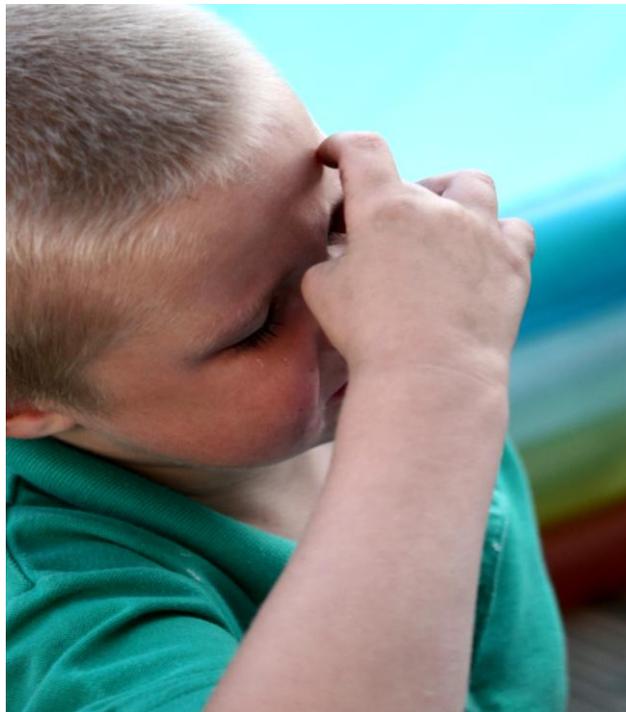




Auditory Processing Disorder

What is APD? FAQ. Initial APD Screening. How Fast ForWord Helps. Articles and Resources.



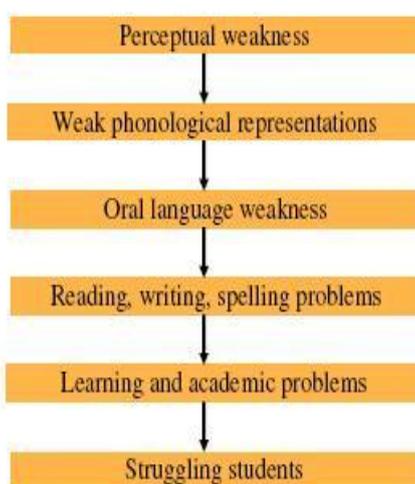
This guide is intended for general interest only. Readers are advised to seek appropriate advice before taking action.

The mention of therapies in this report does not necessarily imply endorsement. Gemm Learning cannot accept responsibility for errors or omissions.

Summary

Auditory Processing is basically the role the brain plays in the hearing process which ultimately enables us to develop learning skills. Essentially, it is our brain and not our ears that hear. The ears play the part of sending raw information on for further analysis where, all being well, it is eventually deciphered by the hearing centers in our brain. How well the raw information is interpreted by the brain depends on our level of Auditory Processing skills which are primarily developed during the critical periods of language learning, between the ages of 6 months to 3 years. This is the period when the brain is most prepared to map information from sounds or spoken words onto its language centers. As we will see people who have difficulties can recover these skills by following appropriate intervention programs. **Research on Brain Plasticity clearly demonstrates effective rewiring of the brain to remediate auditory processing difficulties**

Language Literacy Continuum



People with Auditory Processing Disorders (APD) have difficulty understanding instructions and sustaining attention, particularly in the classroom environment where there is frequently competing background noise. The sounds of peers whispering or talking, traffic, as well as lawnmowers or children playing outside, are just some of the common classroom distractions that make learning very difficult for these children. They need to expend far too much mental energy and cognitive resources trying to sort through the various sources of auditory information that their brains are receiving, such that they cannot learn or perform to their full educational potential.

The reason why they experience difficulties processing information is because the sounds of the English language have not been sufficiently imprinted on the language centers of their brain. While there may be different causes for this, often children have experienced multiple middle-ear infections (including "Glue Ear") during the period of critical language development of zero to four years old, whether or not these ear infections were recognised at the time.

Despite the prevalence of APD, its symptoms are still frequently misinterpreted as signs of ADHD or ADD, a hearing deficit, general learning difficulties, or even depression. It is frustrating for the student, parents, and teachers to see a



seemingly bright child struggle academically, without understanding why. As a result, they frequently slip through the educational cracks, where schools have neither the knowledge of how to address the child's needs, nor the resources. Furthermore they usually don't qualify for special educational assistance.

