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EXCEPTIONALITY SOLUTIONS THROUGH SOUND THERAPY

Why Aren't Children Learning? An examination of how Sound Therapy can enhance our approach to remedial learning

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Introduction

Why aren't children learning?

Learning is the most important activity our children undertake in preparation for their lives as adults, when we hope they will be able to contribute to the community in ways which fulfil their potential. Yet today it seems that more and more children are beset by learning difficulties, which means they struggle and fail, where they should be progressing with natural ease. Teachers are dismayed at how to teach a class when several children with ADHD are making it impossible for anyone to concentrate.

Parents are anxious to see if their children perform to the required standards, and when they don't, are thrown into the desperate hunt for solutions, hoping they will find a way that their child can catch up to the normal level.

How is it affecting our children and their future?

When children cannot keep up with their peers, cannot handle the curriculum, cannot learn to read and write fluently, what future do they have? Even trades and manual careers today require the three 'R's. Not only are illiterate young people faced with bleak employment prospects, but their self-esteem suffers throughout their schooling and a vicious cycle is created which often leads to drug use, crime or psychological problems.

Recent decades have seen significant increases in neurodevelopmental disabilities, such as ADHD, autism and other problems which affect children's ability to learn. In the United States, three to five percent of children have ADHD, and youth visits to physicians for the disorder have increased ninety percent from 1989 to 1996 .[1] While these conditions are often blamed on genetic causes, a growing body of evidence points to environmental and chemical contributors to the changing patterns of childhood disease.[2] Thousands of synthetic chemicals are now part of our daily lives, and most of these have only been invented in the past fifty years. Over 85,000 synthetic chemical compounds are now registered for commercial use in EPA's Toxic Substances Control Act.[3] We are also seeing increasing rates of asthma, childhood cancers, and disorders of endocrine function and reproduction.

If, as a result, more and more children are finding it harder to think, concentrate and learn, what does this mean for the future capacity of our race? As more and more people have reduced brainpower, surely scholarly institutions, and then professional bodies and government policy, will be affected. This is a very grave problem for society!

How can it be resolved?

While it is essential that we, as a society, address the causes of the problem, parents meanwhile need support to deal with the enormous struggles of daily life with a learning disabled child. Every possible remedial therapy and support system should be made available to parents to ease their burden, and to help their children regain their natural ability learn with ease. We need to look to methods which are harmless and will not lead to further health problems or possible drug addiction. Parents need to be alerted to early signs of learning problems, to be aware of the resources they can access, and to know how they may be able to prevent learning problems from occurring in the first place. We need treatments which are easy and cost effective to implement. These families are under enough strain without also having to pay out thousands of dollars for remedial programs. Government budgets are becoming more and more restricted, so solutions must be cost-effective. We need to look to prevention, which is always cheaper than cure. Then our social resources can be directed, instead, towards improving our overall standard of education.

What must be done to find solutions?

Throughout recent history a number of inspired doctors and other practitioners have made links between various fields of endeavour, and have come up with methods which restore natural function and ability to the parts of the brain and the senses where they are needed. One of the methods which most effectively addresses the issues of integration and function to assist learning is Sound Therapy, based on the work of Dr Alfred Tomatis.

Brilliant in his time, Tomatis did not fully understand how his method worked. Only now, with more advanced neurological knowledge, are we truly beginning to understand the mysteries of the inner ear system and how integral it is to our ability to learn. As we follow this path, mysteries are revealed which explain many areas of functioning—perception, expression, thinking and being. Sound Therapy opens the curtain which other approaches to learning leave drawn.

The field of Sound Therapy is about the rich and intricate connection between the ear and learning. It leads us to explore the different functions of the ear including:

- Hearing, balance, spatial orientation and the ear's role in sensory integration.
- The ear's ability to transform the vibrations we call 'sound' into meaningful and beneficial stimuli.
- The role of the ear in prenatal, developmental neurology.
- The role of the ear in relation to language, evolving consciousness, the sense of the 'other', and the early budding of our desire to communicate.

All our senses—sight, touch, smell, taste, balance, movement, internal body-awareness and hearing—play an essential role in learning. We will look at how ear function is interlocked with, and fundamental to, our other senses and the whole, marvellous learning process.

Addressing the correct development and integration of the senses is a natural and supportive way to improve functioning and learning capacity for all children. Bringing this awareness into our child-care and education systems could serve to prevent a great many problems from developing in the first place. Therefore I hope that this information will be used, for prevention, by all families who wish to help their children be the best they can be.

Part 1

Some different views on causes and solutions for learning difficulties

When a child is growing and learning, each year, month and day are momentous opportunities for a foundation of joy and knowledge to be laid down. It is essential that educators and parents are able to use a range of interventions to help make the journey easier and more rewarding for

themselves and the child. All children have a tremendous capacity to learn, whether they are gifted children, of average ability, or specially challenged.

The sensory integration premise

My premise is that almost all learning and developmental problems can be most effectively addressed with sensory integration therapies. These may include Sound Therapy, vision therapy, and tactile, movement and balance activities. Probably the most fundamental and intrinsic of the sense organs to sensory integration is the ear, housing as it does the organs of both hearing and balance.

However, this view is relatively new and unfamiliar to many parents and practitioners. I will examine in depth the evidence to support this premise, and how it differs to the alternative views.

I will explore three different viewpoints which I will call 'Behavioural', 'Mechanistic' and 'Integrative.'

The basic premise of the Behavioural approach is that the problem is caused by poor parenting or the wrong sort of education. The child is not learning simply because he needs a different sort of instruction. The solution offered is: remedial instruction programs, parenting classes and more intensive study hours for the child.

The Mechanistic approach is a reductionist view that seeks to identify the specific fault in the way the brain functions, and then supply the missing element to compensate for that fault. If certain neurotransmitters are not being produced, a drug is administered to replace those chemicals. Specific measurement is taken only of the identified problem and how the intervention affects it. Little attention is paid to side effects or larger social impacts.

Then there is the Integrative approach. This is based on a philosophy of wholism which sees the brain as a self healing, regenerating system that can effect its own repair if given the right sensory stimulation. Rather than isolating one specific problem or deficit, this approach looks for all the linkages between different areas which need improvement, and heals by increasing interconnections in the nervous system.

Let us look now in a little more depth at the assumptions and implications of each of these views.

The behavioural view

This view says the child would do well if he or she tried harder, the educational system needs to change, and that reward and punishment behaviour modification techniques work best. We need to measure and improve teacher effectiveness and provide special instruction to those children who can't learn in the classroom.

It's just poor parenting

The behavioural perspective tends to focus on mistakes made by parents and teachers. If you see a lot of bad parents trying to manage ADHD children it is easy to assume that the parents are the problem, that if only they didn't give in to the child, or if they gave it more love or firmer boundaries or more stimulation, it would behave differently. Poor parenting certainly can exacerbate ADHD, but it is not the cause. Because ADHD children are so stressful to manage, many parents, finding after some years that they cannot solve the problem through discipline, back off and choose a more peaceful path. It is easy, then, for an unfamiliar observer to jump to the conclusion that the lack of discipline is the cause of the problem, when what they are seeing is just the coping mechanism of the parent.

The very best, most patient, most aware parents in the world may find they have an ADHD child, and some of the worst parents have children who do not suffer from the problem. So, to blame the condition on poor parenting is really a superficial and unsatisfactory response. Even if there is a statistical correlation between poor parenting and ADHD, this does not prove that the one caused the other.

In fact, a study done by researchers Dr Barkley and Dr Cunningham in 1980 showed that, rather than poor parenting causing ADHD, the hyperactive behaviour prompts poor parenting habits. When the child's behaviour improved with drug treatment, the mother's responses changed for the better.[4]

They need different ways of teaching

ADHD children learn differently. They do not conform well, or respond well to traditional curricula. They are often bright, get bored easily, rebel and do their own thing, and may turn out to be quite brilliant and talented later in life. Fortunately, educational experts are finding ways to teach ADHD children more effectively by using multi-sensory stimulation, letting the learner play a more active role and by following the child's interests rather than a set curriculum. These innovations are excellent and it would be wonderful if they were applied to the whole educational system. However, they are more labour intensive, so this is unlikely.

It is advantageous for ADHD children to be seen as different, rather than disabled, and this attitude comes from a position of truly wishing to help and facilitate the growth of the individual. However, we are fooling ourselves when we suggest that ADHD is not a disorder. Although we can accommodate these children with better resources and special tutoring, the fact is, that life is more difficult for them, and they are limited in some of their abilities to plan, organise and enact their will in an orderly way upon the world. These approaches are effective coping strategies, but they do not address or remedy the underlying problem, which is that these children are not able to focus their attention the way they should.

The mechanistic view

This view says that the child is not learning due to a genetic disorder which causes the brain to malfunction unless given certain drugs. Malfunctions can be isolated and compensated for. Until we can fix the gene problem, the best course is to use chemical stimulants to help the brain to function better. There is no viable alternative and this is an easy and effective treatment. Parents have a right to a peaceful home life, and the child has a right to be given a substance that will allow him to concentrate and learn.

It can be easily fixed with a drug

Drugs give an apparently quick fix, but parents choosing this option may not have anticipated the possible dangers of drug therapy. Because drugs are in most cases wholly geared towards treating the symptoms, by suppressing the symptoms in this way we make it less likely that we will ever identify and treat the underlying causes of the problem.[5]

Drug treatments are popular with many consumers today because they want a 'quick fix'. We are used to an 'instant' culture where anything can be fixed with a machine or a pill. Overstressed parents are particularly in need of quick, effective solutions when dealing with overactive, exhausting kids. Hence, they are receptive to, and willing to accept, the medical approach of stamping out the symptoms with drugs. The trouble with this type of 'quick fix', though, is that in the long term it usually makes the problem worse. The generation that is growing up on drugs now, for example, will be even less able to provide their children with healthy immune systems, or an environment to support them.

There is nothing wrong with giving kids psych drugs

In short term drug use there is noticeable improvement in about 80% of cases.[6] What is alarming is the rate of increase at which medication is being given to our children. An article in the *Journal of the American Academy of Child and Adolescent Psychology* quotes the incidence of ADHD at 3%. The rate of medication has doubled every two years since 1971.[7]

Abuses have been revealed which include incidents of children snorting Ritalin, teachers and pharmacists stealing it, and parents selling it. An expert from the Ohio State Pharmacy Board, Tim Benedick, said on an ABC 20/20 show, "Ritalin is highly addictive. It is speed."[8] While these examples are from the US, other countries generally follow the same trends to a lesser degree.

Ritalin has been nicknamed "paediatric cocaine." It is very similar to cocaine in its chemical make-up, and both drugs use the same receptor site in the brain. They create the same "high" and are used interchangeably in medical research. We are prescribing drugs very similar to cocaine to children as young as three.[9] Is it any wonder we have a drug problem? Are we teaching our children that drugs are the answer to any problem? It is seen as acceptable because a doctor is involved. But who is to say that doctors have infallible judgement on these matters, especially when their training and ongoing professional pressure teaches them, too, to solve so many problems with a drug prescription?

The integrative/organic view

Learning disabilities are increasing due to environmental toxins

ADHD and other neurological functioning disorders are growing in epidemic proportions. While there has not been a lot of research funding directed to this field, there is sufficient evidence for us to be extremely concerned.

In the past sixty years, thousands of new chemicals have been invented and we know very little about their combined effect on our, or our children's, health. For example, in the US over 85,000 synthetic chemical compounds are now registered for commercial use in EPA's Toxic Substances Control Act, and 2,800 high-production-volume (HPV) chemicals are currently produced in quantities of 1 million lbs, or more, per year.[10]

Australia is known to have a worse record than most western countries in its regulation and control of the use of toxic chemicals.[11]

Many hundreds of these chemicals, which are widely used in foods and other consumer products, have never been tested for their potential toxicity to humans; fewer still have been tested for their possible developmental toxicity to children.[12]

Moreover, toxicity tests are often completely inadequate to measure long term effects; nor do they address the impact of ingesting wide combinations of chemicals. Therefore, the hazards that these chemicals may pose to children's health and development are still largely unknown.[13]

However, we are seeing increasing evidence that this uncontrolled mix of new chemicals is contributing to changing patterns of disease in children: the wide prevalence of neurodevelopmental disabilities such as ADHD and autism, increasing rates of asthma and childhood cancers, and hormonal abnormalities which effect endocrine function and reproduction.[14]

Certain toxins have been found to disrupt attention span, as in ADHD. The most studied of these is lead, which is known to decrease IQ, reduce the ability to pay attention, and increase disruptive behaviour in the classroom.[15]

Another class of toxic chemicals which has been shown to interfere with children's cognitive development is Polychlorinated biphenyls (PCBs).[16]

PBCs are especially problematic because of their long persistence in the environment—and in human tissue. Children may be exposed to PCBs *in utero* (as they can cross the placenta), through breast milk, or from dietary sources such as fish and shellfish, and from certain other fatty foods, which contain high concentrations of PCBs. These chemicals have been associated with poorer neurodevelopmental function in infants.[17]

Other studies in Holland and Michigan found that such exposures could result in lower IQ scores and poorer verbal abilities.[18]

Less research has been done on environmental causes of autism spectrum disorders, but several studies have shown connections between thalidomide and autism.[19]

Other research indicates an interaction between genetics and industrial contaminants in the environment.[20]

For those who look, there is plenty of evidence (despite limited funding to this field of research) that there are real, increasing, environmentally caused problems affecting our children. This is creating increased learning and behaviour problems, which are taxing parents, child care centres and schools to their limit as they attempt to cope.

Supporting development *versus* covering symptoms

While prevention is a pressing issue for environmental policy makers, parents and teachers are faced with helping those children who have already suffered damage. The new wave of sensory integration therapies offers the most palatable solution to addressing these problems, after the fact. Numerous inventive, pioneering clinicians have found ways to repair chemically caused damage, using only supportive, harmless means. The philosophy of sensory integration therapies is to access the nervous system via its sensory receptors, using the portals that nature designed, to bring about learning and neural development.

The idea is that the brain never stops learning and rebuilding itself. Interruptions at a crucial stage of development can leave the child lacking in certain brain structures, but a remarkable degree of repair is sometimes possible when an approach is used that works with, not against, the nervous system. The right stimulation will increase the plasticity of the brain, enabling it to regenerate more effectively. Because the human body works in a highly complex, integrated way, a weakness at any point has multiple impacts on function. Conversely, when one sensory pathway is restored, there may be exponential benefits as other, linked systems spring back into function.[21]

Educational tools and Sound Therapy

I propose that we add sound, as an educational and therapeutic tool, to the smorgasbord of treatments offered today to enhance learning. This range includes private tutoring, remedial education, sensory motor (movement) activities, speech therapy, behaviour management, diet, supplementation and medication. Sound Therapy is the least known and least explored therapy to be added to this list, and is currently only included in a small number of multi-treatment clinics and referral networks. It is however a vital part of assisting learning and brain development.

