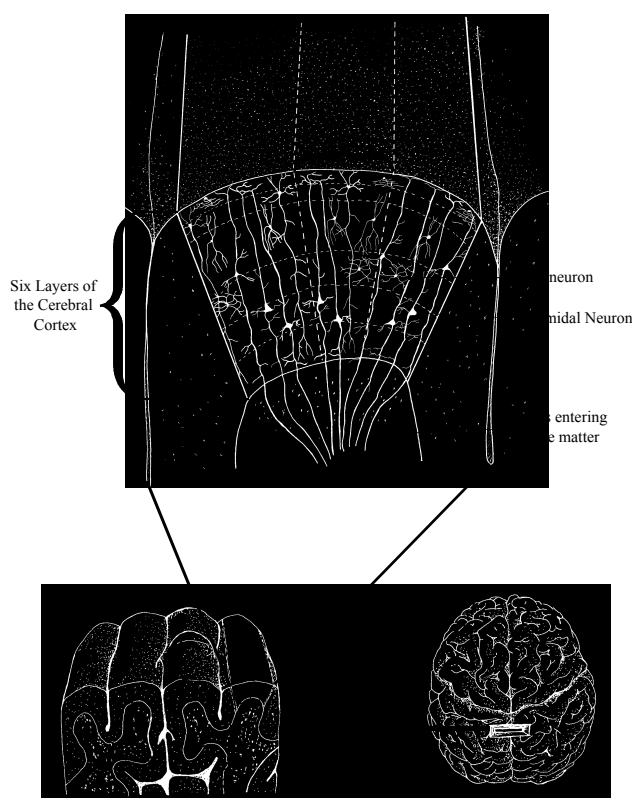


Figure 1. Cortical Columns. Vertical slabs of cortex consisting of all six distinct cell layers, called cortical columns, are the functional units of the cerebral cortex. Some of the cells like the large pyramidal cells have dendrites that extend through almost all layers and axons that exit the gray matter to become part of the white matter tracts carrying information to other parts of the brain and body. There are also innumerable interneurons connecting the cells within each cell layer and between the layers.

Indeed, it was a misunderstanding about the nature of these “lead” functions from which the popular “Right Brain – Left Brain” model of learning and brain function arose. Because damage to specific cortical columns caused loss of specific conscious functions, e.g. the ability to form an image, or figure out certain types of problems or solve certain types of puzzles, it was assumed that the damaged area actually did that specific function. In reality, all that cortical column did was

provide a point of entry into these inter-linked sets of cortical and subcortical modules that actually performed the function lost because of the damage to the cortical “lead” function.

An analogy would be damage to the “K” key on your keyboard. Your consciousness is still intact and able to initiate “K” questions, and your computer system is still able to process and answer “K” questions, but the interface to initiate “K” processing in the computer has been damaged. Like wise, if a Gestalt “lead” function is damaged, the process initiated by this “lead” function no longer activates the inter-linked cortical and subcortical functions that are required for this process to occur. Thus, while damage to the area initiating a function, “blocks” the rest of the processing needed to perform the function, the area initiating function never actually ever “did” the function in the first place. To continue this analogy, in most cases it is not overt “damage” to the cortical “lead” function or subcortical brain areas that prevents effective thinking, but rather “blocked” access to these brain areas due to some stressor that is the problem. Thus, much in the same way a “sticky” key blocks fluent typing, “blocked access” to specific brain areas blocks effective thinking and problem-solving.

Synopsis of the LEAP[®] Model of Learning:

In summary, the LEAP[®] Model of Learning is based on the following suppositions about the nature and location of neural processing underlying learning and memory:

- Sensory processing initiated by sensory receptors generates initially linear neural flows that rapidly diverge at each successive processing centre (spinal and cranial nerve ganglia, brainstem nuclei, subcortical nuclei, limbic cortices, and finally neocortical columns) into a number of different complex data streams. All processing below the neocortex is subconscious.
- Each processing centre, at each successive level within the spinal cord, brainstem, diencephalon, basal forebrain and cortex elaborates the sensory data, defining some aspect more than another, or adds additional types of information needed to define the sensory data further at the next level of processing. All processing below the neocortex is subconscious.
- At the higher cortical levels, input from many lower levels both cortical and subcortical is integrated to form a conscious perception of the initial sensory experience.
- These higher cortical levels not only integrate processing of the “raw” sensory data, but also include integration of input from memory areas about past experiences with similar sensory stimuli.
- At the highest cortical levels the conscious perceptions formed at lower cortical levels are further processed asymmetrically in either Gestalt or Logic cortical columns, and hence perceived as a visuospatial pattern or a Gestalt, or abstractly as a verbal word based language or an abstract symbol based mathematical language.
- The very highest levels of conscious processing that underlie our thinking about conscious perceptions, while dependent upon input from all areas of the brain, are generally frontal lobe and particularly involve working memory areas in the Dorsolateral Frontal Cortex.
- A whole set of basal brainstem mechanisms maintain the organism in a state of homeostasis, such that higher level conscious sensory processing can proceed effectively: These include the Reticular Activating System, the Periventricular Survival System, the Vestibular System and the Sensory-Motor System. Imbalances within or between these systems may disrupt on-going sensory processing and integration at this and higher levels. Processing at this level is totally subconscious.
- The initial “raw” data stream is “sampled” by the Amygdala and other survival centres in the brainstem, and coloured by the survival emotions paired or associated with the

sensory stimuli being analyzed, including the physiological responses to these emotions, and is the basis of Conditioned Learning. These primary survival emotions may disrupt on-going sensory processing and integration at this and higher levels. Processing at this level is subconscious.

- When survival emotions of the Fight or Flight response are activated above some “threshold” value, the amygdala and other brainstem structures such as the Periaqueductal Grey Matter of the midbrain inhibit frontal cortical processing, interfering with reasoning and problem-solving. The cause of this loss of higher level conscious cortical processing is a direct consequence of activation of the subconscious primary survival emotions of the Limbic System and Brainstem.
- Secondary processing of the sensory stimuli in the Brainstem, Limbic System and lower cortical levels generates a series of control functions defining the nature of the sensory data stream (e.g. control of pupils in vision) and second-order integration of this sensory data (e.g. movement, shape and location of object in space). Processing at this level is subconscious.
- Further processing in the palaeocortical components of the Limbic System (e.g. hippocampus, cingulate, subcallosal and orbitofrontal cortices) generates secondary emotions relative to the sensory data stream and primary emotions already supplied by the amygdala and other brainstem areas via sampling memory of related events. These secondary limbic emotions may disrupt on-going sensory processing and integration at this and higher levels. Processing at this level is largely subconscious.
- Initial cortical processing is predominately bilateral and subconscious, and is dependent upon earlier processing at brainstem and subcortical levels. Emotions, either primary or secondary, may disrupt on-going sensory processing and integration at this and higher levels.
- At some level of cortical processing the sensory data stream emerges into a conscious perception, and is dependent upon earlier processing at brainstem, subcortical, and earlier cortical levels. Emotions, either primary or secondary, may disrupt on-going integration at this and higher levels
- At the highest levels of cortical processing, the processing is largely done in one hemisphere or the other and perceived consciously as a logical, rational thought or a visuospatial Gestalt, and is dependent upon earlier processing at brainstem, subcortical and cortical levels. Emotions, either primary or secondary, may disrupt on-going integration at this level, and any “thinking” dependent upon this level of processing.
- Thinking about the fully processed and integrated sensory experience in the frontal lobes, based upon remembered sensory experiences relevant to the current experience may lead to decisions, which will be represented neurologically by activation of either Logic or Gestalt “lead” functions or both.
- These “lead” functions will then initiate a cascade of neurological flow, which is initially frontal cortical, but rapidly flows into other cortical areas and subcortical structures like the basal ganglia, thalamus, and cerebellum, which in turn feedback to the cortex and each other. Emotions, either primary or secondary, may disrupt on-going processing and integration at any level of this process, and thus overtly affect the final outcome of the cognitive functions taking place.
- Coherent neurological processing at any stage of the above process is dependent upon both uninterrupted flows along integrative pathways and within integrative processing centres. Disruption or de-synchronisation of the timing of these integrative neural flows or disruption or de-synchronisation of processing in any of the integrative centres may result in loss of cognitive function.