It is important to understand that if your child does have a processing deficit, it is unlikely they will outgrow these problems without appropriate intervention. The difficulty lies in choosing the best way to assist your child's learning, given that there are so many options available. Most of the parents we meet have tried various programs and tutoring, with limited success. This may be because the intervention is not addressing the underlying processing deficit. It is as though the builders are trying to stabilise the roof before the walls are completely built. **Equally it is essential to establish fundamental oral language skills before learning to read and write.**

Section 1 Introduction

APD is identified worldwide as among the most prevalent causes of learning disability. The incidence is estimated to be as high as 3-5% of the population, and is more common than the prevalence of hearing loss (Chermak & Musiek, 1999). However, because APD frequently coexists with a number of other childhood disorders, each characterized by similar behaviors, the percentages may well underestimate the true incidence.

Health professionals conducting APD assessments acknowledge the condition as pervasive and treatment as essential. **Anyone experiencing academic or behavioral difficulties should be assessed to rule out hearing loss or APD deficit.** Too frequently children's symptoms are addressed, yet the underlying cause of difficulty remains uninvestigated.



The process of assessing an individual's abilities is reliably standardized, results compared to a normed scale, with the test itself involving specialized technology, knowledge and training. Reporting should be clear and understandable, with suggested environmental modifications, compensatory techniques, and methods of cognitive training tailored to the individual's needs.

We have divided our report into the following sections:

- 2) **Key information:** There are many aspects to APD. We have outlined the most common questions and their answers in this section.
- 3) **Questionnaire:** This questionnaire may be completed by the child's teacher/s and/or parent/s as a guide in determining whether further assessment is warranted.
- 4) **"Unlocking the Learner Within:"** will give you an insight into how APD can affect the child in the classroom
- 5) **"Games Retrain Brain"** is an article by Brad Hutchinson an Audiologist/Speech Pathologist on the benefits that can be got from Fast ForWord for the treatment of APD
- 6) **The Times Article *My Son has Auditory Processing Disorder (APD)***

- 7) **"Slipping through the Educational Cracks"** is another article by Brad Hutchinson on the school aspects of APD.
- 8) **Fast ForWord:** Here we summarize the research on the programs.

APD is indeed quite common as a cause of learning disability. We hope that this summary report will give you an insight into the condition and that you have the information that you need to take the next step to assist your child to overcome their difficulty.

Section 2

Auditory Processing Disorder FAQ

What is Auditory Processing Disorder (APD)?

Auditory Processing Disorder is a measurable neurological defect located in the higher auditory neural pathways. Sound waves enter each ear canal and are passed through the middle ear where they are "prepared" for delivery to the cochlea (part of the inner ear). The cochlea "transduces" the sound waves into electric nerve pulses which are sent to the brain by way of the hearing nerve (VIII Cranial nerve). The eighth nerve inserts at the brainstem, where a complex network of crossover fibres pass much of the right ear's information to the left side of the brain and vice versa.

It is generally within this network that Auditory Processing Disorder exists. Auditory Processing Disorder is due to neural integration dysfunction or out-of-sync arrival times of the electrical impulses from the two cochlea, through the brainstem, to the brain. Since speech is dependent on time, any delays of time one ear over the other can cause a child to hear distorted sounds.

Is Auditory Processing Disorder (APD) anything like ADHD, ADD or autism?

Current literature uses the term co-morbidity to relate Auditory Processing Disorder to other diagnostic labels. This means that the two may coexist with each other or with a multitude of other individually labelled disorders such as LD, ADD, ADHD, dyslexia, autism, and PDD.

Auditory Processing Disorder, however, is one of the few that is "measurable" through established audiology and otology instrumental tests. ADHD, autism, are usually diagnosed by case history and observation of overt behaviors such as failure to stay seated, inattention, hyperactivity (or hypo-activity). In general, Auditory Processing Disorder is almost always a component of learning disabilities, ADHD, dyslexia, autism and other related disorders, but the reverse is not necessarily true.