A powerful tool for change

Sound Therapy uses music, that has been filtered in a special way, to stimulate the ear and brain. It is a powerful tool, going far beyond music therapy, for it can restore brain function and enhance learning at any stage of life. However, because of the way brain pathways are built, it is a fundamental fact that the earlier an intervention is given, the greater will be its effect. The mother listening prenatally will perhaps help the child more

than anything. A child listening in the first weeks or months will have more impact than listening at age three; but listening at four is again so much more powerful than listening at eight or ten or twelve. Yet, because of the amazing resilience and plasticity of the brain, this is doesn't mean that the seventeen year old or the thirty year old will not profit. In fact even the ninety year old usually notices a significant advantage from the therapy. Just like education, Sound Therapy is beneficial at any stage of life.

Sound Therapy is a listening program that was researched and developed by the pioneering French ear specialist, Dr Alfred Tomatis. It uses specially filtered classical music to stimulate the ear and enhance brain development. It is an easy and highly effective way to improve auditory processing, language development, learning and behaviour. It has been found effective in speeding and enhancing language skills for all children. It has also frequently proved beneficial for children with special needs such as ADHD, Down's syndrome, autism spectrum disorders and speech problems.

The particular benefits of Sound Therapy are that it:

- Provides direct brain stimulation through the auditory sense
- Can correct many language problems early, before schooling becomes a problem
- Enhances and builds brain connections
- Improves sensory integration by activating the cerebellum
- Improves language skills by stimulating the auditory cortex
- Improves ear function and reduces ear infections
- Enhances other forms of remedial learning and sensory treatment
- Is simple and easy to use
- Is cost effective
- Can be used at home or in schools
- Is beneficial for all children, whether of average ability, specially gifted, or learning disabled

Does my child need therapy?

For parents, it is hard to face the thought that their children may have some kind of developmental disorder. More than anything, parents want their children to be healthy, talented and a brilliant reflection of themselves. However, the fact is that many children today are dealing with new environmental challenges, and many do have special needs. The sooner those needs are identified and catered for, the greater the more likely it is that our children will reach their true potential.

Living with a 'different' child

When a child is diagnosed with ADHD, learning difficulties, sensory integration disorder or autism, all of these conditions lead to behavioural problems. Many mothers would recognise this real account of one mum's day with two challenging children.

'When one day bleeds into another and you haven't been to sleep 'til 2 am, you get up feeling like a walking zombie. You were up four times in the night to screaming nightmares or bedwetting. Then the kids are up again at 7 am and you stagger out, bleary-eyed to start making their breakfast, grabbing the tea towel off Jared before he pulls all the glasses onto the floor.

Half asleep, you have to feed them and wrestle their clothes on, while trying to stop them trashing the house, then make sure they don't kill each other before you get them into the car.

Going to the toilet gives no respite with the little one hanging onto your knees and the eldest wanting a hug when you'd like a quiet moment.

You come back to the kitchen and Jared is pulling things out of the cupboards—any that don't have a safety catch are fair game. He pulls everything out just for fun. Then while you're putting those things back in, he pulls a chair over to get up to the high cupboards and drops the picnic basket on his brother's head. More screaming.

You put him out in the yard so you can think to get their breakfast organised. He finds some sticks in the yard and starts playing at being Buzz Lightyear or some knight in shining armour swinging a stick around pretending it's his sword. When you open the door to let him in, he pokes you in the eye with his sword. As you sit down to feed the baby with a damp cloth on your eye, the baby throws his spoon at Jared so Jared whacks him and he cries. Then you tell Jared off for hurting the baby and he starts crying too, so you can't hear yourself think. Not much breakfast is being eaten!

You finally get all their bags organised, bundle them into the car, drive to Day Care, do the shopping, and it's 2 pm before you get anything to eat. Today was the first time in six months that you have taken him to Day Care because he's been behaving better and you think that surely now he'll fit in OK. You sure need a break! Doing the shopping was a breeze with only the baby. You are finally sitting down to a cup of tea when the phone rings. It's Day Care! The supervisor says, through loud howling in the background, "Could you please come and get your son. He is uncontrollable and we simply cannot cope with his violence towards the other children."

You choke back the tears of exhaustion and frustration. Gritting your teeth you say, "I'll be there soon," thinking to yourself, "how is it—I manage him twenty four hours a day; these are trained professionals and they cannot handle him even for two hours!" You have seen before how, in any conflict, your son gets blamed and the other children are always assumed to be perfect angels. A child with ADHD has special needs, but he isn't given a fighting chance.

Wherever you go you see lots of people looking and thinking what a bad parent you are. When you turn up at Day Care you hear two different kids say, 'There's that naughty little boy'. 'All he needs is a good smack'. Labelled naughty before he goes in the door, what chance has he got of forming good relationships?

Finally Dad gets home and you sit down for dinner, hoping for a few peaceful minutes to eat. Next thing, the baby pulls a hot pot of curry over himself. He was sitting on Dad's lap next to the counter and grabbed the cord to the electric frying pan, dragged it towards him in one gesture and the curry went all over him. So it's off to the hospital instead of sitting down to dinner, both blaming yourselves, 'why weren't we more careful?' But it's impossible to be careful enough with octopus arms everywhere and that insatiable impulse to reach and grab, far beyond the level of the average child.

The only break you get is on a Saturday, when once Dad thinks he can take Jared to the shops. But that doesn't last long. While Dad is reading the list and trying to find the items, Jared grabs a packet of chips and runs out of the store and up the street. Dad follows in hot pursuit. Jared crawls under a parked car so he can't be caught and calls out 'na-na, na-na-na you ca-an't get me!' Dad arrives home cranky and hands Jared over ranting, 'Take him would you I've had enough!' he carries on, 'We *have* to do something—this is *ridiculous*!' Dad does not take Jared to the shops any more.

You know very well how hard it is shopping with Jared. One day you lost him in the supermarket for forty minutes. You were pulling your hair out, frantic with every story going through your head about how it only takes two seconds for a child to be abducted, not daring to wonder, has he been picked up by a paedophile? Finally, after forty minutes of desperate searching, you found him sleeping in somebody else's pram! Then there was the day he put the dog in the drier, set the kitchen alight, drove the car out into the street, threw the cat into the fan, and drove his bike headlong into a stone wall.

If you can get them to sleep before 12 pm you're doing well. And then it starts all over again. But still you love them more then anything.'

Stress on the mother

Many mothers have confessed that they have come very close to 'losing it' with their learning disabled children. Sleep deprivation, combined with the need to be constantly vigilant (often into the late evening), the difficulty of getting breaks because baby sitters and child-care centres can't cope, constant trouble at school—all add up to an overwhelmingly stressful life. Motherhood is not a job you can just resign from! If the mother is at home with the children it is usually impossible to achieve anything around the house, so her partner frequently comes home to chaos, the cooking and shopping not done, and a wife desperately needing a break. These stresses can, and often do, lead to conflict in marital relationships.

Common behaviours

Some of the common difficult behaviours in children with ADHD and other learning and developmental disorders are:

- irritability
- poor concentration
- impulsivity
- unreasonableness
- restlessness
- argumentativeness
- tantrums
- uncontrollability
- aggression
- excitability
- unhappiness
- short attention
- lack of perseverance
- unwillingness to co-operate
- restless sleep and trouble settling to sleep
- disruptiveness and hyperactivity

as well as poor school work including:

- reversal of letters

• poor reading ability, spelling and maths
• fear of school
• inability to make friends

These are often accompanied by health problems such as:
• sore throats
• tonsillitis
• bronchitis
• colds
• bed-wetting
• urinary tract infections
• constipation and diarrhoea
• stomach pain
• leg pain and joint pain
• ear infections
• twitching
• eczema and rashes

Contrasting viewpoints

I will now present the evidence I have discovered about pre-natal and early childhood development. This knowledge gives a deeper appreciation of how the child's brain and nervous system unfold in the early years laying the foundation for all future learning. Unless nature is allowed to take its course and the psycho-physical organism allowed to develop organically, we are seeing more and more that functional problems will arise in the educative process.

Part 2

Baby in the womb

The miracle of language

Daniel was slow to begin speaking. His mother had been under a lot of stress during her pregnancy and he was born several weeks premature. He suffered from a series of ear infections and allergic-like symptoms in his first two years. By the age of three he was only saying a few words and no one but his mother could understand him, but the doctor said this was within normal range. It was very hard to get him to sleep at night so the whole family's rhythms were disrupted and his parents were exhausted. Then they went to an environmental doctor who suggested mineral supplements, a change in diet and a few other sensory integration therapies. Daniel started seeing a specialist physiotherapist who developed a movement plan to stimulate sensory integration. He also had cranial osteopathy to correct the alignment of his cranial bones which had been affected by his birth, and he started listening to Sound Therapy every night. Within a week his parents were amazed at the change in his speech. He started using words they didn't know he knew, using them in context and putting together much

more advanced sentences. After two weeks he was sleeping better, better co-ordinated and easier to manage all round.

This story is typical of children whose development has been delayed by stress, toxins and illness. Recovery often comes very quickly when the right combination of treatments is given to stimulate integration of the nervous system.

A baby's brain begins to develop several months before birth. Millions of brain pathways are created, the foundations for thinking and learning already laid in place at birth. The first years, the first months, the first hours of life have immense importance in the future intelligence of the child. The baby's brain is stimulated by inputs from the senses. Smell, sight, touch, taste—movement, all these sensory inputs build the new being's sense of the world.

Children's author and learning advocate, Mem Fox says 'It's as if the brain were an excited acrobat learning fantastic tricks with every new piece of information.' [22] What the acrobat does with this new information is actually to build new brain connections, creating axons and dendrites, the communication wires that connect the neurons and send messages between them. A child's learning, which grows by leaps and bounds in the first months and years, is built up in layers. First the child learns to appreciate space, movement, the sensations of its body. It learns to recognise faces, to hold its head up, to cry for food and to move its hands. These learnings affect the most basic brain wiring, creating a structure of communication between the neurons on which more complex perceptions can later be hung. By the time she is a year old, the child will probably have learnt all the sounds in her native language. Later she refines her ability to reproduce the sounds, and later still learns the letter symbols that represent them.

Each layer of learning lays a foundation on which the next level of understanding can be built. Just as with building a house, the quality of the foundation is of vital importance for the stability of the next level. If the foundation is shaky because it was learned under stressful conditions, if there is an association of pain or fear or humiliation which occurred at the time of certain levels of learning, this will always be restimulated when that learning is accessed. It is for this reason that child psychiatrists advocate the great importance of creating a safe, loving environment for the child in his early hours, days and months.

The first layer of learning is the most crucial, as it determines the wiring structure for everything that hangs off that level. However, the brain's genius is that it learns to adapt by closing off painful memories, going around them, creating new pathways of understanding. Instead of the simple structure of a house which has stumps carrying bearers and joists, then walls, rafters and a roof, the brain is made of millions and millions of complex interweavings which are infinitely adaptable. To an enormous extent, the brain can deal with trauma, setbacks and stress, while all the while receiving the stimulation of human language, which eventually takes on meaning. However, it is still true that a happier, more secure child learns more easily and develops greater intelligence because her attention is not being diverted by disturbing

emotions which interrupt the chemical and electrical transmissions of the neurons. Trauma may cause a child to set up more complicated pathways which make the efficient conveying of information difficult.[23]

The ear

The ear is a miraculous organ combining hydraulic pressure pumps and electro-chemical energy systems which are far more complex than any machine used today. The complexity of this organ's contribution to learning and language can perhaps be better understood if we look into its evolutionary origins. The ear evolved from the gills of the fish, and its original purpose in the early vertebrates was for sensing variations in pressure. It was only much later that it became our instrument of hearing.[24] As a hearing organ, its first role was to stand guard against danger. Detecting the direction of sound was of primary importance. Now, it has become our instrument of communication with other people and has been adapted to analyse nuances of sound in incredible detail.[25]

Dr Tomatis, who was the first to uncover the miracle of healing the ear with sound, calls the ear 'the Rome of the body' because almost all the cranial nerves lead to the ear. This shows that hearing is not an isolated sense but is integral to all levels of our awareness. Our sense of hearing interacts with our visual and tactile senses, and with our vestibular sense which gives us our orientation in space.

Our hearing organ is encased in a series of bony chambers which also house the vestibular system, the organs which inform our sense of balance and movement. This intimate involvement perhaps shows why music has such an influence on the whole body.[26]

Hearing is the most developed of the senses before birth. The ear develops alongside the brain, and, as neural connections are formed in the womb, the structures we use for hearing are growing at the same time. Our whole nervous system; the incredible sensory receptor of our skin, are linked, too, in so many ways to the developing ear. In tracing its embryonic development, Tomatis concluded in fact that the skin is differentiated ear.[27] We listen with our whole body, as though our body is a huge extension of our ear.

When does the foetus hear?

It has been proved that the foetus has hearing at four and a half months, but Dr Tomatis, the pioneer of the work on early human hearing, believed that hearing begins much earlier.[28]

Tomatis began with the question 'why do we need to speak?' Why this need to be in constant communication? He began to get answers from the literature on the hearing of baby birds inside the egg. When studying to be an ear, nose and throat specialist, he was reading the work of the world renowned English scholar, Negus, *The Mechanisms of the Larynx.* One of the observations in this comprehensive work was that if the eggs of songbirds are

hatched under silent foster mothers, the birds, when they are hatched, may be unable to sing.[29]

This triggered Tomatis's curiosity and exploration into the auditory world of the unborn. He realised that the auditory conditioning of the birds must begin in the egg, and asked, therefore, 'is the same true for humans?' Tomatis would have liked to repeat the experiments himself but was unable to, due to a lack of time, money and eggs.[30]

What does it sound like in the womb?

The sounds that the foetus hears are predominantly low frequencies due to being filtered through water. At the time of his first experiments, using the technology available in the 1950s, Tomatis incorrectly concluded that the filtering effect of liquid raised the frequencies of the sound, meaning it made the sound higher pitched. In fact, it is the reverse. However, he was correct that the foetus hears high frequency sounds first, because the part of the embryonic ear that develops first is the part that hears high frequencies.

Environmental sounds form a background medley over which the mother's voice dominates, holding the attention of the foetus. These sounds are extremely important, for through them the first emotional and mental bonding is established between child and mother. Much research shows that babies become calmer when exposed to a tape of intra-uterine sounds.[31]

Tomatis gives a beautiful description of the sounds heard in the womb:

'The universe of sound in which the embryo is submerged is remarkably rich in sound qualities of every kind. The foetus experiences internal rumblings, the movement of chyle at the time of digestion, and cardiac rhythms at a sort of gallop. It perceives rhythmic breathing like a distant ebb and flow. And then its mother's voice asserts itself in this context, a little noise superimposed on all the other sounds, a noise in the form of a coded message of exceptional quality.' [32]

Tomatis suggests that the visceral sounds of the mother—the heartbeat, the intestinal gurgling and respiration—explain our universal love of the sound of surf, which reflects these rhythms and perhaps gives us our own internal sense of rhythm.

Our knowledge of embryonic development now confirms what Tomatis first mooted about how early we begin hearing in the womb.