- Maintaining integration along all integrative pathways and within all integrative centres produces optimum function, a state called Brain Integration in LEAP.
- Loss of integrated brain function is the principal cause of dysfunction in both mental and physical performance, called Loss of Brain Integration in LEAP.
- The primary mechanism causing Loss of Brain Integration is de-synchronisation and loss of timing of neural flows along integrative pathways and within integrative centres by inhibition or excitation of these pathways and centres by neural flows originating from brainstem and limbic survival related emotions.
- On-going Loss of Brain Integration is often generated by early childhood trauma that creates long-term disruption of Brain Integration as a mechanism of coping.
- Other factors affecting Brain Integration are genetic, structural, organic brain damage, and environmental stressors:
 - Structural defects or abnormalities can be of developmental origin, e.g. neuronal migration problems, or result from toxin exposure at specific critical periods of development, e.g. fetal alcohol syndrome. Many cognitive defects have been shown to correlate with abnormalities in brain structure.²⁴
 - Organic Brain Damage may result from a head injury, and this damage often results in sclerosis that disrupts neural flows underlying Brain Integration (e.g. hippocampal sclerosis and subsequent epilepsy are often associated with learning disorders).
 - Genetic Factors affecting Brain Integration are often genes that code for specific alleles for specific enzymes involved in maintaining normal levels of neurotransmitters or receptors in brain circuits.²⁵ Deficiencies in either neurotransmitters or receptors will compromise Brain Integration, and have behavioural consequences. This is both the basis of much ADHD behaviour and the justification for drug use to ameliorate these behaviours.²⁶

Other genes may code for alleles that affect fatty acid metabolism and utilisation, especially in maintaining neuronal membrane stability and function. This affects predominately physical co-ordination and reading.²⁷
 - Diet and nutritional deficiencies may also compromise brain function and result in loss of Brain Integration. Diets rich in fast or junk foods often create marginal nutritional deficiencies that may disrupt brain function, and often contain various preservatives and additives, like the azo-food dye tartrazine, that may cause a total loss of brain integration in sensitive individuals²⁸.

Indeed, the misbehaviour and academic performance of children and young adults have been shown to improve significantly with diet change or nutritional supplementation²⁹, and several recent books have discussed this aspect of behaviour and learning problems³⁰.
 - Environmental factors such as electromagnetic fields emitted from man-made electronic equipment and Geopathic stress from distortions in the earth's electromagnetic fields may affect the brain integration of sensitive individuals and result in learning problems.³¹

Loss of Brain Integration and Compensation

When Brain Integration is lost via disruption of the most efficient neural pathways and/or centres, either by organic damage or by functional inhibition of cortical or subcortical functions due to outputs from survival centres in the brain, specific conscious functions dependent upon this integration is also disrupted. The overt loss of conscious function is, however, often far less than the

degree of interference with underlying functions might suggest because the brain is a master at compensation and will automatically compensate for these disrupted flows by using other areas of the brain, both conscious and subconscious to produce the most efficient processing possible.

Thus, even children with considerable organic brain damage will often establish compensatory neurological patterns of activity to produce varying levels of function in spite of massive disruption of neural pathways underlying normal function, e.g. children with cerebral palsy may learn to walk and talk. It is indeed this tremendous compensatory capacity of the brain that allows even highly disintegrated brains to produce some degree of function, however, the level of dysfunction controls the degree of compensation. Thus, the greater the degree of dysfunction present, the less compensation that is possible.

If the disruption of integrated function is at the more basal levels of integration, the ability to compensate for the resulting dysfunction is much more limited than if the loss of integration is at a higher level of processing because all higher levels of processing are dependent upon the quality of the data integrated at earlier levels of processing. For instance, while damage to an early component of vision, say the retina or optic nerve totally disrupts sight, damage and hence loss of integration in the V₃ area of the occipital cortex may leave the image fully intact, but disrupt only colour vision.

When the highest levels of cortical integration are disrupted directly or lower level cortical or subcortical functions underlying these higher cortical functions are disrupted, we may lose the capacity to “think” in certain ways. For instance, we may maintain Gestalt creative abilities (e.g. be good at art and design), but lose the ability to perform even simple mathematics because of the loss of the ability to abstract (e.g. are hopeless at maths). Specific Learning Disorders result from the loss of integration in of higher-level cortical functions or lower-level subconscious cortical or subcortical functions supporting these higher-level functions directly activated by consciousness.

Children and adults suffering Specific Learning Disorders usually know what they need to do, often even how to do it (e.g. I want to spell this word, so I need to sequence the letters and remember this sequence). But they just cannot activate the necessary subcortical and cortical processing to do what they know how and want to do consciously because of loss of integration at some level of neural processing required to do this function. When this loss of Brain Integration affects their ability to read, spell, write or do mathematics, it results in SLDs. However, they will still attempt to perform these functions, but in some compensated way. For instance, a child that cannot spell words correctly (that is, visually in English), still attempts to spell words, but using phonetics to compensate for the “mind’s eye” image he/she cannot create.

Because the level at which the integration is disrupted is unknown to the consciousness and compensation is largely subconscious and automatic, a person with Specific Learning Disorders is only aware that some function is difficult or not possible to perform, but not why this is so. Most often Brain Integration is lost in subconscious functions that were never accessible to our consciousness in the first place.

SYNOPSIS OF THE RESULTS OF LEAP STUDIES TO DATE:

There have only been a few controlled studies of the effectiveness of LEAP to resolve learning problems because funding for studies involving Energetic Medicine are very limited as for any “new” technique that is outside the current Paradigm. Below are the summary results of the LEAP studies done to date. The first two of these are unpublished research done as part of a degree in Psycho-physiology at Swinburne University, and the other is a fully controlled study of the effects of the LEAP program on children with identified Specific Learning Difficulties (SLDs) from an Israeli School for Children with SLDs. The results of the Israeli study are in preparation for submission to the International Journal of Learning Disabilities.

Swinburne LEAP Studies:

Two studies were undertaken at Swinburne University: One was a study of the differences in cortical processing, Digit Span and Reading Comprehension between adults with ADD and the other was a Controlled Study of the affects of application of the LEAP program to children who had identified SLDs.

Swinburne Study 1: Effect of the Learning Enhancement Advanced Program (LEAP) on Cortical Activity, Auditory Short-term Memory Performance and Reading Comprehension. *by Susan Mc Crossin, B App Sc (Hons), Swinburne University*

Introduction:

Previous studies (Silberstein et al., 1995) had demonstrated that a recently developed sophisticated type of EEG, Steady State Visual Evoked Potential (SSVEP), was capable of generating maps of cortical activity sensitive to cognitive processes. In SSVEP there are transient reductions in amplitude that appear to index regional increases in cortical activity associated with the performance of a cognitive task. Because it is possible to estimate the amplitude of the SSVEP using as little as 1 to 5 seconds of recorded activity, this technique was chosen to investigate changes in brain activity associated with attentional and decision-making cognitive tasks.