Therefore focus on the APD component would be helpful in reducing the symptoms of the other labelled disorders. It is a strong possibility that all of the listed disorders do not exist as separate conditions but are rather related to each other on a severity continuum beginning from the very mild (dyslexia for example) to severe (autism).

Is Auditory Processing a hearing loss?

Yes, but not in the usual sense that most people are aware of. The types of hearing losses that are quite obvious, and can be shown on an audiogram, are called either conductive or nerve losses. Conductive loss is found in the ear canal (wax usually), or in the middle ear (including the eardrum and Eustachian tube), occurring in either or both ears, with each ear having little influence on the functional effect of the other. Nerve loss is a result of cochlear (inner ear) dysfunction.

Auditory Processing Disorder, on the other hand, occurs as a failure of the interaction of both ears at the brainstem, midbrain or cortex. This is called auditory integration and is not always reflected as a loss on an audiogram. However, sometimes, a slight drop in the high frequencies, more often in one ear, is a clinical indicator of Auditory Processing Disorder.

Why does a student with Auditory Processing Disorder pass regular hearing screening tests?

Hearing screening tests are designed to test the largest number of subjects in the least amount of time. A general hearing screening usually uses a fixed intensity of about 20dB at as few as four frequencies. The criteria for "failure" is usually set at one low frequency missed (indicates possible middle ear loss) and/or two high frequencies (nerve). Auditory Processing Disorder usually occurs in the absence of middle ear involvement, or in a single high frequency, or maybe in a frequency not even tested in the hearing screening protocol.

How do students with APD show the symptoms?

Individuals with Auditory Processing Disorder (APD) experience difficulties in using auditory information to learn and communicate. The most common symptom that characterises APD is when an individual cannot "listen" well when in the presence of background noise; however they may also have some or all of the following characteristics:

- Frequently request the clarification of information
- Misinterpret commands and instructions
- Have difficulty following verbal instructions
- Have poor auditory attention
- Are easily distracted
- Experience difficulties with phonics and speech sound discrimination
- Have reduced auditory memory
- Have poor expressive and receptive language skills
- Have delayed response to auditory stimuli
- Experience reading, spelling and other academic difficulties
- May have behavior problems



How can I understand the experience of APD?

To understand the experience of APD, it is necessary to understand how Central Auditory Processing skills are employed in day-to-day life. Consider sitting at a long table during a dinner party. Your ability to 'tune out' of the boring conversation at your end of the dinner table and listen in on the separate, interesting conversation being held at the opposite end of the table is an important skill, enabled by effective Auditory Processing.

Similarly, in a classroom environment students are continually required to filter out background noise (such as peers talking, air-conditioners, traffic noise, and lawn-mowers outside) to be able to hear the necessary information required to

learn. When a student has APD their auditory system usually experiences difficulty honing in on the appropriate signal (the teacher's voice). This has educational implications as it means that they are constantly expending excess mental energy in trying to understand the ongoing stream of information - energy that could be directed towards learning.

Some students with APD often do not recognise subtle differences between sounds in words, even though the sounds themselves are loud and clear. For example, the request "Tell me how a chair and a couch are alike" may sound to a child with APD like "Tell me how a couch and a chair are alike". It can even be understood by the child as "Tell me how a cow and a hair are alike." These problems are more likely to occur when a person with APD is in a noisy environment or when he or she is listening to complex information.

What are the causes for APD?

- The majority of cases result from chronic ear infections or glue ear. Mounting evidence has found that children who experienced the mild, fluctuating hearing loss associated with ear infections or glue ear have long-term problems with higher-order auditory processing skills and learning due to insufficient imprinting of the fundamental language components during the critical language development period.
- Some processing problems are thought to be genetic, where sometimes other members of the family exhibit similar processing weaknesses.
- APD has also been associated with birth trauma, maturational delays, as well as idiosyncrasies in the Central Nervous System.

It is because there are many different possibilities, even combinations of causes, that each student needs to be assessed on an individual basis.

Do all children have the same Auditory Pattern Difficulty?

Not all children with APD have the same auditory pattern difficulty. Those with temporal processing difficulty (time-related aspects of audition) will probably be more affected with intonation issues, perceiving rhythm, rhyme, stress, often referred to as metalinguistics, or prosody.

Also, moving to music dancing etc, involves a cross-modality task - auditory input and motor output versus repeating a nursery rhyme (auditory input, verbal/ language based output).