Gestation and the development of the ear

3rd week	ear first appears
16th week	ear is functional and foetus responds to a sound pulse
20th week	the cochlear structures are functioning
24th week	foetus begins actively listening [33]

Position may also make a difference to auditory perceptions. An eight month old foetus in the cephalic (head down) position will experience more sound from bone conduction. Its head is closely wedged against the mother's pelvic bones. This will stimulate sound vibrations in the tiny bones of the foetus's middle ear, already developed to its full size.[34]

Sonic Birth

Sonic birth is the term Tomatis developed to describe the acoustic experience of the birth transition. A major adjustment is required to adapt from the muffled internal sounds heard in utero to receiving and deciphering sound carried through the medium of air. The amniotic fluid empties out of the baby's ear on the tenth day after birth. Prior to that, it still hears sound as in utero. When the fluid empties, the child is left in auditory darkness and must begin adapting to the air medium.[35]

Here our mother plays a crucial role, if she is available to us, to motivate and communicate, for she is the link between pre-birth and after-birth experience.[36]

Tomatis says that we long

'…to be cuddled and caressed by a voice that seems to be the same as the already familiar one that spoke to us in the depths of our uterine night. We think we recognise it, even though we cannot put an image to it. This voice approaches us whenever we cry with hunger. As we suck with greed what our mouth has touched, we drink avidly at the same time of the voice that pours its bounty over us. Vocal food is as necessary to our human development as the milk we take in.' [37]

The Sound Therapy program that Tomatis eventually designed is another way of bridging that gap between the heavenly sounds of the womb and the reality of this air filled world. In doing so it gives us the opportunity, at any age, to also bridge the gap in the psyche of the individual who somehow lost or left dormant a part of the self, which never fully transposed itself into the adult world. Part of development, whether sensory, mental or emotional, can be left in limbo when, on some level, there have been insufficient personal resources to achieve maturity. This lack can be bridged by sound when we create a simulation the birth experience, and, through the process of Sonic Birth, support the individual to successfully make the transition.

High frequencies

One of the most important discoveries Tomatis made in his years of research was the beneficial effect of high frequency sound on the brain. The mother's voice is the first high frequency sound we hear. Its special encoding of detailed meaning, its message of love, gives it an importance no other sound will ever have.

High frequencies are high tones, as opposed to low tones. Children's voices contain more high frequencies, and fewer low frequencies than adults' voices. A violin gives out more high frequencies than a cello.

The human ear is designed to respond to, and benefit from, the rich medley of high frequency sounds found in a natural environment. Rain, running water, birds and insects generate an abundance of stimulating, high frequencies. Unfortunately, today children grow up in a world dominated by low frequencies and these have a tiring and dulling impact on the nervous system. They are not the sounds which stimulate, enliven and create interest.

Moreover, most of the low frequencies are machine noises, accidentally generated by industrial necessity, not created for the purpose of enjoyment, communication or education. Our willingness to let ourselves and our children suffer this constant bombardment of noise, clearly demonstrates that we do not attribute much importance to the impact of sound upon our health.

The noise level in the womb is thought to be about 30 to 96 decibels. This is around the level of normal conversation. Compared with our normal sound environment, the womb is relatively quiet.[38] However, ultrasound, which is used to give us a visual image of the foetus, is known to cause a much higher level of noise and may be quite disturbing to the foetus.

There is clinical evidence that noise can damage babies. A Japanese study of pregnant women near Osaka airport found they had smaller babies and an increased incidence of premature births. I would have to suggest that air pollution could be a contributing factor in this case. However, chronic noise has also been associated with birth defects.[39] Knowing this, surely it would be wise to protect newborns as much as possible from noise pollution? Yet it is not one of the recommendations given in prenatal training.

Sing to your baby

Since the baby's first attunement and first learning of language occurs when still in the womb, mothers can enhance this further by singing to their babies before birth. In her article 'The Maternal Womb: The First Musical School for the Baby', Ruth Fridman describes how she found that both mother and baby benefited when she began teaching music to pregnant women.

She got the mothers to create their own songs. Once able to set aside their anxieties and fears, they showed great interest and tenderness as they shyly expressed what they would sing to their babies. Each mother found her own personal way of communicating with her baby, using her own rhythms, and communicating things that she may not say in speech, but could say in song.[40] The mothers also benefited from using music at the birth of their babies.

It is vitally important for babies to hear their parents talking to them during gestation. When a pregnant woman sings, her baby responds with movements. These movements are important for the sensory motor development of the baby.[41] The third trimester, when the baby's growth is the most rapid and learning is intensified, is especially important

Newborn babies prefer to hear a song, story, or rhyme that their mother sang to them in utero rather than a new song.[42] One baby at just nine months was singing the song that his mother had regularly sung to him since before his birth.[43] When babies are born prematurely and need to spend time in an incubator it is very valuable to play them recordings of their parent's voices, speaking and singing to the child.[44]

Sadly, the lullaby has largely become a thing of the past. Young mothers have lost this important folk tradition. Michael Odin MD believes that young

mothers have a profound need to sing to their babies, but changes to the birth process and hospitalisation have interfered with this instinctive behaviour. Throughout time, and all over the world, women have sung to their unborn babies. Now we know the significance of this because we understand that the foetus was having its first language lesson in the womb. The inflections of the mother tongue are learned through song as essentially as through speech.

Sound stimulation before birth helps the brain to develop higher levels of organisation. The elements of music—such as tonal pitch, timbre, intensity and rhythm—are also elements of spoken language. This is why listening to music prepares the brain of the foetus to understand and produce the sounds of language.[45] Music is like a pre-linguistic language which stimulates and nourishes the growing baby. Music affects our physical body, emotions, intellect and our sense of beauty. It is a language of its own, which gives us an understanding of that which cannot be expressed in words. Yehudi Menuhin, who was recognised as the greatest violinist the world has known, partly attributed his musical talent to the fact that his parents were constantly singing and making music before his birth.

It is beautiful to see the foetus, 'dancing', as it were, in the womb—sometimes as early as the first trimester—as the vestibular system develops.

Giselle Whitwell in her article 'The Importance of Prenatal Sound and Music' says: 'the movements appear as graceful somersaults, flexing of the back and neck, turning the head, waving arms, kicking legs—all self-initiated and expressive in nature.'[46]

By the second trimester, DeMause describes the actions thus:

'The foetus now floats peacefully, kicks, turns, sighs, grabs its umbilicus, gets excited at sudden noises, calms down when the mother talks quietly and gets rocked back to sleep as she walks about.'[47]

In a London maternity hospital, Michelle Clements observed the response of four to five month old foetuses to different types of music. She noted that they were soothed by Mozart and Vivaldi but became disturbed by loud passages of Beethoven, Brahms or rock music.[48]

In summary, research clearly confirms that the preference of newborns is to hear lullabies sung by their mothers, or slow passages of baroque music, Vivaldi, Telemann or Handel, with a tempo resembling the heartbeat at rest. Infants also prefer music that is consonant (harmonious) rather than dissonant.[49] These composers have continued to be loved for centuries, for their music always communicates peace, order and joy.

How is it that we speak?

Tomatis says that the miracle of speech is taken for granted by all of us, only because we are totally surrounded and steeped in it from the moment of birth and before. If we take a step back and look more deeply at the phenomenon of language, our eyes are opened to just how extraordinary it is.

A question Tomatis asks is 'how is it that we are able to speak; to produce these complex verbal sounds?' We assume that the body is designed with a special device intended for this function. But this is not so. In fact we have to bring into service two parts of our anatomy intended for quite different purposes, that of the respiratory system (diaphragm, nasal passages, larynx, lungs and rib cage) and the digestive system (mouth, lips, soft palate, tongue and teeth), complex structures intended originally for quite another purpose. There is no specific organ for speaking.[50]

This is all without discussing the role of the ear, which is also essential for speech. Try listening to a deaf person who has never heard speech. They have little chance of producing anything but a muffled jumble of almost incomprehensible sound, with no rhythm, meter, musicality or high frequencies.

Therefore, says Tomatis, we speak with our ears.[51] So in order to speak, our ear and larynx must be engaged together, while being diverted from their original functions.

Tomatis describes beautifully how the infant discovers speech. As the baby first learns that it has control over breath and the making of sound

'…The nascent awareness of our emission and our own audition is of all human phenomena one of the most constant, most precious and most worthy of protection.' [52]

' The dialogue takes hold rapidly and without mediator; to the adult who leans over the cradle, it may sound incoherent, but it is highly significant to the infant who awakens to his own sensations. This endless game of sonic interchange, this bath in a tub of noise that we can run and take without anybody's help, constitutes our first awakening to life, our first declaration of independence, our first awareness of the complex mastery of co-ordination we will achieve as we develop.'[53]

The first word emitted by babies in all cultures is the same. As the tongue and palate move apart and then together again, the resulting sound is 'Mamamama' This sound, made accidentally, quickly takes on significance as the adults interpret it as the baby's first word…language has been spoken. This word immediately brings joy and smiles to the face that the baby sees in front of him and he begins to understand that the utterance of this sound produces the most desired response of bringing his mother to him. Thus the meaning and purpose of language is known with the first word. With this first word, all the baby's fundamental needs are met. Anything beyond that is just play.

The ability to summon mother is everything. With her comforting, familiar presence the baby knows that all his needs are met. As the most human of our acts—the development of language—occurs, any illness, sorrow or worry can have a profound effect in interrupting this development. If, on the other hand, the baby's verbal calls go unanswered, for mother is absent, then vocal language loses its meaning and the game loses its attraction. Instead, it recalls the painful memory of abandonment, and absence of that pleasant and delicious sound, the familiar voice of the mother.

It is extraordinary in workshops, when we ask participants to speak of a memory of their mother's voice, the depth of sharing that follows. This

question always takes us right to the core of the relationship with the mother. Before reading further, you might like to close your eyes and think of your own memories of your mother's voice, and see what feeling this evokes.

If, in contrast, we simply said 'tell us a memory of your mother', we would no doubt hear of more superficial things like the embroidery, the clean house, the flowers she picked. But memories of the voice elicit deeper and more personal stories: the song with which she sang me to sleep, or the tone when she said my name when she was displeased with me. The memories shared are both joyful and painful, and invariably this exercise brings the participants closer together in an intimacy of trust created by the depth of sharing.

Part 3

Listening is the road to learning

James, who had long term learning difficulties with reading and spelling, had been using Sound Therapy for just a few weeks when he said to his teacher 'I can learn this now! I don't understand why it was so difficult before.'

Emily could never grasp the concept of the clock face, but suddenly learned to tell the time after a few days of Sound Therapy. She also found she had a whole new group of friends because she was participating and communicating better.

Another nine year old girl said, 'It doesn't sound like I'm under water all the time any more.'

Many students find that when they use Sound Therapy their study is easier, their grades are higher, they can pay attention in class and learning is not so stressful.

Children and teenagers sleep more soundly, wake refreshed and can focus their brain on learning. Children who are delayed several years behind their grade level in language and reading skills, catch up in just a few months after they start Sound Therapy.

Dr Tomatis said, 'Listening is the road to learning', for he had seen, first hand, the dramatic shift that takes place in learning ability once the listening function has been corrected.

Listening is the most basic element of communication and is a pre-requisite for other skills such as speaking, reading, and writing. It is through the ear and our capacity to interpret sound that we develop a relationship with our environment and with those around us. Interruption in the development of the listening function at an early age can result in emotional withdrawal or maladjustment and may produce severe learning or behavioural problems.

'A human being's journey to maturity begins with a dialogue between the embryo and the womb. It finally achieves its goal when the individual becomes part of the social framework. An ideal sonic pathway exists which must be followed in order to reach maturity. When the foetus and mother establish communication, the foetus desires to pursue this further. After birth, the infant wants to extend this communication, first with the mother, then with the father, and then with society in general.' *Dr Tomatis.*[54]

Listening is hearing plus motivation

Listening is a *voluntary* act which requires the desire to use the ear in order to focus on selected sounds.[55] To do this, the child must have both the psychological willingness to hear and the physical ability to use the ear efficiently. Then she must have a high level of efficient brain integration so that the sounds received by the ear can be processed in an effective way. A dysfunction in any of these areas can produce severe impediments to a child's development.

But my child is not deaf

Apparent deafness is a typical symptom of learning difficulties. If parents have taken their child for hearing tests only to be told that his hearing is fine, and are now at a loss as to the cause of the problems, it may mean the problem lies not with hearing, but with auditory processing.

Temporary hearing loss, however, affects many children of primary school age through middle ear infections (otitis media). These infections reduce the responsiveness of the middle ear and cause temporary hearing loss, which can affect the child's learning ability during those times. This temporary sensory deficit is significant at stages of growth where brain development and the laying down of fundamental learning strategies are occurring rapidly. A sensory deficit at such a crucial stage can cause a delay which may affect the child for years to come. There are now excellent educational resources to assist families and teachers in reducing the impact of such temporary hearing deficits.[56] However, it is more useful still to prevent the problem from occurring in the first place.

Closing the ear

Why would the ear close down? Tomatis said that children may withdraw from communication because of early emotional trauma, repeated ear infections or other unknown causes. They close down part of the listening capacity of the ear, or involuntarily choose longer, indirect brain circuits, which make their processing of sound inefficient. The ears do not have lids the way the eyes do, but they have ways of closing off internally to protect the child from disturbing input or loud noise. The immature psyche may shut

down as a defence mechanism, which then becomes habitual and retards normal development.[57]

Listening

Much more basic to learning than reading and writing, is listening. [58]Listening is the foundation for learning. Before speaking, reading, writing or other more academic skills can be gained, good listening is essential. This obvious fact is often missed because listening is so automatic, so close to our being that we take it for granted. We do not measure listening, to make sure the listening faculty is operating well, before endeavouring to teach the child more complex skills. Then, when there is a listening disorder, we have to work backwards from the apparent lacks in school performance until we come to the root of the problem.

However, parents of learning disabled children, when asked, will always express their exasperation that the child seems not to be able to listen. Yet he can hear. He can hear when he chooses to, his hearing has been tested and is fine. Unfortunately there is no recognition in most professions that listening and hearing are in fact two different functions, though one is dependent on the other.

When Tomatis speaks of listening he means much more than is normally associated with that word. He made a clear distinction between hearing and listening. Hearing is the passive perception of sound, while listening is a voluntary act which requires desire. The listener must choose at some level of consciousness to focus the ear on selected sounds. In other words, listening is the ability to select the sound information which one wants to hear, in order to perceive it in a clear and organised fashion. Further than that, listening includes the ability to relay the sound clearly and quickly to the appropriate parts of the brain, without distortion. It then includes the ability of the brain to receive, decipher and interpret that sound in a meaningful way. The listening function is therefore very closely related to attention span, vigilance, short term memory and concentration.[59]

Spirig, a psychologist who used the Tomatis method extensively and is a great proponent of the work, says 'We are capable of tuning our listening or of focussing it on a subject that interests us. There is an enormous psychological component in listening.'[60]

More recent research also indicates the necessity for different parts of the brain to be well integrated before learning can happen easily.[61] A lack of well integrated neuronal wiring may result in the apparent psychological state of disinterest or obstinacy, for the child will lack the ability to focus. The key to better learning then, is to find a way to stimulate and further develop the brain's wiring.[62]

Tomatis found a way to improve listening and stimulate brain connections through sound. The implication of this is enormous, when we stop to fully contemplate the effect of good listening, not only on learning, but on

emotional and intellectual development, on personal relationships, social and work relationships and even on international relations.