The Learning Enhancement Acupressure Program (LEAP) has been developed empirically since 1985 and has been applied to the improvement of specific learning problems on several thousand subjects with generally excellent results. The LEAP treatment employs a specific acupressure protocol to improve brain functions (Krebs & McCrossin, 1994) that has been empirically demonstrated to reproducibly improve various learning dysfunctions including deficit Digit Span ability and poor reading comprehension.

Pre and post-testing of subjects undergoing the LEAP protocol with WISC-R has shown marked improvement on all of the subtests (Paphazy, unpublished data). Improvement was consistently seen even on visuo-spatial subtests like Block Design which had not previously been observed to change over time, regardless of considerable periods of remedial treatment. Block design is often considered to be a measure of innate intelligence as it tests spatial reasoning not affected by acquired verbal knowledge.

After LEAP treatment some subjects have shown an increase in the Block Design task from a previous ranking in the 25th percentile of same aged children to the 75th percentile and changes to as high as the 99.6 percentile have been recorded. Changes of equal magnitudes have been observed on all subtests, for instance from the 1st to the 50th percentile ranking on the Digit Span subtest.

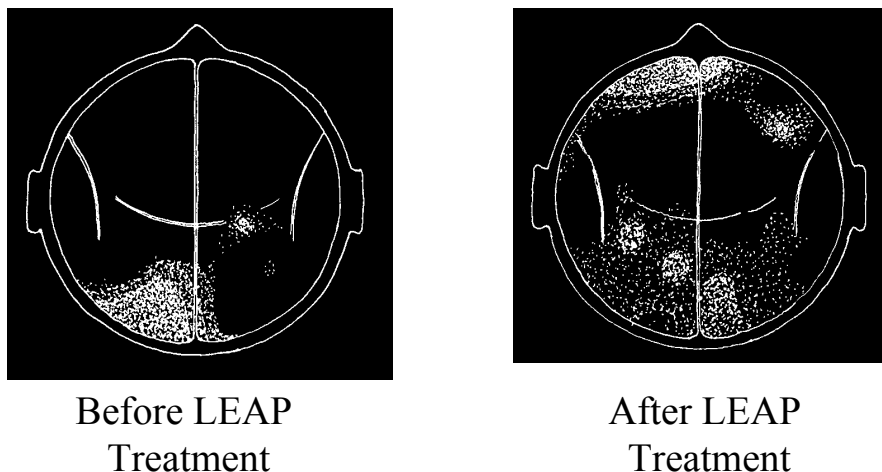
In those cases where improvement was not observed or was marginal, either on several or on only a specific subtest, neurological assessment demonstrated varying degrees of organic brain damage in almost all cases (Dr. Graeme Jackson, personal communication). The damage observed varied from

developmental problems such as neuronal migration problems, temporal lobe epilepsy, hypoxic damage resulting from birth difficulties or traumatic injury such as blows to the head.

In this study the five (5) adult subjects ranged in age from 18 to 44 years (mean 30, S.D. 10). No subject had a history of epilepsy or any type of organic brain damage, both of which may be associated with such deficit digit spans as an adult.

Although the SSVEP activity maps for both tasks, Attention Primed and Decision-making, varied in detail between subjects, similar patterns were observed for both types of tasks. Prior to the LEAP treatment, all subjects showed predominately occipito-parietal lobe activity with little or no frontal lobe activity during the decision-making task, characteristic of people with ADD. While these people still made decisions, they were not made upon the basis of careful consideration of “cause and effect”, but rather upon “impulsive” partial processing initiating a reaction to stimuli presented. Following the LEAP treatment, there was now a very different pattern of areas of activation. All subjects now showed increased bilateral activation of the frontal lobes, the areas involved in conscious higher-level rational evaluation of the data and the lowest levels of cortical activity in the occipito-parietal lobes during decision-making. (Figure 1)

Figure 1. SSVEP Maps of typical subjects Before and After LEAP treatment. Degree of stippling indicates degree of activity. Before treatment subjects with learning difficulties showed the most activity in the occipital lobes when performing attentional and decision-making tasks. After treatment the cortical activity now switched to the frontal lobes on the same attentional and decision-making tasks, the same areas active when normal subjects perform these tasks.



Digit Span:

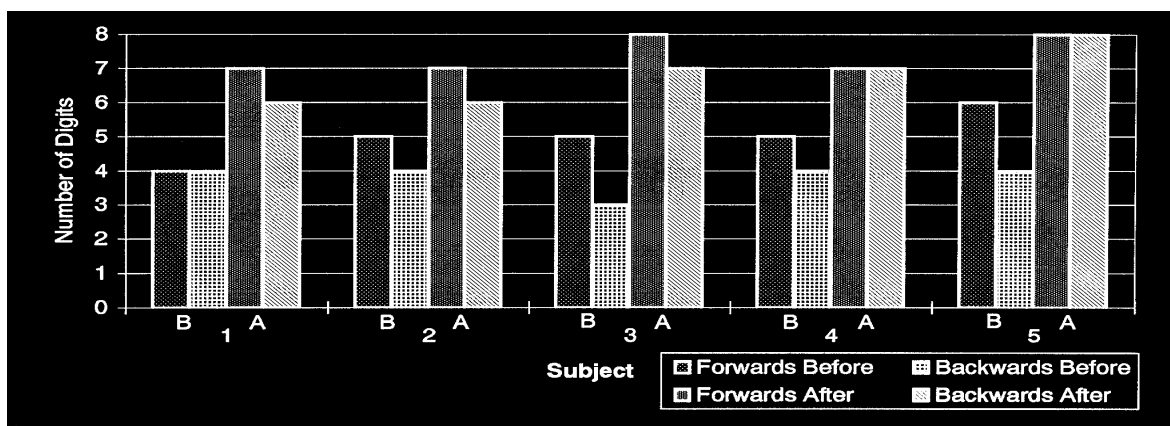
The Digit Span subtest of the WISC-R was used as a measure of short-term memory, retrieval and distractibility (Horn, 1985; Reynolds & Kaufman, 1985). This subtest of the WISC-R is a measure of the auditory short-term memory processing and freedom from distractibility, where a subject repeats a verbally presented sequence of random numbers. The span or number of digits that can be accurately reported varies with age, varying from 3 forwards and 0 backwards for a 4 year old to 6 forwards and 5 backwards of an average adult. Deficit digit span is when the subject recalls fewer digits forwards and/or backwards than is average for their age (Horn, 1985; Reynolds & Kaufman, 1985).

The Forwards task requires predominately basal short-term memory functions of the hippocampus, while the Backwards task requires the additional step in working memory of the frontal lobes to create an image which is then simply “read” backwards. Not surprisingly, people with deficit Backwards digit span have difficulty spelling and remembering their times tables because both tasks are heavily dependent upon creating an image in your “mind’s eye”. This image must then be stable enough for the brain to make a “picture” of it, and then store this picture in Eidetic Memory or Picture Memory of the occipital lobes. Spelling or remembering your times tables is then simply

“recalling” into consciousness the picture of the word or the answer to the times tables and “reading” this recalled information.