What does APD diagnosis involve?

Audiologists make the diagnosis of APD using standardised tests of processing skills, administered in carefully controlled acoustic environments, with very sophisticated, calibrated equipment. The APD diagnosis guidelines are very strict, where individuals must be within the bottom 2% of their age group in Auditory Processing skills to be categorically diagnosed with an APD, and a borderline APD is attributed to those individuals who are classed in the bottom 2-9% of their age

group. Individuals are also required to satisfy the criteria of being within the normal range for intelligence, as well as being within the normal range for hearing thresholds.

Because children with APD vary in their difficulties, it is important to have a comprehensive audiological evaluation (which includes a full test battery) that evaluates many areas of AP functioning.

The AP Assessment firstly involves a hearing assessment to ensure that a hearing deficit is not causing the difficulties. Once the integrity of the ear has been established, the assessment then involves putting the child's auditory system under stress to determine whether the child experiences difficulties with one or more of the following auditory tasks:

- Sound localisation and lateralisation, referring to the ability to identify the source of a sound.
- Auditory discrimination, referring to the ability to distinguish similar speech sounds, such as /b/ and /d/.
- Auditory pattern recognition, referring to the ability to determine similarities and differences in patterns of sounds.
- Temporal aspects of auditory processing, referring to the ability to sequence sounds, integrate a sequence of sounds into words or other meaningful combinations, and perceive sounds as separate when they quickly follow one another.
- Auditory performance decrements, referring to the ability to perceive speech or other sounds when another signal is present, such as background noise competing with the teacher's voice in the classroom environment.
- Auditory performance with degraded acoustic signals, referring to the ability to perceive a signal where some of the information is missing. For example, parts of the sound spectrum may have been deleted, the highest or lowest frequency components of the sound are removed, or where the sound is compressed in time
-

When an AP Assessment is conducted, the child's results are compared to the performance of thousands of other children who have undergone the assessment, to determine whether they have good, average or low abilities in processing information.

Section 3

Auditory Processing Disorder Initial Screening.

Child's name: _____ **DOB:** _____

Checklist completed by: _____

Tick one answer for each question to indicate how often the behavior is exhibited in your child's / student's / client's daily life. If you answer 'sometimes' or 'frequently' to many of the questions, the individual should be referred for formal testing.

Participant Behavior	Never	Sometimes	Frequently	Unsure
Misunderstands what is said				
Requests that information or instructions be repeated				
Appears to not hear properly or to be a 'selective listener'				
Experiences difficulty with phonics				
Experiences difficulty with reading				
Experiences difficulty with spelling				
Experiences difficulty putting thoughts onto paper when writing				
Experiences difficulty with comprehension				
Experiences difficulty with problem solving or abstract concepts				
Performs better one on one				
Experiences difficulty in noisy environments				
Either unusually sensitive or unresponsive to noise/ sounds				
Appears confused by multiple, lengthy, or quickly presented verbal instructions				
Appears to be easily distractible				
Experiences difficulty paying attention in the classroom				
Difficulty expressing/explaining information or rephrasing self				
Provides slow or delayed responses				
Experiences difficulty understanding the point or focus of group activities				
Takes a long time to complete classroom work and/or homework				
Is teased or left out by peers				
Unusually tired after school				
Experiences behavior problems				
Low confidence and/or self-esteem				

Section 4

Unlocking the Learner Inside

Why do some children 'get it' in the classroom, while others struggle to understand even simple verbal instructions?

Nine-year-old Justin has always had trouble following instructions, despite his average intelligence, and normal vision and hearing thresholds. At home, Justin works quite well when his mum pays him one-on-one attention, although his homework usually takes longer than it should. In the busy classroom environment, Justin's teacher becomes frustrated with him, because he does not seem to concentrate or listen. He frequently asks for information to be repeated and usually looks at what his classmates are doing so that he can copy. Justin's reports have shown that he is falling behind academically and has become occasionally disruptive in class. Justin's teacher has suggested to his mother that he be tested for ADHD; however Justin's mother does not believe this to be the reason for her son's non-compliance in the classroom.