The Tomatis effect

In his early clinical research, Tomatis discovered that people do not produce sounds they cannot hear. His first law is that 'the larynx emits only those harmonics that the ear hears.'[63] He therefore was able to deduce that speaking or singing is entirely dependent on our ability to listen.[64]

Listening is the key to the development and enhancement of language and learning skills, as without it, no linguistic ability is possible.[65] Moreover, listening is the basis of communication and therefore shapes the child's social development, self-image and confidence as well.[66]

Speech

Tomatis showed that speech is under the control of hearing. What comes out of the larynx is essentially under the control of the ear via the neuronal connections. In other words, speech is controlled by the ear.[67] This discovery, originally made in his work with singers, he later applied to his great interest in children with learning difficulties.

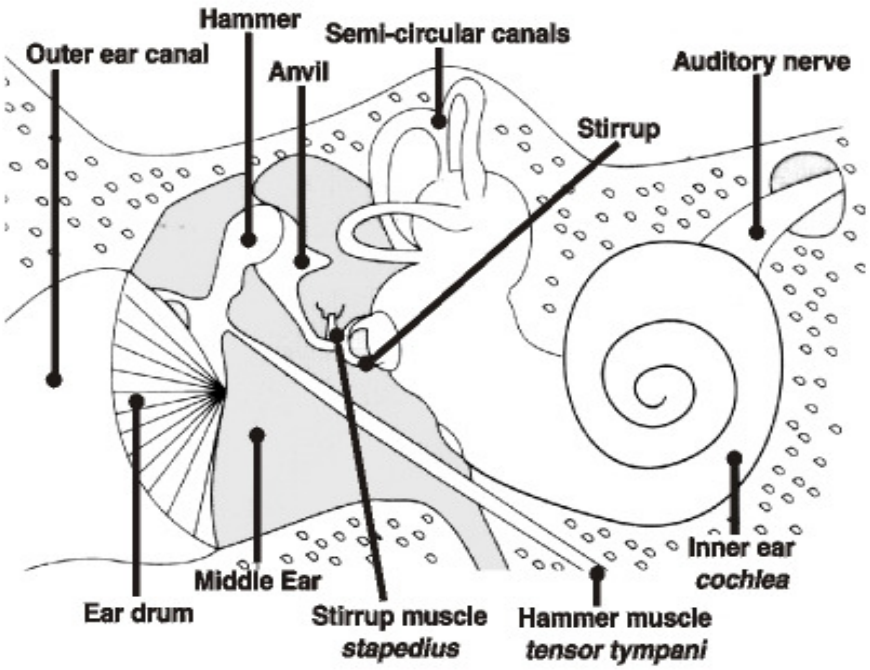
He found that difficulties in reading, writing, remembering instructions, concentration, ease of oral communication and the ability to listen to oneself and express thoughts in words, were all functions of the basic ability to listen and process sound.[68]

Auditory control of speech

So in speaking, we use only those harmonics which we can control through our auditory sense. If we can't control them it means we do not use them for self monitoring when we are speaking.[69] The treatment method which Tomatis developed was designed to give back and to broaden this audio-vocal control.

Ear

Let us take a journey into the inner chambers of the ear and see what remarkable structures are there to support the miracle of hearing. There are different chambers inside the ear (see diagram below), each of which plays vital roles in our hearing and our sense of balance, movement and space.



The middle ear

The middle ear is a small cavity between the eardrum and the inner ear. It contains a chain of three tiny bones called ossicles. These bones link the eardrum to the inner ear. The ossicles have names that describe their shapes. The hammer bone is joined to the eardrum. Its other end is attached to the anvil, which is delicately linked to the next bone, called the stirrup. The base of the stirrup fills the oval window, which leads to the inner ear.

The middle ear is cut off from the outside by the eardrum, but it is not completely airtight; a ventilation passage, called the Eustachian tube, runs forwards and downwards into the back of the nose. The Eustachian tube is normally closed, but opens by muscular contraction when we yawn or swallow.

The inner ear

The inner ear is an extremely delicate series of structures contained deep within the bones of the skull. It consists of a maze of winding passages, collectively known as the labyrinth. The front part, called the cochlea, is a tube resembling a snail's shell and is the organ of hearing.

The vestibular system

The rear part of the labyrinth, known as the vestibular system, and consisting of two chambers and three semi-circular canals, is concerned with balance. The canals contain hair-like cells and are filled with fluid. The hair cells in the cochlea deal with sound vibrations. Those in the semi-circular canals are sensitive to gravity and acceleration or the movements of the head, (nodding 'yes', shaking 'no' or tilting to the side). The information concerning posture or direction is registered by the relevant cells and conveyed by nerve fibres to the brain.

The active ear

Dr Tomatis' radical breakthrough in treating the ear, came as he began to see the ear as an active organ directed by either voluntary or unconscious messages from the brain. The role of the middle ear is to provide the ear with the best possible conditions so that perfectly analysed sounds reach the cochlea. It does this through the fine-tuning and delicate operation of its two muscles—the muscle of the hammer, which adjusts the tension and quality of the eardrum; and the muscle of the stirrup which regulates the pressure of the stirrup, on the oval window, thereby altering the pressure in the inner ear chamber which is filled with fluid. This muscle, which controls access to the inner ear, never rests—from some months before birth until the moment of death.[70]

The correct tonality of these muscles is absolutely essential for good listening. A hypotonic (reduced tension) condition of the musculature will produce confused hearing, so the person will not understand what is said.[71]

As these muscles are activated by Sound Therapy, the middle ear comes into balance and the inner ear is then trained to become open and receptive to high frequency sounds, such as the baby heard when it was first developing in the womb. This assists children who may have missed out on a crucial stage of their auditory development, to complete the necessary stages.

Another significant aspect of rehabilitating these muscles is that problems such as glue ear, ear infections, earaches and sinus are usually relieved. Children are very prone to ear problems because in children the Eustachian tube is more horizontal than in adults, so it doesn't drain so easily. Add to this a poorly functioning hammer muscle and you will have problems. A branch of the hammer muscle causes the Eustachian tube to close, so unless that muscle can release when needed, chronic ear blockages will result.

Hearing loss

It is traditionally believed that the auditory curve cannot be modified, meaning that hearing cannot improve once it has been damaged. Tomatis found there were many exceptions to this rule, especially among children. Dr Spirig, who used the Tomatis method extensively in clinical practice, said: 'We often find in treating deaf adults and children that their listening and audiometric curve improve, even though they have been told this was impossible.'[72]

By approaching hearing from the point of view of improving listening, Tomatis was able to make a difference to the individual's ability to receive and interpret sound. He found that the ear fully rediscovers its role as an instrument of communication when distortions of the listening curve are overcome.[73]

Understanding

A child may have adequate hearing but be unable to analyse the sounds she hears—because listening depends not just on the function of the ear, but the entire auditory pathway in the brain.[74] Even if the effort to attend is made, the child may have difficulty understanding unless the message is repeated or expressed in a different way. This is often not possible in a classroom situation. Inadequate listening, in the full sense of its audio and cognitive components, may affect the child's ability to remember what is said, or may lead to misunderstanding.[75] When one is trying to learn and the second piece of information is based on a misunderstanding of the first piece, there is little hope of gaining clarity.

High frequencies

Poor listening is usually involved in a lack of perception of high frequencies. As we learned in the previous chapter, the perception of high frequencies, heard first in the mother's voice, gives the ear its incredibly delicate ability to interpret complex sound. Tomatis said that frequencies above 8,000 hertz are recharging for the brain. Much more complexity is possible in the high frequencies as these sounds are so much more compact, and therefore contain much more information.

High frequencies carry not only more detailed information, but they also carry the emotion in the message. When a voice becomes monotone, without variation of expression, it is lacking in high frequencies, and it seems to carry no emotion.

Tomatis also discovered that, as he treated his subjects for ear related and communication disorders, the high frequency sounds he was exposing them to had an unexpected beneficial effect. His clients reported feeling more energised, mentally alert, with an overall sense of well-being. Thus he discovered that high frequency sound not only activates the ear, but is also of neurological benefit as it stimulates the firing of brain cells.[76]

Left brain Right brain

When speech begins, the baby repeats a single syllable as in the words 'Ma-ma', 'Pa-pa', 'Da-da'. Tomatis' theory is that the right and left brain hemispheres each produce one of the syllables. They are then reproduced vocally at different moments because of an asymmetry of the nerve path to the speech organs. The two branches of the vagus nerve (10th cranial pair), which links the brain to the speech organs, reach the larynx by different

routes. The distance to be covered is longer on the left side. Therefore sound from the right ear reaches the brain a fraction of a second faster than sound from the left ear.[77]

The two sides of the brain and the two ears play different roles in the processing of sound. The left hemisphere is served directly by the right ear and, to fulfil its role as the primary supplier of linguistic information, the right ear takes the role of deciphering high frequency sounds.

Sorting out laterality

High frequencies are the sounds which give meaning to language, both because they are the definers of consonants and because the higher harmonics carry the emotional message of the sound. For this reason, the right ear must be the dominant ear for a person to listen effectively. The process of one side of the brain becoming dominant in certain activities, such as right-handedness, is called laterality. This is particularly important in the case of the ears.

If the left ear is dominant two problems may arise. One, there will be a fraction of a second's delay in sound reaching the language centre in the brain, causing auditory confusion and possible stuttering or dyslexia. Two, the person will be predominantly oriented to low frequency sounds and will feel distanced from others—since the low frequencies are long wavelengths, covering distances of 35 to 140 metres. The result is that this listener feels distanced from the source of the sound and consequently is isolated from the people with whom she, or he, tries to communicate. One listener who described herself as a dyslexic adult wrote:

' I already knew I was "locked in" for that is how I have experienced the world, as though I lived at a distance; which makes sense because the eyes are the furthest away sense. Being a dyslexic adult, with switched off ears, has caused terrible suffering, as you will understand. I am in my mid-50's and it has taken all these years to wait, and work only with body and eyes, cut off from true sound.

I am "switching on", Patricia, with a calming effect. I can hear the anger in my voice. My speech has become softer; I am so amazed by this listening ability. I keep on thinking it will stop. If it does, I'll go mad.

Now my experience of sound therapy has humbled me. I am in awe of sound. I can actively focus on sound sources. It's incredible, as though I have been given a new instrument, calming my mind and soul.'[78]

Left-ear-dominant people who have used the Tomatis Sound Therapy, have described living with a sense of being shut off from sound and from other people. This has changed as their laterality shifted to the right ear.

The elements of listening

All these elements—the tone of the ear muscles, the psychological receptivity, the efficiency of brain pathways—are crucial to successful listening. If any are affected, the whole system breaks down. So we cannot afford to ignore

listening. If we attempt to improve a child's learning ability without first addressing any deficit in listening, we are building on shaky ground. Therefore, listening must be the first port of call for addressing how a child learns, for listening is the key to learning.

Part 4

Sound Therapy: a home based listening program for children

Frances was a bright, friendly child who everyone liked when they met her. Her parents were very attentive and wanted the best for her, but Frances wasn't learning. She just couldn't retain what was covered in school, she couldn't remember the letter sounds, she was always losing things and forgetting what her mother told her. Because she saw the difference between her abilities and those of her friends, Frances was starting to feel bad about herself. Her parents decided to try Sound Therapy to see if it could help her with reading and spelling. Frances went to bed with the headphones on every night, listening to the Sound Therapy music or stories. After three days she told her mother she was feeling much better. Her head felt clearer, she wasn't having nightmares and she was paying attention better in class. Her school report card said it all: 'Frances is focussing much better this term and has jumped ahead in leaps and bounds'. Frances also found her athletic abilities improved and she was being chosen first for teams at netball. She felt much happier and was making new friends as well.

Children build their sense of the world, contact, meaning and love from listening to their mother's voice in the womb. Through the miracle of life, the baby's brain is formed out of neurons, axons and dendrites; patterns and meanings are created as the mother's voice lays down an imprint of order. No wonder, then, that sound has such a powerful capacity to heal, to affect mood, mental function, brain development and learning ability as we grow. Dr Tomatis drew on the remarkable power of sound to heal when he made the unique discoveries which launched the field of Sound Therapy.

What it does

Sound Therapy works on the whole being by retraining the ear—activating and building brain pathways, as well as affecting thinking, emotions and physical co-ordination. As the whole auditory pathway is stimulated and opened, the child's ability to learn is dramatically enhanced. Connections between the two hemispheres of the brain are strengthened so that thinking and co-ordination improves in many areas. The child's equilibrium, sense of self-control and self-esteem develop, so naturally, behaviour improves.

Building brain pathways

The brain is made up of specialised cells called neurons. These build up electrical energy until there is enough to fire off a signal to another neuron. Each time a neuron fires, it is helping to build and strengthen brain connections.

Our neurons are connected by tiny branching filaments called dendrites, and longer ones called axons, which link more distant parts of the brain. These connections use both electrical and chemical energy. Once the electrical charge is sufficient and the neuron fires, a signal heads off along the axon or dendrite. The electrical charge causes the release of a naturally occurring chemical from a nerve. Thousands of different chemicals, called neurotransmitters, act to carry messages between the neurons in the brain. Once the message arrives at another neuron, it needs to be transformed back into an electrical impulse to be received. This will only be successful if the destination neuron has the right receptors—that means the right sort of neurotransmitters, or brain chemicals. One of the differences between a brain and a computer is that a computer uses only electrical energy, whereas the brain uses chemical energy as well, making it infinitely more complex.[79]

A child's brain is unbelievably active, as learning happens much faster in childhood than in later life. Therefore, the firing of neurons and activation of neurotransmitters is occurring at a great rate. Sound Therapy can support and speed this process by helping to activate the neurons even more. Where there are developmental problems, the structured activation caused by the rhythmic, harmonious patterns in the filtered classical music, assists in healing and connecting the brain.

Activating the ear

The ear is obviously the organ of receptive language, on which so much of learning depends. Dr Tomatis says that the ear is the gateway to the brain. It is the sensory organ which has the most direct and complex interconnections with many different parts of the brain. The ear is linked to all three levels of the brain: the automatic, or so-called reptilian brain; the emotional brain, which first developed in mammals; and the cerebral cortex, which is unique to humans.

The ear is active even when we are asleep, monitoring our environment in case of danger. The complex, intricate connections of nerve endings in the inner ear convey extraordinary detail about the outside world to our brain. Sound quality also gives us immediate information about emotion. Danger, excitement and love are all conveyed by sound, so the limbic system, our emotional brain, is highly attuned to what the ear tells us. Information, knowledge, language, most of the learning we do in school is brought in by the ear - so the cortex, our thinking brain, is constantly wired in to what the ear is telling it. All this makes the ear a natural portal by which we can gain tremendous access to many parts of the brain. Sound is an encoding system by which we can reprogram brain pathways.

Much evidence points to the fact that learning difficulties are in some way linked to ear function. Therefore, a therapy which directly and naturally improves the ear's performance is a direct and easy way to assist with learning. Sound Therapy is different from music therapy because it uses specially treated sound, intended to physically improve the way the ear works, as opposed to just using music for an emotional impact.