Before the LEAP treatment the digit spans all subjects were well below the adult average of 6 forwards and 5 backwards, with all but one below the average for a 10-year old. The Post-test digit spans of all subjects improved dramatically and now ranged from 7 forwards and 6 backwards to as high as 8 forwards and 8 backwards (Figure 2).

Figure 2. Digit Span scores for subjects before and after LEAP treatment. In all cases the forwards and backwards Digit Span increased significantly following the LEAP treatment.



Reading Comprehension:

Reading comprehension is the ability to recall information about what was read shortly after reading it. Reading comprehension often does not vary directly with reading speed, as both slow and fast readers may demonstrate good or poor comprehension of what was read. Poor reading comprehension is expressed by the inability to recall much of the detail of what was read or to confuse or confabulate the storyline or information presented by the author. Subjects with normal reading comprehension can easily recall greater than 90% of the material read when tested within a few minutes of reading it. Individuals with poor comprehension can generally recall less than 50% and may recall almost nothing.

All subjects were asked to read standard passages from the Neale Analysis of Reading and then tested for their reading comprehension. Reading comprehension showed equally remarkable improvements. The percentage of reading comprehension on the Neale Reading Analysis before treatment varied from 62.5% to 37.5% with one case of zero percent comprehension as this subject was unable to answer a single question correctly on the material read. The Post-test assessments showed that after the LEAP Treatment reading comprehension After the LEAP treatment for learning difficulties all subjects scored 100% on reading comprehension.

Swinburne Study 2: The Effect of Acupressure Treatment on Measures of Cognitive Ability, Standard Intelligence Test Scores and Reading Comprehension for Children with Learning Difficulties. By Susan J. McCrossin, B.App. Sci. Hons. (Psychology & Psychophysiology), Swinburne University

Measures of Cognitive Ability:

Cattell (1963) defined intelligence as comprising of two distinct aspects: ‘fluid’ and ‘crystallised’ intelligence. Fluid intelligence is the capacity to perform abstract reasoning which involves ‘native’ intelligence and is thought to be unaffected by formal education. This includes the ability to solve puzzles, memorise a series of arbitrary items such as words or numbers, as well as the ability to change problem solving strategies easily and flexibly. Crystallised intelligence, on the other hand, comprises of abilities that depend on knowledge and experience or the amount of stored factual knowledge, such as vocabulary and general informational knowledge (Murphy & Davidshofer, 1994).

In the current study, subjects’ performance on the Inspection Time, which is a cognitive task measuring fluid intelligence, was compared before and after acupressure treatment designed to improve mental ability. Tests that are believed to measure Crystallised intelligence were not used as knowledge of facts

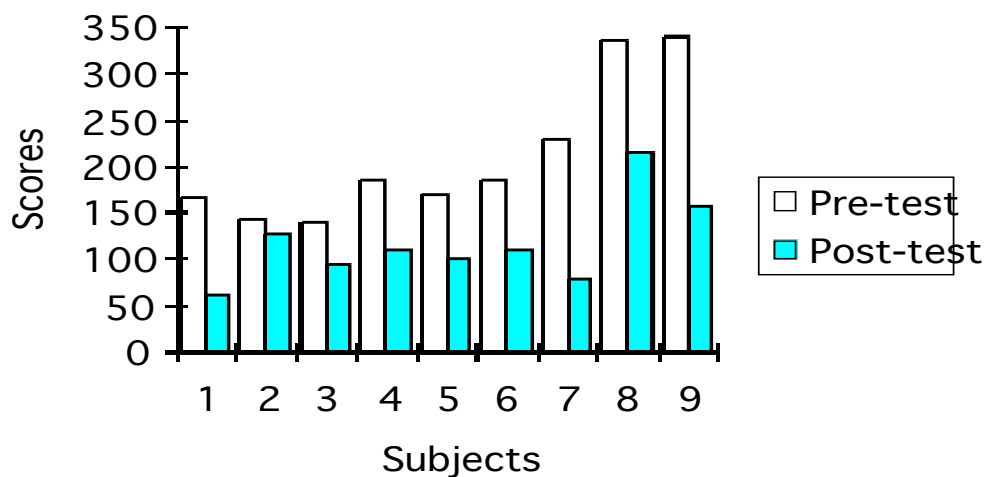
is accumulated over a number of years and would not be expected to change substantially over the short time frame of the study.

Inspection Time:

Savage (1970, cited in Deary & Stough, 1996) suggested that individual differences in intellectual ability may be attributable largely to the speed of intake of visual information processing. A currently used measure of the speed of visual information processing is Inspection Time (IT), an estimate of the stimulus presentation time (in milliseconds) which a subject requires to correctly respond 80% of the time (Deary, 1993; Deary & Stough, 1996). IT has been found to be highly correlated (-0.8 to -0.9) with performance IQ as measured by the Wechsler Adult Intelligence Scale - Revised (WAIS-R) (Nettelbeck & Lally, 1976; Lally & Nettelbeck, 1977). Although more recent studies suggest that the IT-IQ correlation may be closer to 0.5 (Nettelbeck, 1987).

Normal scores for control groups on the IT test range between 55 and 120 milliseconds (msec) with scores higher than 100msec considered low normal (Tsourtos et al., 1995). All subjects in both the Control and Treatment groups were low normal or very slow in their performance on the IT Pre-test. On the Post-test the Control group remained unchanged, while in the LEAP treatment group all individuals improved with those who scored above 140 milliseconds on the pre-test improving their IT scores the most. (Figure 2)

Figure 2. *Pre-test and Post-test Inspection Time Scores for the Treatment Group.*



Digit Span:

The Digit Span subtest of the WISC-R was used as a measure of short-term memory, retrieval and distractibility (Horn, 1985; Reynolds & Kaufman, 1985). This subtest of the WISC-R is a measure of the auditory short-term memory processing and freedom from distractibility, where a subject repeats a verbally presented sequence of random numbers. The span or number of digits that can be accurately reported varies with age, varying from 3 forwards and 0 backwards for a 4 year old to 6 forwards and 5 backwards of an average adult. Deficit digit span is when the subject recalls fewer digits forwards and/or backwards than is average for their age (Horn, 1985; Reynolds & Kaufman, 1985).

The Forwards task requires predominately basal short-term memory functions of the hippocampus, while the Backwards task requires additional working memory processing in the frontal lobes to create an image which is then simply “read” backwards. Not surprisingly, people with deficit Backwards digit span have difficulty spelling and remembering their times tables, both tasks heavily dependent upon creating an image in your “mind’s eye”.

All subjects demonstrated deficit age-specific digit span varying from near average at 6 forwards, but a deficit and 4 backwards compared to the average of 6 forwards and 5 backwards to highly deficit digit spans at 5 forwards and 3 backwards.

After LEAP treatment the digit spans all subject's were above the adult average of 6 forwards and 5 backwards. The Post-test digit spans of all subjects ranged from 7 forwards and 6 backwards to as high as 8 forwards and 8 backwards (Figure 3a & b).

Figure 3a. Digit Span Scores for the Non Treatment Group at the Pre-test (B) and Post-test (A) of the Study. * Zero backwards as subject could not understand concept of reversing digits.