While some children do experience similar difficulties to Justin's due to a hearing deficit, ADHD, a learning deficit, or even depression, Justin experiences a significant **Auditory Processing Disorder (APD)**. This means that while his ears are able to hear the information, his brain has difficulty processing or interpreting the information quickly enough, particularly in environments like the classroom where there is competing background noise.

The reason why these students experience difficulties processing information is because **the sounds of the English language have not been sufficiently imprinted on the language centers of their brain**. While there may be different causes for this, often children have experienced multiple middle-ear infections during the period of critical language development of zero to four years old, whether or not these ear infections were recognised at the time.

In an average classroom there are likely to be a number of students who find it difficult to learn because they have APD. Not all will possess the same behaviors as Justin; some, for example, will be achieving within the average range academically but will be expending a lot of energy to concentrate on verbal

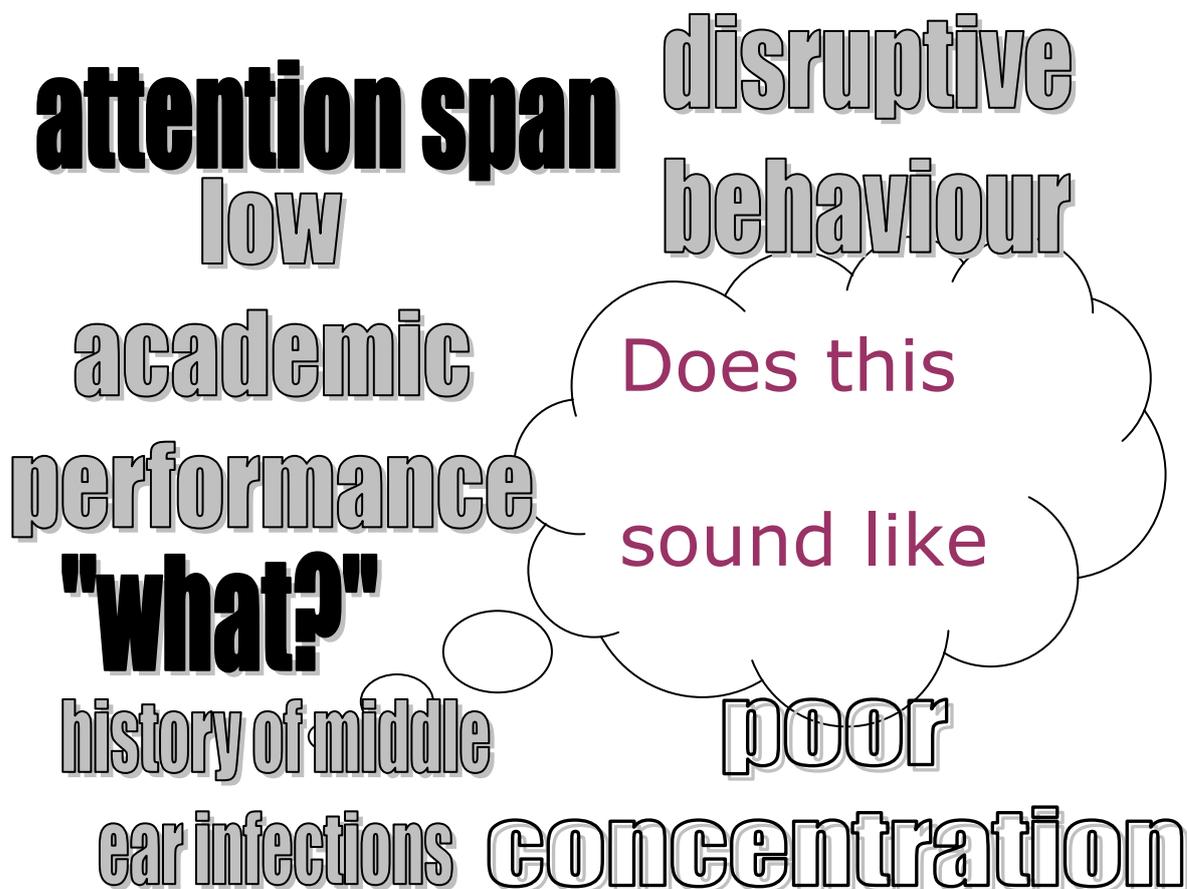


instructions, rather than directing this effort into learning. Many parents of these children will be able to identify with similar learning difficulties during their own schooling years.