Addressing the cause

Parents sometimes think, 'Why should my child need Sound Therapy, he can hear perfectly well?' With Sound Therapy we are going deeper than simply improving hearing. We are also going to a deeper level than is addressed with most remedial education programs. Unlike other programs, which attempt to assist a child to adapt to or compensate for a learning difficulty, Sound Therapy attempts to 'effect a repair'. There is substantial evidence that with most learning difficulties the root of the problem is in some way involved with the ear.

Sound Therapy for general developmental issues

If there is a delay in a child's auditory development, the sooner it is addressed the less likely it is that the child will fall behind in school. Listening is the foundation for learning. The child may be receiving sounds into his or her brain in such a way that they are jumbled and incomprehensible.

It may not be obvious that listening is the cause of the child's problems, but we must remember that listening is the foundation for most of our communication skills.

Poor listening can lead to:

- poor concentration
- bad behaviour
- delayed reading and writing skills
- poor performance at school
- social isolation
- the child not achieving up to his/her potential

How to identify a potential listening problem

If several of the points on this list apply to a child, then it is very likely that she or he would benefit from Sound Therapy.

- **Difficult family history**
- **History of ear infections**
- **Difficulty in using language and explaining herself/himself in words**
- **Short attention span, easily distracted**
- **A tendency to misinterpret messages or to ask for them to be repeated**
- **Poor at following instructions**
- **Slow to develop intelligible speech**
- **Does not get along well with peers**
- **A lack of enthusiasm and initiative**
- **A reluctance to communicate**
- **Difficulty in reading aloud**
- **Poor social skills, which may result in withdrawal, hyperactive or aggressive behaviour**

- **Difficulty in reading and writing which manifests as reversal of letter forms, sound confusion, slowness or messy work**
- **There may seem to be a higher aptitude in maths than in English**
- **Child lacks response to human speech yet seems to respond to environmental sounds**

History

Dr Tomatis 1919-2001

Dr Alfred Tomatis was a French ear, nose and throat doctor who began his own branch of research in 1946. He had the kind of enquiring mind that always goes beyond what it has been taught—the mind of a true scientist, which sees a phenomenon and asks 'why could this be?'

A great source of inspiration to Tomatis, was a doctor who was called to treat him during one of his many childhood illnesses. At the time he was suffering from three fevers which he had contracted simultaneously—typhoid, Maltese fever and typhus murin. A parade of doctors had failed to diagnose his condition, so finally the well-respected Dr Carpocino was called. After examining Tomatis, he pronounced, 'I don't know what is the matter with him. I must search for the answer.' He persisted in his search until he was able to successfully diagnose and treat the boy and bring him back to health. It was his statement 'I must search' which had the most profound effect on Tomatis' development and career choice, for from that moment on he decided to do the same. He would become a doctor so that he could search for answers to what he did not know. To find out totally new information one must go outside of the parameters of existing disciplines, and this is what Tomatis did. He worked in his research clinic with hearing impaired retirees, with singers and then with learning disabled children.

The Electronic Ear

As Tomatis experimented and studied his subjects, he gradually developed a device for filtering sound so that it retrained the ear to proper functioning. He called his device the Electronic Ear. He described it as a replica of the natural ear, for it had the ability to adjust its responses to different frequencies of sound and control the type of sound that travelled on to the recipient's natural ear. By making the adjustable functions of the ear external to his patient, Tomatis could manipulate them, and begin to enforce the type of natural, open hearing which his patients may have lost. The Electronic Ear was the basis of what became known as the Tomatis Method. Tomatis found that playing filtered classical music through the Electronic Ear was a highly effective way to retrain the listener, and that its benefits included greater learning ability and better brain function as well as better co-ordination, listening, energy, emotional health and intellectual power. He also used classical stories for children, which develop imagination, lateral thinking and deeper wisdom at the same time as strengthening ear-brain pathways.

Patricia Joudry

Patricia Joudry was my mother, and it is thanks to her that Sound Therapy became accessible to the general public at an affordable price. While the Tomatis clinics gave, and continue to give, a very valuable service with

structured supervised programs, the cost and time commitment they involve made them beyond the reach of many families.

My mother underwent the clinical treatment in Montreal. Her reason for having the therapy was to help with a problem she had hearing in a noisy room. She was not deaf—she simply could not separate a single conversation from the background noise. I was astonished to hear that there was a treatment for this, and recommended that she try the Tomatis therapy. She did so, willingly, and we were all amazed at the results. Not only did it fix her 'background noise' problem and her extreme sound sensitivity—it also cured her chronic insomnia, perpetual exhaustion, and her writer's block! Her full story is told in our book, *Sound Therapy: Music to Recharge your Brain.*

She was like a missionary on fire, after her Sound Therapy breakthrough, wanting to share her discovery with the entire world. She found a way to do that when she was able to enlist the monks of St Peter's Abbey in Saskatchewan, in Western Canada, to assist her in putting out the portable Sound Therapy program. The monks were using Sound Therapy at their vocational school at the abbey, which ran a program for learning disabled teenagers. The therapy was much more effective when they were able to make it portable, with Patricia's cassette tapes, as the students could listen in class. They listened on Walkmans, the volume was kept low, and rather than distracting them from hearing the teacher, they found it helped them to concentrate and pay attention.

Sound Therapy International

I became involved in Sound Therapy after reading my mother's book, as I wanted to benefit from the 'side effects' of better sleep and more energy. I started distributing her book and tapes in Australia and was soon receiving letters reporting remarkable experiences. People were overcoming chronic stress, depression, self-confidence problems, and hearing disabilities—and children were learning to read, speaking better, feeling happier and achieving much better at school. The enthusiasm of my listeners lead me to produce more tapes for children, make educational videos, write new materials and begin training practitioners. I was in demand to speak to groups of mothers, teachers, retirees and varied practitioners.

Advantages of the Self-Help Program

The program which we developed is a self-help program. It is portable, affordable, accessible and easy to use. It takes very little time, fits in with your daily activities and is simple to administer. This means that any family, parent, teacher or individual can use the program after simply reading one of our books.

While we pride ourselves on running a professional organisation with quality customer service, our commitment is to always keep the therapy affordable. There are no high clinic fees to pay, and no exorbitant costs for unnecessary tests. It is still a portable, self-administered method which any family can afford to purchase and have as an ongoing resource to use at home.

Conditions Sound Therapy may help

Sound Therapy is likely to help a range of learning and developmental challenges. These include auditory processing, achieving right ear dominance, ADHD, dyslexia, speech problems, autism and Down syndrome.

Auditory processing

Successful listening and learning depends on good auditory processing. Auditory processing means the ability to translate the stream of vocal speech sounds into words and meaning, and then recreate those sounds as speech.

Effective auditory processing depends first on accurate hearing. Children must be able to see the printed letter, hear the sound of the letter, say the sound, relate the sound to the written symbol for the letter, and then register it and store it in the auditory cortex. Then they need to be able to retrieve the memory and relate the letter symbol to the sound again, and recreate it vocally. In addition, they need to be able to blend the letter and its sound with all the other letters which form a word. Therefore, there is a great deal more than hearing required for successful use of language.

A fractional delay, at any stage of this perception and vocalisation, can lead to great difficulties when it comes to learning the complex literary skills of reading, writing and spelling. While difficulties in speech may go unnoticed in the early years, they become magnified under the pressure to perform at school, and to translate spoken into written skills.

Timing is a crucial aspect of auditory processing, because a slight delay can mean the sounds are heard, or perceived or reproduced, in the wrong order. Such difficulties, called 'linear sequential processing problems', make it extremely difficult for the student to accomplish note taking and writing. Poor auditory memory may be part of the problem, and a person who is otherwise quite intelligent may have enormous difficulties performing academically when these functions are impaired.

Establishing right ear dominance

Sound Therapy recordings are made so that the sound is louder in the right ear. This improves the efficiency of the brain in processing language because the right ear connects to the left side of the brain, which is the language centre. This makes linguistic pathways more efficient and the result is an improvement in reading and vocal skills.

Sound Therapy stimulates the brain pathways which enable very fast transmission of information from ear to brain and from brain to vocal apparatus. When the processing speed is increased, it is easier for the student to keep up. He or she will not be constantly struggling with information which is jumbled and mixed up because of being received in the wrong order.

ADHD

Attention Deficit Disorder or Attention Deficit and Hyperactivity Disorder is an increasing, and very demanding problem. While it has been observed to run in families, the fact that the condition is on the increase indicates that there are probably environmental factors as well. It appears to affect 20% of boys and 8% of girls. However, some researchers think that a lot of girls are missed in the statistics because they are more likely to have dreamy symptoms than hyperactive ones. They are less difficult to manage, so may miss out on diagnosis and treatment.

ADHD and the brain

ADHD is believed to be caused by a deficiency in the transmission system, which relays messages between cells in various parts of the brain. Our new abilities to see the brain through MRI scanning give us greater insight into certain brain disorders. In ADHD the limbic system, which is the emotional and impulsive brain, is working full throttle—but the cortical areas which focus attention, control impulses and control stimuli are not fully active and engaged.[80]

MRI scans of ADHD children show a lack of brain activity in several right hemisphere regions.[81] These include the anterior cingulate cortex, an area which focuses attention on a particular stimulus; and the prefrontal cortex, which is key in controlling impulses and planning actions. An area in the upper auditory cortex which integrates stimuli has also proved underactive. This may cause the child to be unable to grasp the big picture. They experience the world as fragmented, with one stimuli after another vying for their attention. Poor functioning of the frontal lobe means the child cannot think quickly enough to put the brakes on and control the impulse to act. This impulsiveness and hyperactivity also leads to behavioural problems and poor social skills. The same is true for adults with ADHD.

Sound Therapy stimulates these underactive areas by increasing the energy in the neurons, which in turn probably raises the level of excitatory neuro-transmitters. The increased cortical activity allows the person to get a grasp of the whole situation, inhibits the limbic system and results in more controlled and focussed behaviour.

ADHD and auditory processing

The majority of children with ADD/ADHD have auditory reception problems, so they seem not to hear or remember instructions. When their hearing is tested, however, it usually proves to be normal, since the problem is what they do with the information after they hear it. These children are so easily distracted by environmental stimuli that they cannot retain a list of instructions in their minds. They also cannot tune out unwanted input and focus on selected sounds. It is this indiscriminate reception of auditory input which leads to the inability to concentrate their attention on a selected topic for any length of time.[82]

Improved inhibition and attention

By stimulating the frontal lobe, Sound Therapy may restore the child's ability to think quickly and put the brakes on before acting. In a sense, Sound Therapy has the same effect as stimulant drugs such as Ritalin. Brain function is speeded up and the child becomes more efficient in dealing with environmental stimuli. Sound Therapy also retrains the listening capacity, or the auditory reception process, so that the child can learn to focus on the desired sound and to relay the sound directly to the language centre in the brain. Auditory reception problems are caused, in part, by the shutting down of the ear to certain frequencies of sound. The ear muscles become lazy and unresponsive and must be stimulated in order to regain the capacity to tune in to the desired sound. Sound Therapy has been shown to provide this rehabilitation for the ear as well as helping to reorganise auditory transmission in the brain. This process reduces stress and tension in the whole nervous system as the child, instead of being constantly distracted by every sound in the environment, becomes able to attend to a chosen stimulus.

Hey Mum, watch me learning!

Sound Therapy can have widespread benefits for children with ADHD. If the child is hyperactive, you may observe a significant decrease in activity; while lethargic, dreamy children may become more energized. As listening discrimination is re-trained, memory and concentration improve so that learning can be achieved with a great deal less effort. If the child has had difficulties in learning a particular skill, such as spelling or telling the time, there may be a sudden shift in these areas. Sleep and appetite problems will also be resolved as the whole system becomes calmer and less erratic. The behavioural difficulties, such as impulsiveness and aggression, are now brought down to a manageable level. The child may now be able to pay attention in class, understand and follow instructions and be motivated to communicate and learn.

Dyslexia

Dyslexia was a popular term for learning difficulties in the 1950s, and through the 1970s. One of the earliest writers on the subject was Dr Hinshelwood, who was an eye surgeon, which may account for the initial emphasis on visual difficulties. The group of symptoms listed for dyslexia eventually came to include poor co-ordination, lack of sense of time, multiple learning difficulties, poor memory and concentration. This group has a surprising number of overlaps with what is now called ADHD.

The role of the ear in dyslexia

Dyslexia is generally thought of as being the tendency to reverse letter forms; hence poor spatial orientation, and problems with linear sequential processing. Dyslexia was a major focus of Dr Tomatis' research, and he was one of the first practitioners to discover the great importance of the ear in the condition of dyslexia.

Laterality and sound confusion

Tomatis focused his theory of treatment for dyslexia largely on laterality, meaning which side of the brain is dominant for particular functions. The left hemisphere of the brain is the main centre for processing language. Sensory information received on the right side of the body generally goes to the left hemisphere of the brain, and vice versa. This is also true for hearing. Because the most direct way of conducting sound to the left hemisphere is via the right ear, for efficient listening the right ear must take the leading role. In addition, to fulfil its role as the primary supplier of linguistic information, the right ear takes the role of deciphering high frequency sounds.

Because high frequencies give definition to consonants and portray the emotional intent of the voice, this gives the right ear a very important role. Tomatis found that to listen effectively, a child must develop right ear dominance. A child who is left ear dominant will normally have much greater difficulty processing language. Longer, less efficient brain pathways must be used. The sounds from the left ear go first to the right hemisphere and must then cross the corpus callosum (the great divide between the right and left hemispheres) to get to the language centre in the left hemisphere. This delays sound reaching the brain by a fraction of a second, causing auditory confusion, and dyslexia or stuttering.

Dr Tomatis argued that children with dyslexia have failed to achieve right ear dominance and that therefore the order in which they hear sounds becomes jumbled. If they sometimes use the left and sometimes the right ear as the directing ear, sounds may reach the brain at different speeds, so letters will be jumbled. This accounts for errors of reversal, such as writing 'was' as 'saw' or pronouncing 'spaghetti' as 'busghetti'.

Correcting linguistic pathways

Tomatis believed that the balance between the two hemispheres of the brain is of fundamental importance in overcoming dyslexia. Both hemispheres play a role in processing language, but the roles they play are different. The eye must combine with the power and the quality of the ear to make sense of the written sounds. This co-ordination happens easily when the left hemisphere deals primarily with audition and the right hemisphere deals primarily with vision.

In dyslexia, the route which allows for phonic analysis has been damaged. Sound Therapy may help to restore the functioning of this route and eliminate the cause of the problem. Tomatis says, 'We read with our ears ... the ear is the organ of language, the pathway to language assimilation, the key that controls it, the receptor regulating its flow.' Sound Therapy stimulates and exercises the ear, encouraging it to receive and interpret sound in an efficient manner. Music is a highly organised series of sounds which the ear has to analyse. Therefore, listening to music is an excellent way for a child to learn how to perceive sounds in an organised fashion, or in other words, to listen. The higher volume of sound to the right ear, which is built into all Sound Therapy recordings, means that the right ear is educated to be the directing

ear. When this right ear dominance is achieved, the problem of reversal is often reduced or entirely overcome.