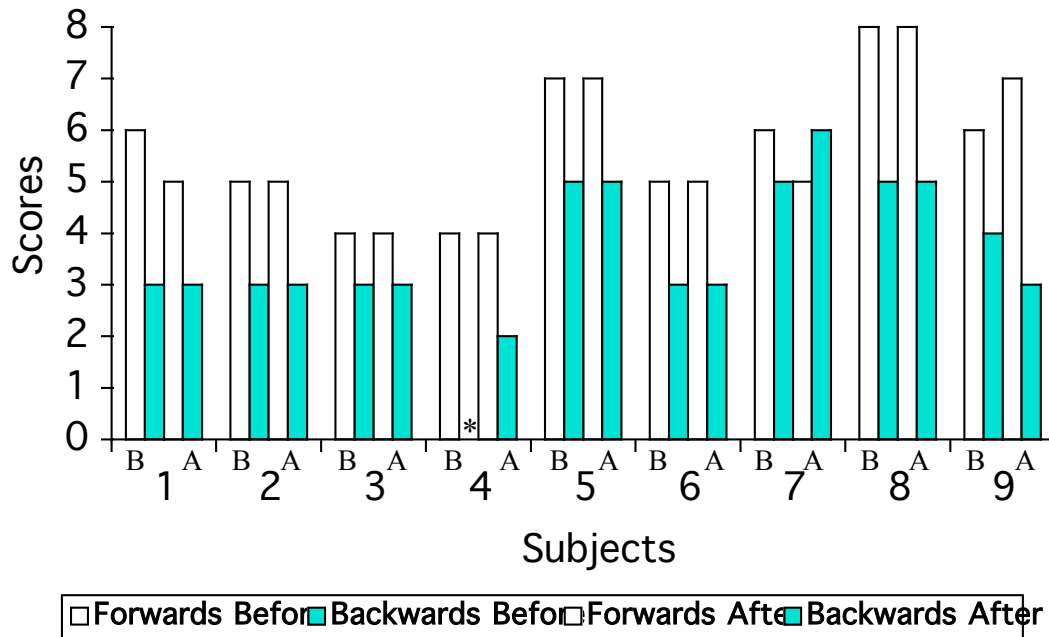
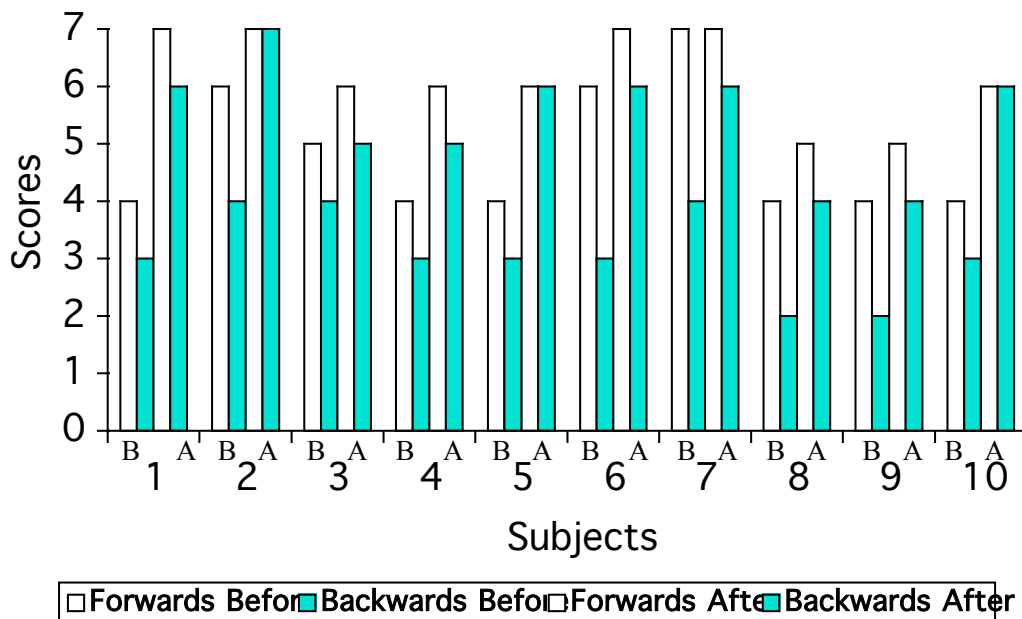


Figure 3b. Digit Span Scores for the LEAP[®] Treatment Group at the Pre-test (B) and Post-test (A) of the Study.



Reading Comprehension Task:

Reading comprehension is the ability to recall information about what was read shortly after reading it. Reading comprehension may not very with reading speed, as both slow and fast readers may demonstrate good or poor comprehension of what was read. Poor reading comprehension is expressed

by the inability to recall much of the detail of what was read or to confuse or confabulate the storyline or information presented by the author. Subjects with normal reading comprehension can easily recall greater than 90% of the material read when tested within a few minutes of reading it. Individuals with poor comprehension can generally recall less than 50% and may recall almost nothing.

All subjects were asked to read standard passages from the Neale Analysis of Reading and then tested for their reading comprehension. The percentage of reading comprehension on the before treatment varied from 62.5% to 37.5% with one case of zero percent comprehension as this subject was unable to answer a single question correctly on the material read. After the LEAP treatment for learning difficulties all subjects scored between 85 and 100% on reading comprehension (Figure 4a & b).

Figure 4a. *Reading Comprehension Scores for the Non Treatment Group at the Pre-test and Post-test of the Study.* * Six-year-old subject unable to read.

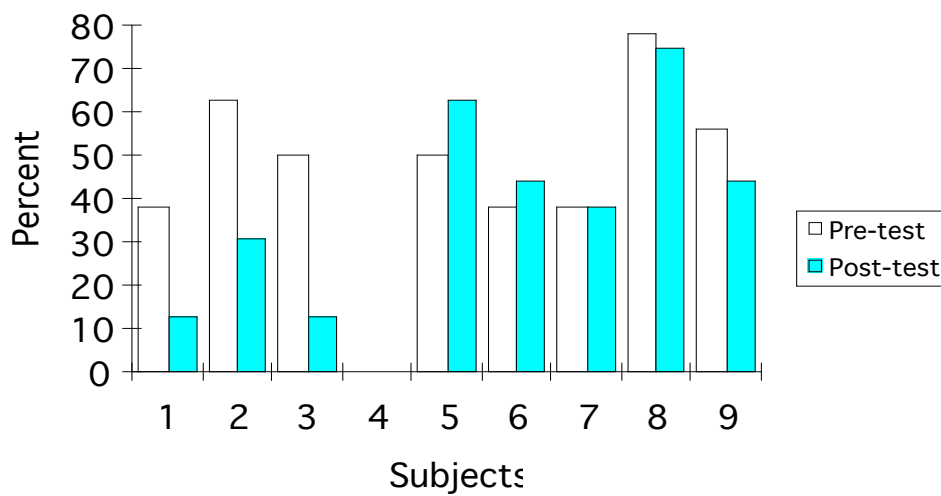
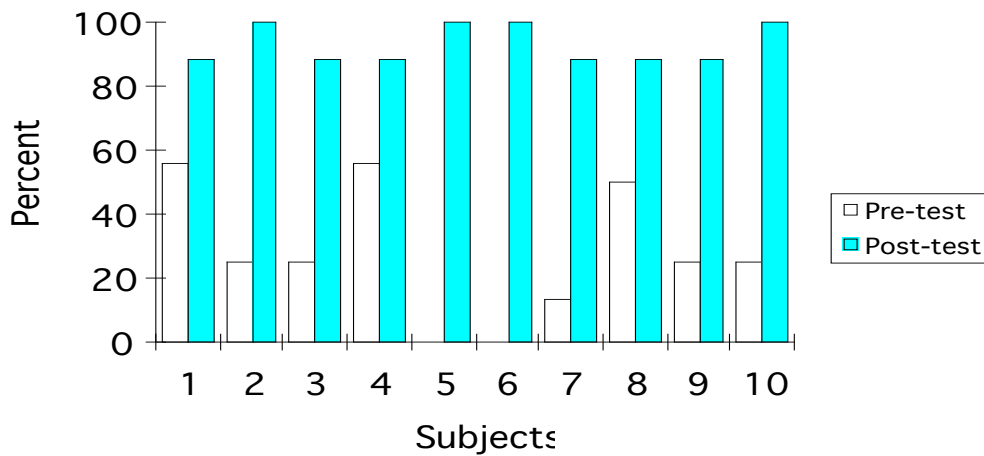


Figure 4b. *Reading Comprehension Scores for the LEAP® Treatment Group at the Pre-test and Post-test of the Study.* * 16-year-old subject unable to read.