While for some children language is a strong learning stimulus, for others it can be confusing. It is essential for the child's parent and teacher to understand that APD is real and the associated behaviors, including difficulties listening to information and processing what has been heard, are not within the child's control. We believe that all children want to succeed, and, given the chance, they too can develop the language centre in their brain so that they are able to reach their own learning potential.

Language and learning difficulties may become apparent when the child is very young, and if left untreated, problems are likely to persist into adulthood. In providing intervention for APD it is essential to address the underlying problem, the processing deficit, to avoid 'band aiding' the symptoms. The most successful treatment for APD is a very sophisticated computer program called *Fast ForWord*, which was designed by American neuroscientists and is based on over 25 years of neurophysiological and behavioral research. *Fast ForWord* is founded on the optimal learning principles of frequency, intensity, adaptation and motivation, and incredibly, an average of 2 year gains in auditory processing skills are achieved through only 4-8 weeks of participation.

Section 5 Games Retrain Brain



Games Retrain Brain

Brad Hutchinson (Audiologist/Speech Pathologist)
B.Sc PgradDipAud, MaudSA (CC), MSPAA

Disruptive behavior in the classroom and performance below expected academic levels may be treatable by specialized computer games. The games Auditory Processing skills lacking in approximately 5% of children who can exhibit a range of characteristics like reduced attention and concentration, difficulty following verbal instructions with frequent requests for clarification, while reading, spelling and other academic subjects suffer.

Neuroscientists and speech pathologists designed these computer games, based on over 25 years of research into how the brain learns. They have found that the brain learns best through intensive, repetitive, motivational and adaptive teaching

techniques, all incorporated into the games which target the Auditory Processing deficit.

Auditory Processing is basically the role the brain plays in the hearing process which ultimately enables us to develop learning skills. Essentially, it is our brain and not our ears that hear. The ears play the part of sending raw information on for further analysis where, all being well, it is eventually deciphered by the hearing centers in our brain. How well the raw information is interpreted by the brain depends on our level of **Auditory Processing skills which are primarily developed during the critical periods of language learning, between the ages of 0 to 3 years.** This is the period when the brain is most prepared to map information from sounds or spoken words onto its language centers.

The main cause of defective Auditory Processing skill development is middle ear infections. Unfortunately, large numbers of children go through these critical periods for language learning with this condition, commonly known as glue ear. When glue ear is present, it results in a temporary mild hearing loss which prevents proper speech comprehension. The outcome is that Auditory Processing skills don't get a chance to develop appropriately. It is of great concern that many parents, even very diligent parents, are unaware that their children have glue ear. This is because it is often a hidden condition which commonly occurs along with colds, flues or fevers. In fact, astounding medical evidence shows that at any one time, an average of 30% of 2 year-old ears have glue ear.

Teachers have commented to me that every year in their classroom there are at least a couple of children who are performing below academic expectations, often leading to reduced concentration or disruptive behavior.

Many may be treated for ADHD. But the reason behind their troublesome behavior may relate to Auditory Processing difficulties which prevent them from performing to their true potential. However, massive improvements in behavior and academic levels have been seen since the introduction of the program *Fast ForWord*.

Research done in the US where many thousands of children have played the games shows an average of 1 to 3 years in academic improvement after 4 to 8 weeks of game participation. Some of the changes reported in parent testimonials after their children have trained in the program include improved concentration, organization, higher self-esteem, better reading and spelling outcomes, and improved memory and behavior.

So successful are the games that they have been introduced into the regular school curriculum in over 4,000 schools in the United States and internationally with programs suitable for 6 year olds through to adults. Anyone who is interested can visit the game creator's website at www.scientificlearning.com to learn more about the program. While you're on the website, I recommend you have a look at the Wall Street Journal article on the home page and the NBC video news report in the media section.

Section 6

My son has Auditory Processing Disorder – APD

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TIMES ONLINE

Anne Dixey on a little-known disorder that may affect the school progress of one child in ten

When football dad Kai Vacher wants to shout at his son to take the ball up the wing, he has to restrain himself. For, although Ben, 7 (right), can hear, he can't understand. He has auditory processing disorder (APD), a listening difficulty that could affect 10 per cent of children.