I'm not dumb anymore!

Children with dyslexia often have feelings of inferiority after repeated failure. It is unfair that they must try many times harder than anyone else to achieve only mediocre results. Sound Therapy may offer immediate emotional relief because it is a method of treatment that requires no extra effort from the child. A therapy that does not require the child to struggle with the problem area of language enables him or her to feel let off the hook for once, and enjoy a treatment which is not a constant reminder of his or her own inadequacies. Sound Therapy aims to remedy the *basic cause* of the language difficulties. Once the child is able to receive and interpret sound accurately and easily, his or her ability and motivation to communicate is greatly increased. Thus the problem learner is transformed into a receptive and motivated learner.

Speech development

Speech and the brain

Unless there is a deformity in the vocal apparatus, most speech difficulties are caused by some interference or distortion in auditory reception. Although the hearing may be normal, the relaying of verbal information to the brain could be impaired. Hearing our own voice is a source of constant feedback while we are speaking, and if there is any confusion in the sequence of received sounds it will cause confusion in the output of speech. The results can be substitutions of one sound for another, stumbling over words, or a flat and toneless voice.

The great majority of people use the left hemisphere of the brain as the primary integrating centre for language. Some studies have shown that stutterers process language primarily in the right hemisphere, or a mixture of the two. The right hemisphere is less efficient for processing auditory information, so this results in problems in the timing of speech output.

Speech difficulties frequently lead to problems in other areas where language is used, such as reading and writing. The basis for all these skills is the ability to hear and process sound accurately.

Improved vocal control

Dr Tomatis made an important discovery about the relatedness of the ear to the voice. He established that the larynx emits only those harmonics which the ear is able to hear. A lack of tone in the voice indicates a lack of tone in the hearing. Sound Therapy may fine-tune the hearing and restore the ability to hear missing frequencies by exercising the ear muscles and stimulating the receptor cells in the inner ear. It may also correct reversed or mixed laterality, so that the left hemisphere becomes the processing centre for language. Sound Therapy continually plays more sound into the right ear. The right ear connects to the left hemisphere of the brain, so when the right ear becomes dominant the language function naturally switches to the left hemisphere.

Listen to me talk now!

Dr Tomatis worked with a group of 74 stutterers and discovered that all of them had difficulty hearing from the right ear. When he educated them to use the right ear alone, all of them began to speak correctly. Children with other types of speech difficulties have responded similarly to the treatment. Not only does their speech improve, but their behaviour changes. They become more confident, more dynamic and more eager to talk and communicate. Parents also report improvements in reading and the use of written language. Children with delayed language development or who have difficulty with receptive or expressive language improve spontaneously. Sound Therapy is an excellent adjunct to speech therapy and will generally make the speech pathologist's job a lot easier.

How to use Sound Therapy for speech problems

A good exercise for children with any form of speech difficulty, is speaking into a microphone while monitoring their voice through the right ear. This can be done using a personal cassette player with a microphone, and wearing only the right headphone. The child can speak, sing, read or make any vocal sounds. A similar effect can be achieved without the equipment by simply closing off the right ear with fingers or an ear plug. This increases the volume of the child's own voice in the right ear. This exercise can be done for some time each day, in conjunction with the listening.

Autism spectrum disorders

Autism is a complex developmental disorder which causes children to become emotionally isolated from the world around them. Asperger's syndrome is higher-functioning autism, meaning the symptoms are milder and the child functions well or above average in many areas of life, while still having certain abnormalities in their way of relating to others. A definite cause of autism spectrum disorders is not known, but a fairly consistent trait is believed to be distortion in the reception of sensory information. Many children with autism exhibit extreme sensitivity to noise. Some frequencies are actually painful for them to hear.

Psychological view

Dr Tomatis took a psychological view, suggesting that in order to shut out painful sounds, or other unwanted stimuli, the child closes down the hearing mechanism so that certain sounds cannot penetrate the consciousness. On a physiological level, this closing off of the ear can be achieved by a relaxation of the muscles of the middle ear. Over time, these muscles lose their tonicity. Sounds are then imprecisely perceived and, as a result, incorrectly analysed. Tomatis believed that the reluctance to communicate in children with autism, resulted from the closing off of their being to auditory input. Although they may understand what is said to them, they have tuned out many of the frequencies in the sound and have thus tuned out the emotional content of the message.

Biochemical view

Environmental medicine is now uncovering evidence that autism is related to viruses and toxins which affect the child in its early months, interfering with neurological development. There is now an understanding that there is a physical abnormality in brain structure and function. The inability to deal with language and interaction is now known to be fundamentally due to physiological rather than psychological problems. However, the two systems are so intertwined that neither can be said to operate without the other.

Repairing auditory connections

Sound Therapy offers a child with autism the opportunity to re-open the listening capacity. The fluctuating sounds produced by the Electronic Ear gradually exercise and tone the ear muscles, teaching the ear to respond to and recognise the full range of frequencies. The stimulation given by Sound Therapy builds brain pathways and can, to a degree, make up for missed neurological development at an earlier stage. As this happens, communication takes on new meanings and the child begins to respond where, before, he or she was unreachable.

Tomatis discovered that because of the way the foetal ear develops, the first sounds heard in utero are high frequency sounds. The child hears not only the mother's heartbeat and visceral noises, but also her voice. Re-awakening the child's ability to hear high frequencies re-creates this earliest auditory experience, and enables emotional contact to be made—with the mother first, and then towards others.

I love you Mummy!

Children with autism have responded to Sound Therapy by showing a greater interest in making contact and communicating with the people around them. Interactions with their family members have become more affectionate and appropriate. There is often increased eye contact and the children have a longer attention span. They may initiate contact rather than waiting to be approached. For children without language, vocalisation has increased—initially as screams and then as babbling. Children who can speak may develop a more appropriate use of language; for instance, beginning to use more personal pronouns ('I', 'you') or first names, and using words to express their feelings. They may begin to laugh and cry at appropriate times. Once children have begun to emerge from their emotional isolation, they have shown increasing responsiveness to what they are being taught and to the people who care for them.

Down syndrome

Seventy-five percent of children with Down syndrome have a hearing impairment. This is most often due to recurrent middle ear infections and wax impaction. Repeated chronic middle ear infections result in fibrous adhesions which limit the movement of the ossicles, resulting in progressive hearing loss. Children with Down syndrome are significantly affected by sensory deprivation and they need supportive measures if they are to reach their full

cognitive potential. A delay in the comprehension of language results in a delay in speaking. The impairment of language abilities delays learning in all areas and makes the tasks of education and socialisation more difficult. This results in behaviour problems, which could be avoided if the language abilities were improved.

Clearer hearing, clearer speech

It is very important for children with Down syndrome to have their hearing treated in the early years to assist with language development. These children respond well to education in the area of social and emotional adjustment, motor skills and visual comprehension. The greatest area of difficulty in learning is in auditory vocal processing. They often have difficulty learning to manipulate the speech system—co-ordinating the tongue, lips, jaw and palate. Because they face much greater obstacles in producing speech sounds, they need particular assistance with their hearing. Dr Tomatis discovered that the voice can only produce what the ear hears. Sound Therapy stimulates the hearing capacity and exercises the ear, training it in particular to receive high frequency sounds that are lost when hearing is damaged. The sounds of consonants, such as b, d, p, g and t, are high frequency sounds, and are of course essential for clear comprehension of speech. Before they can begin learning to produce these sounds, children must first be able to hear them. As Sound Therapy may restore hearing in a wider range of frequencies, a greater range of tonality is available to the voice and this is very important for producing intelligible speech.

Better sleep

Sleep disorders are common in people with Down syndrome and this is another area where Sound Therapy can be especially helpful. Sleep apnoea, or short periods of not breathing during sleep, is especially common. People with Down syndrome have small, often 'floppy' airways, which can sometimes be completely or partially blocked during sleep by large tonsils and adenoids, or by floppy walls, or the airway collapsing as air is exhaled. Regardless of the cause of obstruction, the sleeper must awaken briefly to resume breathing. Some patients with sleep apnoea awaken hundreds of times per night.

Symptoms associated with, but not specific to, sleep apnoea include snoring, lots of 'thrashing' about while asleep, excessive daytime sleepiness, mouth breathing, and unusual sleep positions, such as sleeping in a seated or hunched forward position. Sound Therapy may help to restore normal tone to the pharynx and airway walls. It also works on the autonomic nervous system, which is responsible for regulating the control of body functions that are not consciously directed, including breathing during sleep.

The auditory stimulation provided by Sound Therapy has a re-charging effect on the brain and children with Down syndrome generally respond with enthusiasm. It is important to continue language education through the life of a person with Down syndrome. This ongoing learning process may be greatly enhanced for people of any age by listening to Sound Therapy.

Bed wetting

Bed-wetting is a problem which often accompanies learning difficulties, language problems and sensory integration difficulties. Improvement in this area is often seen as one of the positive side effects of Sound Therapy. There may be an emotional component to bed wetting, but it is also quite possible that it is due to delayed integration in the nervous system. Because hearing is linked to the autonomic nervous system, involuntary processes such as digestion, breathing during sleep, bladder control and circulation are also affected. A recent letter we received even described how a man with long-term, severe haemorrhoids had seen them completely clear up after he started using Sound Therapy.

Other conditions

The conditions described above are those for which there is the greatest demand for Sound Therapy for children. There are many other disabilities and types of developmental delay which will respond positively to Sound Therapy. Different professions may have different ways of describing the same problem, and some problems are multi-faceted. These include:

- Central auditory processing disorder (CAPD)
- Sensory integration disorder
- Intellectual disability
- Hearing loss
- Cerebral palsy
- Brain damage
- Syndrome X
- Epilepsy
- Food intolerances
- Chemical sensitivity

Prenatal Listening and Sound Therapy

Sound Therapy is most important and beneficial for expectant mothers. In prenatal life, sound is the first sense to develop fully. The foetus' ear is ready to perceive sound at four and a half months. The baby listens to its mother's heartbeat, respiration and digestive sounds. Dr Tomatis believes that the baby can also hear the mother's voice, and becomes familiar with this sound before birth. Tomatis discovered that the first sounds heard in utero are high frequency sounds (above 8,000 Hz) due to the development of the embryonic ear. Birth is often a traumatic event; the baby is pushed from the familiar protection of the womb into a totally unknown world and bombarded with new stimuli—and now it must begin the process of learning to communicate with others.

The Effect of Sound Therapy

Dr Tomatis says the sound of the mother's voice, with its familiar tone and rhythm, is what provides continuity between the prenatal and postnatal worlds. The infant is particularly accustomed to the high frequency sounds of the voice as heard in the womb, and therefore has an immediate response of feeling reassured when presented with high frequency sounds filtered to a similar level. Playing Sound Therapy will have an immediate, soothing effect on the newborn baby.

The effects of listening for the mother are a soothing of her whole system and stimulation to the cortex of the brain from the high frequency sound. Because of its connection with the vital pneumogastric (Vagus) nerve, the ear plays a part in nearly everything we feel—including heartbeat and breathing, or sensations like a tickle in the throat or butterflies in the stomach. The effects of Sound Therapy are therefore passed through the mother's whole body and have an influence on the development of the foetus.

Prenatal listening program

It is recommended that the mother listens regularly to Sound Therapy throughout her pregnancy. To obtain the full benefits of improved sleep, reduced stress and increased energy, the recommended listening time for an adult is three hours a day. This can be done during other activities, however, so does not require that time be set aside for listening alone.

Effects for the infant

When a baby is born to a mother who has been listening regularly to Sound Therapy, and the headphones are placed on the baby's ears straight after birth, it has been observed to immediately stop crying. Babies whose mothers have listened to Sound Therapy during pregnancy show a distinct lack of tension and anxiety as they grow. They have an inner peacefulness about them and are less reactive, making them easy to manage. They feel secure in their relationship with their mother and will go easily to other people. They have a natural appreciation for classical music and can continue to benefit from its healing properties. Studies have shown that children exposed to classical music before birth are more intelligent.

You don't have to have a problem

A child does not need to have a problem to use Sound Therapy. The program assists in the normal development of the ear and brain for any child. It is just as important for normal development as going to the playground. Today, Sound Therapy is more important than it used to be, since the world is noisier, and all children face chemical challenges growing up; and many children watch more TV, use computers and lack the movement stimulation which earlier generations enjoyed. Computers stimulate the eyes but not the vestibular system, and the rest of the body's musculature is underused.

Part 5

Learning can be fun

Simon was a very good student. He was so good he usually blurted out the answer before the teacher had time to lead the class along and get them thinking. This annoyed the teacher. He finished his work fifteen minutes before everyone else, and became bored, so he was often caught mucking up in class. At home he was absorbed in his hobbies and his computer. His parents both had busy careers and they did not realize there was a problem until the teacher called them in and said she thought Simon was heading for trouble. They were shocked to hear that he rarely turned in assignments and his grades were dropping. When they talked to him, Simon said school was boring, the teachers were dumb and he hated his life. Simon's parents were very concerned so they organised some sessions with a counsellor who coached them on spending more quality time with Simon. His dad started playing sport with him and his mum took one evening a week to do something special with him. They also started him on Sound Therapy because they thought it might help. Simon's attitude changed enormously. At school, when he had finished his work he went around to see if he could help the other students or the teacher. He and his dad joined a chess club and he and his mum started going to a ceramics class. Simon began putting extra work into his assignments and coming top of the class.

What makes learning fun?

Learning is fun when it engages the child's interest. This occurs easily when the child feels good about herself because she is interacting with people who give her approval, or when she is deeply interested in the subject matter; when there is laughter, activity, excitement, discovery and a sense of new achievement and mastery. When learning occurs, the brain is active in many parts. The emotions (acting in the limbic system), are engaged in a positive way, focus is clear and strong, lateral thinking is occurring, new pathways and new understandings are being formed. The emotions, the positive sense of self and the intellect are all engaged. Learning is a whole-brain—or whole-person process. The more sense of wholeness a child has in the learning environment, the more learning will take place.

School and achievement

All parents want their children to do well in school. For some, high achievement is paramount—whether to continue a family tradition, or to improve the child's chances in life beyond that which her family achieved. For others, it is more important simply that their child is happy, but no child can be happy if she is not achieving at least a certain level of competence acceptable within the school system.
This chapter looks at how to help children as they start their schooling to maximise their potential for learning. We will discuss some ways to encourage the whole-self engagement in the learning process. It is not focussed on learning problems, but on the normal basic development stages of the child.

Singing and rhyming

'She started to sing as she tackled the thing

that couldn't be done and she did it!'
Singing is a tremendously important activity, not only in the development of an individual, but also in the development of a culture. Singing is unifying. It unifies the two hemispheres of the brain, combining the left-brain speech function with the right-brain musical and rhythmic perceptions. Those who have suffered brain damage can sometimes sing though they cannot speak.[83] Stutterers can sometimes sing without stuttering. Singing is a powerful way to learn a new language, as the right-brain rhythmic and melodic engagement assists memory. The development of vocal perception, as one learns to measure and modulate one's own voice, is a powerful aid to developing the listening ability.
Western, English-speaking cultures are sadly devoid of singing. Apart from religious practice for the minority of families who still practice religion, there is no communal singing in Western, English speaking culture. The TV, radio and cinema have replaced communal artistic expression, celebration and ritual. Ask a modern group of English speaking people to sing and most often there is a cacophony of strained and poorly modulated voices barely able to scratch out a melody. Compare this to a Pacific Islander nation, a Welsh village choir or in fact almost any less financially privileged nation. It appears that our wealth and higher standards of living have deprived us of one of the most vital and nurturing parts of human cultural practice.