** 11-year-old subject able to read a few small words.



The Efficacy of LEAP Acupressure Treatment for the Treatment of Specific Learning Disabilities: A Controlled Study.

By Dr. Toba Frankel, Haifa University and Dr. Charles T. Krebs, Melbourne Applied Physiology, Pty Ltd, In Preparation for submission to the International Journal of Learning Disabilities.

Introduction:

Thirty-two children from a school for children with Learning Disabilities in Jerusalem were randomly assigned to two experimental groups and matched for gender, age and types of learning disabilities. All children had been diagnosed as being Dyslexic, ADD, or ADHD, and half of both groups were taking Ritalin. All children were Pre-tested on a variety of tests from functional tests for speed of visual and auditory processing and speed of visual decision-making to tests for memory and learning such as the Wide Range Assessment of Memory and Learning (WRAML) and the Dyslexia Screening Test, to behavioural tests for ADD and ADHD as well as subtests of the Wechsler Intelligence Test for Children (WISC-revised) assessing academic performance.

In total thirty-two (32) separate Pre-tests were given each subject, and each subject was then Post-tested between four (4) and eight (8) months after the initial Pre-tests. The Control Group was Pre-tested, and then received only normal remediation available through the school, while the LEAP Treatment Group received on average of 11.5 hours of acupressure treatment over the first two-weeks following assessment by two different LEAP practitioners. Following the initial LEAP treatment, the LEAP Group then received normal remediation available through the school.

None of the Control Group who were only Pre-tested and then received normal remediation showed any significant change on the Post-testing. In contrast, subjects in the LEAP Treatment Group showed statistically significant improvement between the Pre- and Post-tests in Twenty-nine (29) of the 32 assessments performed, a truly remarkable result. Below are presented summary data on a number of academically and behaviourally relevant tests.

Speed of Visual & Auditory Processing:

The Visual and Auditory Order Thresholds are tests involving speed of visual and auditory intake, measured as the smallest interval between 2 stimuli necessary to accurately determine which of the two stimuli (left or right) was perceived first. These tests showed highly significant improvements between the before and after results for the experimental group with t-score analysis ($p < .001$); and showed no significant improvement for the control group. (Figure 5 & 6)

Figure 5. Visual Order Threshold: Pre- & Post-tests for the Control Group (Group 1) and the LEAP Treatment Group (Group 2).

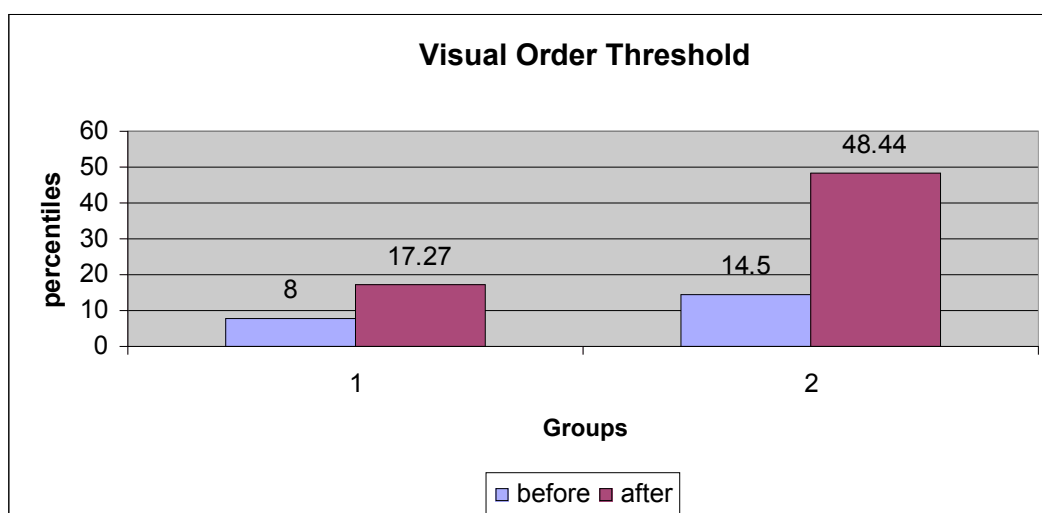
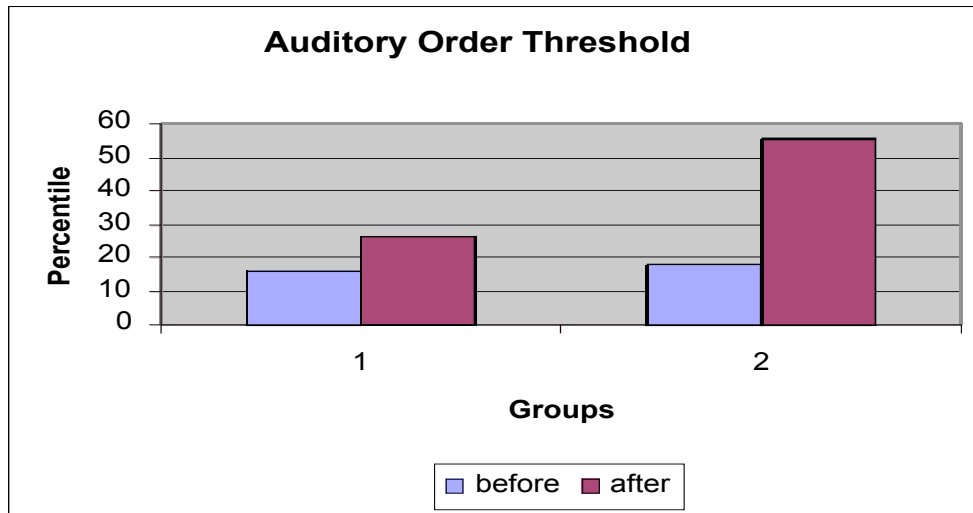


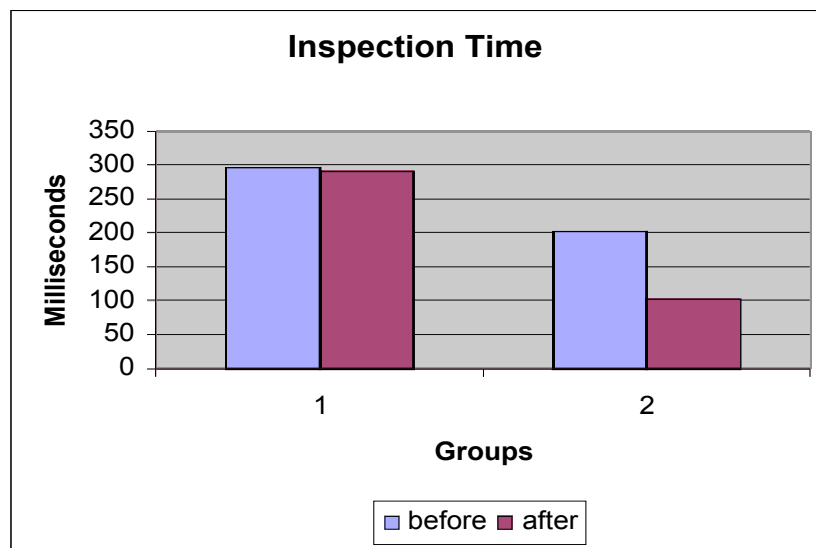
Figure 6. Auditory Order Threshold: Pre- & Post-tests for the Control Group (Group 1) and the LEAP Treatment Group (Group 2).