Kai and his partner Anna had wondered about Ben's hearing since he was little. "Every time he went to playgroup he would say, 'Something is wrong with my ear; there is always a rushing sound like rain'," Anna recalls. But when a teacher suggested he might be deaf the hearing tests came out normal.

Anna gave up her job as a secondary school teacher to help Ben. Her shelves are filled with files, letters and research. It has taken Anna and Kai nearly four frustrating years to get a diagnosis for Ben's condition. They went from GPs near their home in East Sussex to local speech therapists, audiologists and ear, nose and throat specialists until the final, firm diagnosis of APD at Great Ormond Street Hospital, in London.

APD is a listening disorder rather than a hearing disorder; the problem lies in the brain rather than the ear. For any sound to be registered, signals from the ear must be translated by the brain, but children with APD have trouble registering or processing these signals. The exact reason is not yet understood.

Awareness of the condition is comparable to dyslexia 20 years ago. GPs often haven't heard of it and, although the US has led the way in highlighting the condition, there is no routine test. One of the problems is that experts say it is difficult to diagnose before the age of 7 – a child is changing so fast before that age.

How well an affected child listens seems to depend on the situation he is in, and noisy environments are most problematic. Kai, a former teacher and now an education consultant, describes it as like "living with a child who is periodically deaf". Communicating one-to-one is fine, but Ben is lost in a crowd. "When he is at a birthday tea with eight or ten kids he hasn't got a clue what is going on. He will look at the faces and laugh, but there is a slight delay."

The Vachers, along with Ben's 12-year-old sister Lizzie, were ecstatic when Ben's condition was finally diagnosed but then began the struggle to find the right treatment. A breakthrough came with the loan of a radio microphone system from the National Deaf Children's Society – Ben's teacher wore a microphone and he

had a receiver. During that eight-month period he came home "skipping and laughing." The teacher's voice had been distilled out of the background noise. But since the microphone system had to be returned at Christmas, at the end of the loan period, he has been in a class of 35 without the equipment. Anna says: "Four times a day he gets pain in his ears and has to leave the classroom – the teacher says he is struggling. It is about his wellbeing, too. Now it is awful, he comes in from school and just curls up."

Ben has an added hearing sensitivity that means he hates the noise of fireworks or even a hairdryer. But his listening problem does not mean that he cannot appreciate music. "He is very musical and plays the violin and piano," Kai says. "When he hears a song on the radio he will sing the tune perfectly – but he will get the words wrong."

The family is currently in discussions with the local authorities and hope to get another microphone system for Ben to use at his village state school. They cost about £1,300.

Computer training can help APD sufferers

Dilys Treharne, an APD specialist at Sheffield University, says: "We think about 10 per cent of kids have got it – that's a lot of children. Some of them cope quite adequately with it but some really struggle. You cannot cure it but a lot of work can be done to ameliorate the problem."

Options include cutting noise in the classroom with carpeting, radio microphone systems and computer programs. Addison Primary in Brook Green, West London has just joined a handful of other state schools nationally using Fast ForWord (FFW) intensive computer training, aimed at children with APD and other disorders such as dyslexia. The program uses games that reward learners when they listen carefully, correctly recognizing sounds or accurately following on-screen instructions.

Pete Dunmall, the head teacher, had never heard of the condition but, when one pupil was given a firm diagnosis, he decided to use the internal budget to fund FFW for six children who might benefit. "We just want to see what impact this program has with these children and then evaluate," he says.

Diagnosis of APD is complicated when children also suffer from other conditions with similar symptoms. Difficulties with reading might be due to dyslexia and problems concentrating because of attention deficit disorder.

Professor Dave Moore, the director of the Institute of Hearing Research, describes it as a "referral lottery" in which a child sent to an audiologist might be told he or she has APD and one sent to a language specialist might be told that they have dyslexia.

Section 7

Slipping through the educational cracks

Brad Hutchinson
Audiologist/Speech Pathologist

Children do not come with a manual. Often parents are required to implement trial and error to address their child's needs and wants.

In an ideal world, schooling would provide each child's educational needs. In the real world, classrooms usually consist of 30 or so students, and the teacher is forced to aim their instruction at the level of the 'average' child. There is often little opportunity for one-on-one teaching, and invariably it is the parent who is left to address any additional educational needs.