The Pentatonic Scale

Rudolf Steiner was a German educational philosopher whose ideas have resulted in the largest international network of non-denominational private schools. In Steiner education there is a lot of focus on story-telling, particularly the original Grimm's fairy tales because of their strong archetypes. These stories carry strong archetypes which help the child's psychic development. Folk stories from many traditional cultures also carry important lessons which can help children learn about the world and the dilemmas and choices they may face in life.

Steiner taught about the mood of the fifth, which is the best way to introduce music and melody to children. He recommends for younger children that the songs be actually within the style of the mood of the fifth, which is connected to the pentatonic scale. The pentatonic scale consists of five notes (DEGAB), and however you play the notes it always sound harmonious. Special instruments such as xylophones, lyres and flutes can be purchased for children so that they begin making music in the pentatonic scale. Some are beautifully crafted in wood and chosen for their very high tonal quality, craftsmanship and suitability as first instruments for young children. This allows the child to experience music in its fullest meaning.

Children need high quality instruments which are easy to play, so they can fully appreciate the tones and have a good start to music appreciation. These instruments lend themselves easily to free flowing, unstructured music, so well suited to young children. Together, parent and child can enjoy listening and making music.

Many original classic children's songs are written using the pentatonic scale, such as Mozart's 'Twinkle, Twinkle Little star'. These songs are so popular because they reflect the mood of the fifth. There are no big intervals and the tones make an easy stepping for the child. Some good websites for purchasing instruments and other quality toys and educational products for children are as follows:

www.myriadonline.co.uk
http://www.ecobaby.com
http://bushby.customer.netspace.net.au/

Rudolph Steiner said:
'The right introduction into the musical element is fundamental to a human being's overcoming all hindrances that impede a sound and courage-filled development of the will in later life.'

Singing workshops

The suggestion that people should sing with their children will strike fear into the hearts of many, for how can you teach your children something which you yourself cannot do? One of the best ways in which you could help your child's development would be to learn to sing yourself. Attend singing workshops designed to free the natural voice, join a choir or take singing lessons. Sing nursery rhymes to your child, join your child in singing along with radio or TV programs. Buy tapes of children's songs and sing along with them. Learn the piano, guitar, or rent a pianola or karaoke machine—whatever it takes!
Singing to your child is a perfect development opportunity for both of you. Your child will be the most uncritical audience you will ever have. Now is your opportunity to be a legend in your own lounge room! Children's songs are so easy to sing. They are a great way to start because they use simple harmonic intervals, thirds, fifths and octaves. Start with primary notes – like primary colours they give the fundamentals that help the child to gain an understanding of relationships and harmonies.
To get you started, here are a few songs you may know the tunes to. Try singing them with your child of the appropriate age, and see how much they love it! Singing at preschool is one thing, but singing with Mum or Dad is something special.

5 songs for babies

Twinkle, twinkle little star
Rock-a-bye baby
Hush, little baby, don't say a word
Jingle Bells
Hot cross buns

5 songs for toddlers

Bah, bah, black sheep
Mary had a little lamb
Hey-Ho, skip to my Lou
Pat-a-cake, Pat-a-cake, baker's man
Playschool

5 songs for pre-schoolers

The wheels of the bus
Now I know my ABC
Ring-a-ring-a-rosie
Head and shoulders, knees and toes
Eency Weency Spider

5 songs for primary children

Doh, a deer
Row, row, row your boat
Hokey Pokey
Waltzing Matilda
Kookaburra sits in the old gum tree

Learning to read

The best preparation for learning to read is lots of exposure to books and language. TV is not a good substitute for interactive language as it doesn't let you talk back. Passively hearing language is not the same as interacting. What Australian author and literacy expert, Mem Fox, advocates so vehemently and so rightly, is that children need attention and interaction in order to learn language. Someone who has learned a language in school and then finally goes to a country where it is spoken has to start all over again to learn it in a useful way for conversation.

Reading stories to your child is crucial to the child learning to read, and repetition is vital. You didn't learn to drive a car from one day's experience. It was only the repetition of ten or twenty lessons, plus the prior experience of having ridden in a car all your life, which enabled you to pick up this skill. The brain learns through repetition.

Mem Fox recommends reading a thousand stories to your child before the child starts school. Reading aloud is one of the easiest ways to have quality time with your child. It brings a structure, an interesting topic, physical closeness, conversation and an educational activity. Reading a story gives a framework for interaction which helps the parent to enter the imaginative world of the child. You don't have to think up silly games you may feel awkward playing; there is a story which moves forwards, has a beginning and an end, and which, if it is a good one, can bring delight to both parent and child.

I know Mem is right about the importance of reading aloud because it explains why I am good at English. Because I was educated at home in a very unstructured way, my education was lacking in many areas considered essential to a school curriculum. After the first two years of schooling, in which I learned to read, I had no formal lessons, classroom time or curriculum to follow; nor did we have a television. However, our father read aloud to us every night, without fail. My sisters and I gathered around the bed or in the sitting room, for one, two, or if we were lucky, three chapters of

the book of the moment. He read us the entire series of Doctor Do-Little, the Narnia books, Winnie the Pooh, The Wind in the Willows, Watership Down, Oliver Twist, David Copperfield, to mention just a few of the favourites. When it came time to go to university and write essays I had no trouble at all, despite my complete lack of formal school education. Syntax, grammar and creative expression in English came as easily as talking or walking. On the other hand, trying to teach these linguistic rules to children who have had no exposure to literature is almost impossible. The brain doesn't learn that way.
I cannot recommend highly enough that you read Mem Fox's book *Reading Magic*.[84] It is short, engaging and a delight to read and it may make the biggest difference to your children's lives, and your lives as parents, of any learning intervention you undertake.
Parents inexperienced in reading often wonder, 'will my child sit still enough for me to read to him?' As Mem Fox says, surprisingly, even most hyperactive children find it soothing and delicious to be read to. They love to cuddle up in your arms, to settle into the relaxing rhythm of your voice, to have your attention engaged in an activity with them. Even most children with ADHD will respond very well to being read to, especially if you begin this practice early enough in their lives. Mem says the best time to start reading to your child is the day it is born. After all, the baby has been listening to your voice in the womb, your voice is its favourite sound, there is nothing it would rather do than relax, cuddle up to you and listen to your voice. And you can read anything you want. The baby won't know the difference!
Reading to your child is one of the very best ways to help her to acquire the skill of listening. Listening then comes naturally, because you are not talking at the child, but for the child, in her service, with love. When a child is being read to she naturally learns to concentrate and relax at the same time. Relaxed concentration is the key to rapid, efficient and pleasurable learning. This was the great discovery of the Bulgarian Doctor Lozanov, who pioneered the field of Accelerated Learning. He discovered that you can put the brain into a 'best state' for learning by a combination of specific inputs. The students must undertake a deep relaxation exercise, relaxing all the muscles of the body; breathing is deep and regular, the classroom is filled with a background of slow, baroque music, and the information to be learned is presented in a four-second rhythm with particular intonation and in time with the breathing. Lozanov's discoveries were revealed to the Western world in the fascinating books on SuperLearning by Sheila Ostrander and Lynn Schroeder.[85]
This 'best state' can be achieved through Sound Therapy by simply listening to the music while you study. Reading to your child also prepares the child to easily access this 'best state' in the classroom.
Apart from bedtime stories, reading aloud to your child can provide a solution to many difficult and stressful instances.
Have your favourite books to hand in situations which are boring and where it is difficult to contain the child, such as in waiting rooms, on buses and planes, or waiting for a meeting to finish.

Non-readers

Today, fewer children look to books to entertain them. Children who can't turn to books are very demanding, needing constant entertainment or wanting to watch TV all the time. You will have an easier time of parenting throughout if, early on, you put in the necessary support for your child to become a keen reader. J.K. Rowling, the creator of the Harry Potter books, has given a generation of children an amazing gift by inspiring them to read.

Literature immersion

No matter which stage of learning your child is at, you can begin a process of increasing his exposure to books, in your home. Borrow a ton of books from the library. Have them everywhere. If you are interested in books, your children will be. Have books in every room of the house. For older boys who have struggled with reading, get picture books with adult themes such as science, technology or environment. This allows them to get genuinely interested in reading something without feeling babied—or having it remind them of their failure by doing yet another school reader!

Foster a love of literature by reading quality books which you love to your children. If you love the books, your children will love them. Choose books which adults can enjoy too, such as Winnie the Pooh, The Wind in the Willows, Alice in Wonderland, Heidi or The Hobbit. Look for books by the magical Australian children's author, Patricia Wrightson or books by Mem Fox; or find the books you loved as a child.

Brain development in Primary Years

Early exposure to language is of crucial importance, as the prime time for language development is before the age of seven. If this time is missed, as happened with the wolf children who were raised by wolves in the wild, it is possible that language will not develop at all. Before the child can make meaningful sounds, the memory of basic sound and language patterns must be laid down, and this happens in the first two years of life. A child first learns to recognise the sound and meaning of a word. Then begins the more difficult process of being able to reproduce those sounds herself. Long vowel sounds are acquired first, in babbling, followed later by the more difficult consonants. By the age of three, integration of the two brain hemispheres has taken place and fine motor skills are sufficiently developed to produce coherent language.[86]

Unless the processes of listening and speaking have happened correctly, creating a foundation of linguistic fluency, the next steps in learning literacy skills will be fraught with difficulty. These difficulties may not actually become apparent to the parents until the child begins to slip behind in school.

We read with our ears

Dr Tomatis says we read with our ears. Whether children are reading silently or aloud, they are mentally forming words in the auditory parts of the brain.

Because the first language we learn is spoken language, this is where the brain pathways are laid down. Reading and writing skills are built on top of our pre-existing auditory sense of language. If that auditory map is faulty, the more complex tasks involved in written language become almost impossible. The eye has to combine with the power and qualities of the ear to make sense of written signs. The letter is the symbol which we understand only through mental recognition of the sound. A faulty synchronisation between eye and ear results in dyslexia.[87]

Neural plasticity and wholeness

Development is about wholeness. School curriculum does not and cannot truly reflect the integration necessary for effective learning. It is only within the human brain, woven on the individual's unique history and experience, that the true fabric of learning has its weft and weave. Language is such a fluid, poetic and complex system, reflecting as it does—in its melodic essence and its very structure—the depth of human history. Because of this, the child (the brain in question) is always at the centre of its own learning.

The effort to force learning into the form of curriculum is a response to economic constraints which oblige one teacher to teach thirty children the same material in a year—whether or not that material is relevant to the evolution of each child's development of meaning and knowledge. Average children, for whom curriculum is designed, may do well, but those who are brighter may be easily bored while those with special needs may be lost in a sea of irrelevance. How can you as a parent assist, from the outside, your special child to get benefit from a system limited by such constraints? Only by having input to the child, and maybe some favourable intervention with the school and the teacher.

It may help to have a conceptual understanding of the potential difficulties you are facing in trying to get your child's needs met by a structure which is designed around curriculum, not individual narrative. Your child needs most of all to develop a sense of wholeness in the face of whatever challenges he meets in the tough daily world of school. Stimulating the neural network through various sensory integration therapies can support the development of this sense of wholeness.

The story of Rebecca

The renowned neurologist, Oliver Sacks, beautifully illustrated the brilliance of the brain in creating its own patterns and sense of wholeness when he wrote about Rebecca. His experience with this client helped to make him aware of the way our wholeness helps us to overcome the fragmentation caused by neurological difficulties. When Sacks first met Rebecca, it was in a test situation where he was performing standard neurological tests to detect her impairments. He writes his impression on this occasion: 'When I first saw her – clumsy, uncouth, all-of-a-fumble – I saw her merely as a casualty, a broken creature…'

Yet the second time he saw her, in a totally different setting, his impression was entirely different: 'I wandered outside, it was a lovely spring day…and there I saw Rebecca sitting on a bench, gazing at the April foliage quietly, with obvious delight. In this environment she literally "blossomed!" Her posture had none of the clumsiness which had impressed me before. Sitting there in a light dress, her face calm and slightly smiling…'

Rebecca gave a gesture of appreciation accompanied by surprisingly poetic spurts of language using words such as 'spring, birth, growing, stirring, everything in its time.' As his two visions of Rebecca clashed and fused in his mind, Sacks saw how the testing context had coloured the person she was. He graphically describes how such neurological testing is designed 'not merely to uncover, to bring out deficits, but to decompose her into functions and deficits. She had come apart, horribly, in formal testing, but now she was mysteriously 'together' and composed.[88]

Myth, story and narrative

This flash of insight led Sacks to the identification of two intrinsically different modes of thought: the isolating, dissecting mode; and the integrative, composing principle, which allowed Rebecca to become a coherent, intelligible and poetic whole. As he followed her life for the next few years these perceptions were heightened. Rebecca was a young woman of deep sentiments, spiritual knowing, passion and poetry. Through the rituals of prayers at the synagogue, and eventually through theatrical performance, she was able to express her inner self with a fluidity and emotional depth of which one would not have had an inkling in the testing laboratory. Of her performances on stage Sacks said, 'one would never guess that she was mentally defective.'[89] Sacks also watched her survive and rise above her deep grief at the death of her grandmother, her primary parent figure, and recover her sense of self and life purpose.

On one occasion, at a point of transition in her life, she said to the doctor as she looked down at the carpet in his office, 'I'm sort of like a living carpet. I need a pattern, a design, like you have on that carpet. I come apart, I unravel unless there's a design.'[90] This metaphor became for Sacks a symbol of the narrative mode, bringing to mind the distinguished physiologist Charles Sherrington's famous image where he compared the mind to an 'enchanted loom' forever weaving new patterns which give life its meaning.[91] It is this meaning which Rebecca needed in order to function, and for her the narrative model allowed in the poetry, the life energy, vigour, magic—whatever you may choose to call it, but certainly, meaning.

Music is a form of narrative which gives rhythm, purpose and sequence to an activity which may be otherwise devoid of value or meaning. Again and again it has been found that those with very low IQs or frontal lobe damage and apraxia (an inability to do things), who cannot perform a simple sequence of movements, say four or five tasks, are able to do so if they work to music.[92]

Sacks has explored not just deficits in themselves, but has taken into his research his interest in the human being as a whole functioning entity, and has explored the ability of the individual to adapt, restore or compensate for the effect of the neurological disorder. He therefore approaches his examination of a patient's situation as the patient does himself. The question being 'how can I restore functionality and wholeness and fulfilment to my life, given the difficulties I face?' This is by far the most helpful, supportive and humane approach to helping a person with a neurological dysfunction.