Speed of Visual Decision-making:

Inspection Time (IT) is a basic measure of how long a subject needed to inspect the data before they could make a correct decision 80% of the time. The more rapidly you can extract information from visual data, the more rapidly you can process this data at higher levels of processing, which is probably why individuals with the fastest IT scores also score highly on IQ tests. As in the previous Swinburne Study, IT showed no significant improvement in the Control Group and a statistically significant improvement following the LEAP Treatment. (Figure 7)

Figure 7. Inspection Time: Remained the same in the Pre- & Post-tests for the Control Group, but improved significantly in the LEAP Treatment Group.



By random chance, the LEAP Treatment Group happened to have several individuals who had extremely low ITs before treatment which lowered the overall LEAP Group average. In fact several of the LEAP Group had ITs in the low range for normal individuals, and thus could not improve after treatment, but all other subjects in the LEAP Group showed enormous improvement with the LEAP Group twice as fast after treatment than before.

Stroop Test: Executive Control of Impulse.

The Stroop Test is a very simple test: the subject is shown the name of a colour, say yellow, but the word is coloured blue. The rules of the test state that you must state the name of the colour written on the screen, not the colour of the word. However, colour is processed much more rapidly than reading the word, so the impulse is to say the colour of the word rather than the name of the word. Thus, the Stroop Test is a relative measure of executive control of brain function as the subject must inhibit their initial impulse – to say the colour they see, in order to follow the rules – state the name of the colour written on the screen.

Figure 8 shows that the Pre-tests scores are quite similar for the two groups. The Post-test scores however show almost no improvement for the Control Group, but enhanced executive control for the LEAP Group. This indicates that these people were now much improved at inhibiting their impulsive reactions by using frontal lobe to follow the rules. These results synchronise nicely with the SSVEP data showing the shift to frontal lobe activation during decision-making (Fig. 1).

Figure 8. Stroop Test: The Control Group showed no significant improvement, while the LEAP Treatment Group went from deficit to normal in performance of this executive control task. (ex = Experimental LEAP Treatment Group, co = Control Group)



Reading Comprehension Task:

Reading comprehension is the ability to recall information about what was read shortly after reading it. Reading comprehension may not vary with reading speed, as both slow and fast readers may demonstrate good or poor comprehension of what was read. Poor reading comprehension is expressed by the inability to recall much of the detail of what was read or to confuse or confabulate the storyline or information presented by the author. Subjects with normal reading comprehension can easily recall greater than 90% of the material read when tested within a few minutes of reading it. Individuals with poor comprehension can generally recall less than 50% and may recall almost nothing.

All subjects were asked to read standard passages from the Esther Tovli's Hebrew Reading Comprehension Passages and Reading Speed and then tested for their reading comprehension. The percentage of reading comprehension varied in the Control Group, as one six year old child that could not read effectively at the time of the Pre-test had begun to read by the time of the Post-test 6 months later. Also several other Control subjects now comprehended more of what they read, while others comprehended less on the Post-tests. In the Post-tests, all of the LEAP Treatment Group now had a reading comprehension between 70% and a 100% with every subject significantly improving their reading comprehension (Figure 9a & b).

Figure 9a. Reading Comprehension: Pre-test and Post-test Scores for the Control Group.

* One six-year-old subject unable to read at time of Pre-test.

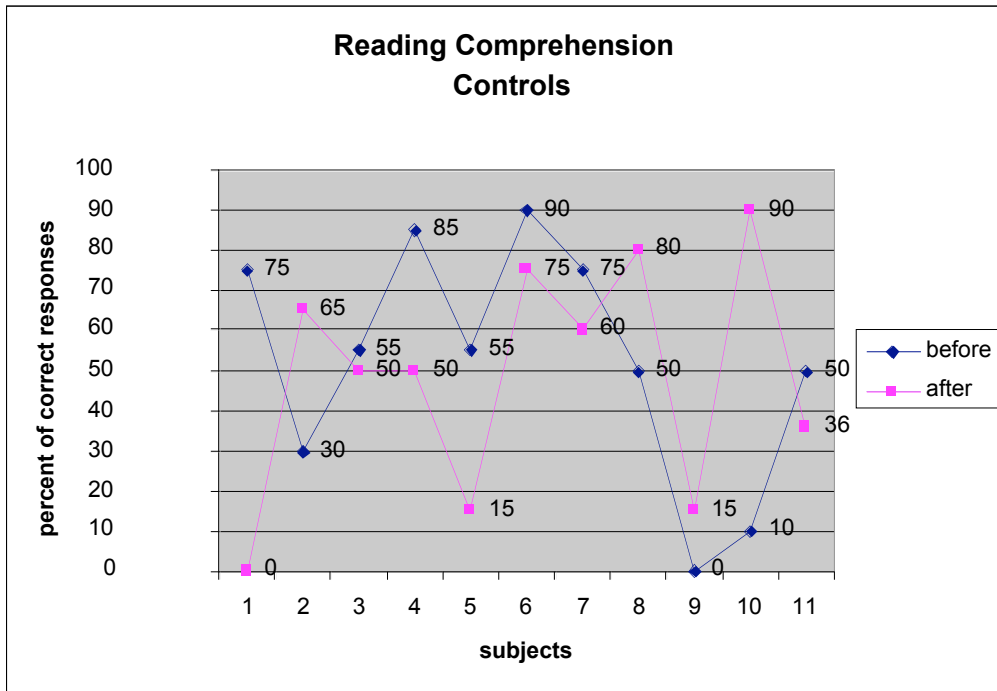
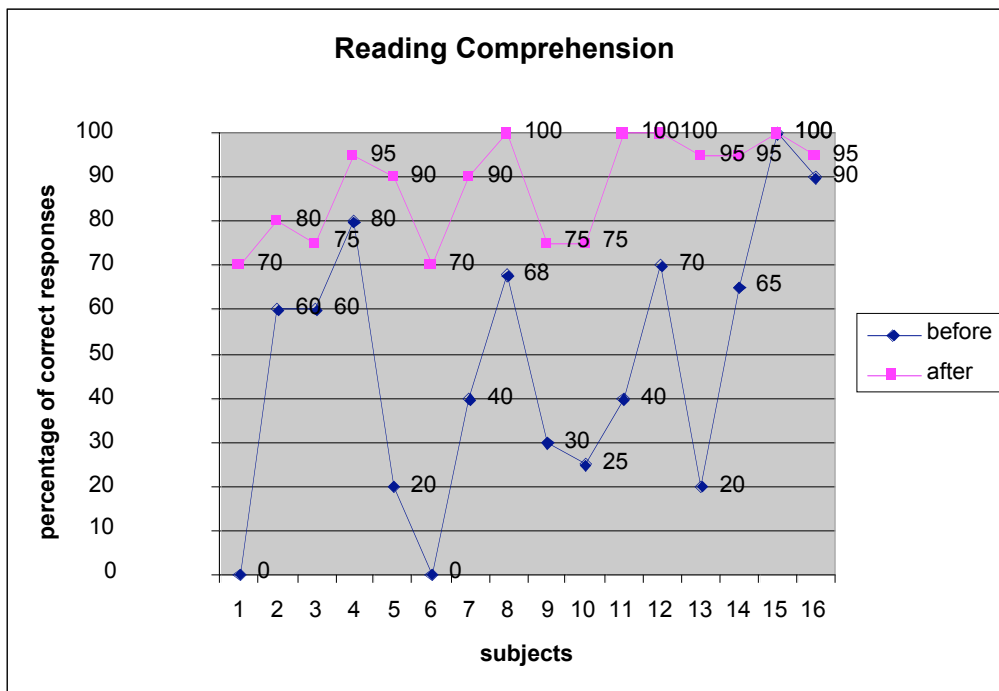


Figure 9b. Reading Comprehension: Pre-test and Post-test Scores for the LEAP Treatment Group.

* Two six-year-old subjects unable to read at time of Pre-test.



Dyslexia Screening Test

Another factor in reading comprehension is speed and accuracy of decoding. This was tested by two subtests of the Dyslexia Screening Test and both of these also showed a significant improvement; Nonsense Passage ($p < .05$), and One Minute Reading Subtest ($p < .05$).

Back Span, the reverse digit memory subtest of the Dyslexia Screening Test showed a significant improvement ($p < .001$), supporting the highly statistically significant results in Backwards Digit Span on the WISC-R test in the Swinburne study (Fig. 3b).

The Dyslexia Screening Test At Risk Quotient is based on the mean of only the problematic scaled scores, and At Risk Quotient showed a highly statistically significant improvement ($p < .001$) compared to the control group. This suggests that just 11.5 hours of LEAP treatment moved these children from being At Risk of demonstrating Dyslexia to no longer demonstrating strong dyslexic tendencies.

Wide Range Test of Memory and Learning

The Wide Range Test of Memory and Learning (WRAML) is a series of subtests predominately assessing memory and learning. While the Control Group showed no change between the Pre- and post-tests, the LEAP Treatment Group showed statistically significant improvement in each one of its subtests, Story Memory ($p < .05$), Design Memory ($p < .001$), Verbal Learning ($p = 0.56$), Picture Memory ($p < .001$), and Symbolic Working Memory ($p < .05$); and when tested by a Cronbach's Alpha of .800, showed a high reliability.

Conners' Rating Scales of Behaviour:

The Conner's Rating Scale of Behaviour is a standard rating scale of ADHD behaviours. It has three primary Indices: The Parents and Teachers Scales, the DSM Index and the Global Index. In addition to the tests of processing and cognitive functioning presented above, the Conners' Rating Scales of Behaviour show very positive results. The Conner's ADHD Index for the Parent Scales was statistically significant between LEAP Group compared with the Control Group ($p < .05$), even though the Teacher's ADHD Index was not quite statistically significant ($p < 0.58$). However, both the DSM Index ($p < .05$) and the Global Index ($p < 0.55$) as well as the Conner's ADHD Global Index for the Teacher Scales ($p < .05$) showed that the LEAP Treatment had a significant effect on ADHD behaviours for a majority of the children in the LEAP Group. Interestingly, of the original eight (8) children on Ritalin at the onset of the study, four (4) were totally off Ritalin at the end of the study and no longer displayed ADHD behaviours. All eight (8) of the children on Ritalin at the onset of the study in the Control Group were still on Ritalin at the end of the study.

Conners' Continuous Performance Test:

In contrast to the overt significant improvement in the ADHD Indices given above, the Conners' Continuous Performance Test showed no statistically significant improvement for the LEAP Group on this ADHD task. Even though there was no statistical significance between the Control and LEAP Groups on this task, the Confidence Index of being ADHD was lower for all but one child in the Post-tests in the LEAP Group, while few of the children in the Control Group reduced their Confidence Index of being ADHD over the course of the study.

WISC-R Subtests: Coding, Block Design and Arithmetic.

Coding is a test for visual short-term memory, eye-hand co-ordination and visual search strategy, clearly all important functions for academic success. This important function showed no significant improvement in the Control Group, but a highly statistically significant improvement following the LEAP acupuncture treatment ($p < 0.001$).

The Block Design subtest is considered an assessment of the innate visuo-spatial reasoning ability as it requires no verbal knowledge and is largely dependent upon fluid intelligence. This is one area of function that invariably improves significantly in clinical practice as you can watch the child improve in this task. Visuo-spatial reasoning underlies much of our thinking and is important in problem-solving. Thus the highly significant improvement on the Post-test in the LEAP Treatment Group ($p < 0.001$) compared to the Control Group supports these clinical observations. Interestingly the Wechsler's Block Design and WRAML's Design Memory show inter-test reliability with a significant Pearson Correlation for the LEAP Treatment Group versus a lack of correlation in the Control Group.

Arithmetic is clearly a foundation academic skill that is often difficult for most children with learning difficulties. This is partly because many of these children have great difficulty with abstraction, a purely Logic function underlying all mathematical processing. Again the remarkable improvement displayed by the LEAP Group compared to the Control Group ($p < 0.001$) suggest that the LEAP Treatment has huge potential to assist children overcome their Learning Disabilities.

Academic Performance: Cause of Improvement.

To note that significant improvements in high level academically important functions like reading comprehension occurred does not offer any explanation as to why they occurred? However, because of the large number of tests from basal functions to high-level cortical processing used in this study, it is possible to understand why these changes occurred, in fact why they would have had to occur! Reading comprehension is one of the highest level academic functions dependent upon many levels of coherent, integrated processing from the brainstem to the frontal lobes. If processes at any level are poorly integrated or poorly accessed, then reading comprehension will suffer.

In the LEAP Treatment Group, all children showed poorly integrated functions from the most basal level of speed visual processing through speed of visual decision-making to auditory and visual short-term memory to working memory of the frontal lobes. Reading comprehension is especially dependent upon the higher level working memory functions of self-monitoring and drawing inferences from what was read to fully understand the meaning of what was read, because without meaning there can be no comprehension.

Since the speed of visual processing (Visual Order Threshold), the speed of visual decision-making (Inspection Time), auditory and visual short-term memory (Digit Span & Coding) and working memory (WRAML) all improved statistically significantly individually, reading comprehension dependent upon these individual processes *must* improve statistically significantly!

Summary: The LEAP Acupressure Program offers an Effective Long-term Solution to Addressing the Correction of Specific Learning Disabilities for most Children and Adults.

From the data presented above as well as thousands of successful clinical outcomes both in my own practice and feedback from LEAP Practitioners around the world (LEAP is now taught in 10 countries), it would appear that the LEAP program provides one possible solution to resolving Specific Learning Disabilities on a long-term basis. In the Israeli study, the children were treated with the LEAP program, but not re-tested for on average of six months following treatment. Improvements that have persisted for six (6) months can be considered permanent, because LEAP corrects the basic Brain Integration problems underlying the symptoms of learning and memory dysfunction, rather than attempting to treat the symptom. On the strength of the data above, it would appear that a trial of the LEAP Program is warranted in the Victorian Schools.

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