How can these ideas be usefully applied to a family situation where you are creating the best environment for your children to learn? The key for Rebecca was to find a pattern, a form and structure in which she could flow and express herself. To render meaning, that structure must be self-engendered, it cannot be imposed from outside. Meaning comes from a question or need expressed by the student; for example, the natural curiosity of the four year old who constantly asks 'why?'

While children have a very limited ability to understand abstract concepts, it is different when these concepts are presented in the form of a story. Because of the symbolic power carried within a story, they understand it easily. This is how they learn about the world. This further explains why hearing lots of stories at the crucial developmental stages of the preschool years will engender many vital foundations for learning.

Building on strengths

Learning is most effective if the approach is to build on the child's strengths rather than always harping on her weaknesses. Unfortunately an uneducated approach to teaching means that we often will automatically focus on the area where learning or understanding is lacking. With a high achiever who wants to achieve perfection in all areas, this may be useful. However, with an underachieving student, repeatedly drilling on the difficult areas may have the same effect as spinning your wheels in the sand. As soon as the dreaded subject is brought out, be it reading, spelling or fractions, the brain goes into shutdown. The child is unconsciously repeating messages like 'I can never understand this', 'oh no, not fractions again!', 'I hate spelling', or 'why can I never get this, I must be dumb?' This is not the ideal mental state for learning! Already the personality is fragmented and divided between negative emotions and an effort to force the concentration to perform. Even a bright student couldn't learn under these conditions. Synapses simply do not fire under stress!

Unfortunately the demands of school curriculum mean that students have to learn things in a certain order, even if they are not interested and the material seems irrelevant to them. Therefore, learning becomes a forced rather than an inspired process. The best you can do as a parent is spend more time on the areas your child loves, build his self-esteem, have fun, get into it, engage with him. As you expand the size of his island of self confidence, knowledge and joy in learning, these positive experiences will

eventually increase the size of the island and build a bridge into the troubled areas.

It is only when the self—and those immediate concerns of the self—are engaged by the material, that true learning occurs. Paolo Friere, the influential educational thinker who taught literacy to peasants in Brazil, was successful in rapidly overcoming huge knowledge gaps because he made the material relevant to the farmers' lives. Friere won international acclaim for his method of teaching literacy based on the day-to-day experiences of his students. [93]

Rather than teaching with tools like 'see Spot run', he started with words and concepts which the farmers needed right then to improve their situations in their everyday lives. They were experiencing threats to their land ownership and livelihood, so terms like 'land, farmer, acreage, cultivation' were immediately meaningful to them and they learned rapidly. Instead of teaching the word 'food', for example, he would teach 'hunger', a word with significance to Brazilian peasants. It was the first step toward creating the social consciousness that could take them out of poverty. They knew that literacy would empower them in their negotiations and because of this the whole self was instantly engaged in the learning process. Likewise, learning disabled children have a greater chance of learning if the material can be made immediately relevant to their daily lives.

This philosophy is also vitally important in the education of Aboriginal children. When children are put in a classroom where the entire curriculum is founded on a civilization which denies and denigrates the value of their identity and cultural values, this does not support a receptive learning state. As soon as a child can look up to an Aboriginal teacher who deeply understands their very different social framework, the whole child can engage, self-esteem is nurtured and learning can take place.

Learning prerequisites

Wholeness and integration are prerequisites for effective brain function.

Learning requires two things:

Firstly, a sense of wholeness and connectedness due to emotional and social meaning, which creates motivation.

This condition existed in the examples of Paolo Friere, and in Aboriginal schools which offer a culturally relevant curriculum. The situation also exists with affluent or well educated families where the type of material offered in the curriculum is reflects the parents' interests and resources available at home. Home schooling is another environment where it may be easier to achieve integration or wholeness, as the curriculum can be entirely tailored and defined by the child's aptitudes and interests.

Secondly, wholeness of attention achieved by integration of the right and left brain. When part of the brain is not engaged, learning is impossible. The brain is much more likely to be activated if the child is interested, stimulated,

happy, physically active, loved and feeling good about himself. This can also be supported by physical exercises which engage both sides of the brain, and by music.

How music supports wholeness

Rebecca's example of the pattern in the carpet is a very graphic one, showing that a meaningful structure and rhythm can engage the brain whereas dry, isolated information loses the thread of attention. Using stories to illustrate a message is a similar process. Another way is with music, which preconditions the brain to use and recognise patterns. Western classical music uses form in intricate ways which have not been so fully developed in any other form of music. It maximises a detailed exploration of three elements, rhythm, melody and harmony. As the brain automatically attunes to this depth of design, a powerful framework for cognitive thought is being laid down.

Simplicity and complexity

Music, especially the music of Mozart has a brilliant way of developing complexity of perception in a simple way. Michael Clark, founder and conductor of the Sydney Mozart Players says that Mozart's music has a unique quality, because when you first listen to it you have the impression that it is very simple. However, when you come to play it and to understand it in depth, you find that it is actually very complex. This was the unique genius of Mozart, to present complexity in such a palatable and apparently simple form.[94]

We are blessed to live in a world where simplicity and complexity both manifest the glory of creation. The process of learning can be seen as a journey from the simple to the complex, and through to a deeper understanding of simplicity. I see it as a three-stage process, and this understanding helps to engender a deeper meaning to any process of life.

The child sees everything in very simple terms, for she does not have the perception to look much below the surface. This is the first stage, which is called the state of innocence. As we grow we enter the second stage, and we begin to discover an unbelievably complex web of questions, truths, contradictions and detail in everything. Knowledge can be extremely confusing as we try to unravel all aspects of our reality. This confusion of searching for knowledge is clearly manifest in adolescence and in the journey of scientific discovery. Eventually the search gives way to a deeper understanding, the third stage, which is surprisingly similar to the innocence and simplicity of childhood. In fact there is great wisdom in simplicity, but it is a wisdom which contains all the complexity of knowledge in a truly useful context.

A quote by Oliver Wendell Holmes puts this succinctly in one sentence: 'I would not give a fig for the simplicity on this side of complexity, but I would give my life for the simplicity on the other side.' Mozart must have had an

innate understanding of this concept, for his music manifests the simplicity on the other side of complexity.

Specialization

One of the attributes of the stage of complexity is specialisation. A necessary part of gaining knowledge is specialisation which, however, insists on breaking everything apart, dissecting, reducing it to its components and negating its wholeness. This is the trend in testing children for learning deficits, and the focus is on the deficit, not the whole child. This process negates wholeness, and its effect, as Sacks perceived on Rebecca, is to 'decompose'. What use is a child broken into its functions or inadequacies? The theory behind this is to treat the specific problem with the specific treatment. This is the whole approach of pathological medicine today, we must isolate the disease, then isolate the drug which treats it, otherwise it is seen as unscientific. Any therapy, which is claimed to treat a wide range of conditions, is seen as suspect and at risk of being dubbed 'snake oil'. Yet wholistic therapies always treat a multitude of conditions because they are treating not the disease, not the deficit, but the person as a whole, vibrant, living, connected being.

Therapies which support greater internal connectedness fall under the umbrella of sensory integration therapies. These include movement, Sound Therapy, vision therapy and nutritional support. Used in conjunction with learner-centred education, these methods give the best possible support for any child to become an avid, successful learner.

It is often difficult to predict what benefit sensory integration therapies will have for an individual, because an individual is far too complex for us to chart and predict which learning, which integration will occur next. But, somehow, nature knows; nature can apply the miracle of healing if given the right tools: love, nurturance, poetry, narrative and music, to name a few.

Conclusion

The integrated brain

We have seen how the child's complex auditory neurology, formed through the incredible interaction of cellular growth on the DNA pattern, is nourished by the vibratory essence of the mother's voice in the womb.

We have heard how the development of listening in the baby's early years, lays the foundation in place for all our later learning. We have seen how the development of right auditory laterality is paramount in brain organization and successful language ability.

We have heard the explanation of how linguistic skills can be enhanced at any stage of the child's life through the input of Sound Therapy, how the right

sort of music stimulates ear function, auditory cortical pathways, and the integration of the auditory sense with the other senses.

We have explored the act of learning, how it happens with ease and joy, and what are the key elements to its developing organically, as it was intended.

Three models for learning difficulties

Let us recap, now, the different models for looking at learning difficulties: The Behavioural view, which advocates behaviour management, better teacher training and stricter parenting; the is the Mechanistic view, which sees learning difficulties as genetic and inevitable, and which advocates treatment with drugs to make the situation more manageable; and finally the Organic/Integrative approach, which has been explored in detail in this paper. This is the approach which seeks to work *with nature* to support the innate ability of the nervous system to heal itself, by providing the right environment and input through the senses—the portals designed by nature to influence the body. Below is a table which gives more detail on the different implications of each of these paradigms or philosophies.

Three Views of Learning Difficulties			
Question	**1. Behavioural**	**2. Mechanistic**	**3. Organic/ Integrative**
Deficit- What's missing?	Desire/discipline	Neuro transmitters	Sensory integration
Input needed.	Input study time	Input Speed/Ritalin	Input sensory activation
Cause At what level is the problem caused?	Education	Genetics	Organic environment
Responsibility Who is causing it?	Parents/schools	God	Society/government
Increase/decrease Will we see it increasing or decreasing, and why?	Ought to be decreasing due to better education and parenting	Is increasing due to better medicine (sick people survive which weakens the gene pool)	Is increasing due to increasing environmental toxins
What happens due to the deficit? Why is the child not learning?	Child is not learning because he needs a different type of instruction	Child is not learning because brain malfunctions unless given drugs	Child is not learning because fundamental function is not there
Belief about system's potential for self correction Why doesn't it fix itself?	Child is wilful - naughty	Brain is fatally flawed and can only work if given chemical	Brain/system is self healing if given the right support
Implication for change	Child has ability to change response – just needs to try harder	Brain function is static. He will always have ADHD	Brain is plastic – constantly improving
Favoured point of intervention	Carrot & stick	Suppress symptom or behaviour	Support the system to effect self repair of fundamental malfunction
What makes it work?	Practice builds brain's ability	Chemicals make brain function	Sensory input builds neural network
System organization	Repetition will change function	Malfunctions can be isolated and compensated for	Integration is the key to functioning
View of interdependence	Desire determines outcome	You have to isolate the specific problem in order to treat it	No malfunction can be treated in isolation
Treatment	Behaviour management	Drugs	Sensory input
Choice How will we solve the problem?	Parenting classes – better curriculum	This couple will have no more children	Toxin free, sensory stimulating environment – more activity, less TV
Social implications	Outcome measures – test teacher effectiveness	Eugenics - Genetic manipulation	Clean up the environment
Ultimate social outcome	More and more behaviour and social	Environmental causes not addressed,	Change social values to work in

	control. Lowest common denominator rules curriculum.	genes get more and more damaged	harmony with natural ecosystem. Ecological instead of economic rationalism.
Whose agenda does this view serve?	Avoids looking at the big picture, focus stays on individual, keeps society short sighted.	Pharmaceutical interests, genetic researchers	Future generations
When would the problem first appear?	As a result of parenting or teacher influences	Conception	After vaccination or other environmentally induced trauma
Energy investment	Many hours of extra instruction	Taking pills is easy. Quick fix to make child manageable	On going therapy, some of which is resource intensive
Negative side effects	Added struggle is hard for child	Loss of appetite, possible future depression, drug addiction	None

Pros and cons of the Behavioural view

The behavioural stance is so called because its strategy for change pivots around managing behaviour. On the positive side, this is the view which has lead to intensive teacher review processes, where all teachers' performances are objectively measured by the grades of their students. It has lead to the proliferation of classes on parenting and the reinstatement of reward and points systems for behaviour management. It advocates remedial instruction for children with learning difficulties, where an attentive, well-trained tutor works with an individual student to find ways of making the information meaningful and accessible to his capabilities. Many positive changes in education, from which everyone benefits, have occurred through efforts to make learning easier for the learning disabled.

On the negative side, this view leads to report cards which say things like 'would do well if he only tried harder', or 'Needs to change her attitude.' It can lead to more and more repetitive hours of study which don't do much good, because the child is not capable of concentrating or remembering. It can be used to blame the parents for the child's behaviour and to deny the existence of biological learning and behaviour difficulties. Because this view advocates changes to curriculum, it can lead to a watered down, lowest-common-denominator curriculum, which is actually designed for slow learners.

Pros and cons of the Mechanistic view

The Mechanistic position is rather cut and dried, with one solution fitting one problem, but without much regard for the complex mysteries of nature. The positives of this view are that it isolates the exact brain chemical needed for better performance, and provides that chemical directly in the form of a pill. Unmanageable children instantly become placid and reasonable. Parents are given a breather and children are able to concentrate and learn. Blame is removed from the parents, the school and the child, and the behaviour is treated effectively with medication. Since this view sees causation as genetic, genetic counselling is important so that parents can decide to stop having children if they realise their genes are likely to keep reproducing the problem. Genetic research is handsomely supported so that solutions can be found in the future. Medication is easy to deliver, and because it is government subsidised, it is relatively cheap for the families.

The negatives of this paradigm—or philosophy—are the increasing dependence on synthetic substances. The drugs have side effects such as loss of appetite, decreased growth, tics, visual disturbances, nervousness, insomnia, depression, and psychotic-like symptoms. Because they solve the immediate problem, however, the more fundamental cause of poor neurological function is not addressed. Most families fail to seek out other forms of treatment, which could support better neurological integration, because the immediate crisis has been dealt with. The powerful pharmaceutical interests, which promote the use of medication, have a large influence on public knowledge through the media and the medical profession—which they use to denigrate other approaches. While public faith, interest and money are pushed into genetic research, the increasing health threat of environmental pollutants is being ignored.

Pros and cons of the Integrative/Organic view

The organic perspective stems from an appreciation of the intricate relatedness of biological systems which make up our natural environment. The benefit of this approach is that it supports our glorious natural inheritance—to be the best that we can be. By giving the right sensory and organo-chemical inputs, the body is nurtured to develop to its own supreme, natural balance. The level of vitality thus achieved, is higher and more fulfilling than that achieved by other means. The inputs are harmless, and in fact, have numerous unexpected benefits in addition to treating the presenting problem. For instance, in addition to treating learning problems, the spin-offs may be better energy, more nourishing sleep, and enhanced creativity, vitality and longevity.

The only negatives of this approach are presented as being a large investment of time and money into questionable and unproven treatments. In fact, no single treatment will entirely solve the problem. Some will work better than others for particular conditions, and it may take some months or years to fully reap the rewards of sensory integration therapies. The application of these methods does require a fair commitment, and a willingness to accept whatever improvements are achieved as another step in the right direction, rather than expecting the type of sudden and dramatic effects which may be seen with drugs. Conclusions on this should be drawn form experience, however, rather than whatever may be publicised by those who represent the more conservative, pharmaceutically based interests.

Sense for the future

Altogether, this input allows us to integrate the different angles and contrary opinions about learning disabilities and come to an intelligent, well-informed conclusion about learning and brain development; and how best to support our children to grow every day in talents, abilities, potential and creative expression, in this beautiful precious world of which we are the keepers.

May we go forward, holding our love and hopes for our children like a beacon! When we truly champion them, they will give more to the world of

their bold, fine vision, their un-jaded joy, as they sing for us all their songs of hope, happiness and profound, innocent wisdom.

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