For one reason or another not all children fit into the 'average' range academically. In recent years, Auditory Processing Disorder (or APD) has been identified as one of the primary causes for learning deficits, and yet there is still little knowledge of this disorder within the general community. Individuals with APD have normal hearing thresholds and at least average intelligence, but their brain experiences complications in detecting, attending to, localising, discriminating, and organising what they hear.

People with APD have difficulty understanding instructions and sustaining attention, particularly in the classroom environment where there is frequently competing background noise. The sounds of peers whispering or talking, air-conditioners or fans blowing, as well as lawnmowers or children playing sports outside, are just some of the common classroom distractions that make learning very difficult for these children. They need to expend far too much mental energy and cognitive resources trying to sort through the various sources of auditory information that their brains are receiving, such that they cannot learn or perform to their full educational potential.

The reason why they experience difficulties processing information is because the sounds of the English language have not been sufficiently imprinted on the language centers of their brain. While there may be different causes for this, often children have experienced multiple middle-ear infections during the period of critical language development of zero to four years old, whether or not these ear infections were recognised at the time.



Despite the prevalence of APD, its symptoms are still frequently misinterpreted as signs of ADHD or ADD, a hearing deficit, general learning difficulties, or even depression. It is frustrating for the student, parents, and teachers to see a

seemingly bright child struggle academically, without understanding why. As a result, they frequently slip through the educational cracks, where schools have neither the knowledge of how to address the child's needs, nor the resources. Furthermore they usually don't qualify for special educational assistance.

It is important to understand that if your child does have a processing deficit, it is unlikely they will outgrow these problems without appropriate intervention. The difficulty lies in choosing the best way to assist your child's learning, given that there are so many options available. Most of the parents I meet have tried various programs and tutoring, with limited success. This may be because the intervention is not addressing the underlying processing deficit. It is as though the builders are trying to stabilise the roof before the walls are completely built. Equally it is essential to establish fundamental oral language skills before learning to read and write.

A very sophisticated computer and internet-based program called *Fast ForWord* has been developed to address the problem of APD and other language and learning difficulties. Based on over 30 years of neurophysiological and behavioral research, this intensive and adaptive program increases the participant's ability to recognise and understand auditory information by 2 years on average, within only 4-8 weeks of participation.

The most important factor that distinguishes this program from so many others is that there is a huge amount of research supporting not only the theory behind *Fast ForWord*, but also the program's effectiveness. It is because of *Fast ForWord's* unprecedented success that the program forms part of the core school curriculum for hundreds of thousands of students.

Section 8

FAST FORWARD ®

SCIENTIFIC BASIS AND PROVEN RESULTS

Scientific Background

The programs evolved from the work of internationally renowned research scientists Drs. Michael Merzenich and Bill Jenkins at the University of California, San Francisco, and Drs. Paula Tallal and Steven Miller at Rutgers University. The research collaboration of Drs. Merzenich, Jenkins, Tallal, and Miller resulted in a **key finding: with the help of computers, phonemes and other speech sounds could be slowed down and digitally enhanced so that they can be differentiated.** Using this technology in an intensive and adaptive manner, the scientists discovered that students can develop a wide range of critical language and reading skills such as phonological awareness, phonemic awareness, fluency, vocabulary, comprehension, decoding, working memory, syntax, grammar and other skills necessary to learn to read or become a better reader. The optimal learning environment used in the *Fast ForWord* products is based on scientifically-validated methods of learning developed by Drs. Merzenich and Jenkins, and includes motivation, intensity, frequency, and adaptivity. When combined with precise protocols and the power of computer and internet technology, rapid advances in learning occur.

The Research

Research on *Fast ForWord* falls into three general categories:

- Initial clinical study and original scientific research by the founders of the company based on studies in the laboratories and clinics of two major universities and published in peer-reviewed publications, such as *Science* and *Nature*;
- National Field Trials and School Pilot Study conducted "in the field" with children in private speech and language clinics, schools, institutions, or at home;
- Ongoing research, including longitudinal studies, at schools where Scientific Learning products have been implemented.

A **Controlled Randomized Clinical Trial** (1994-1995) was conducted at Rutgers University in Newark, New Jersey. The clinical results were published in the January 1996 issue of *Science*, one of the world's most prestigious peer-reviewed journals (Tallal, et. al., *Science*. 271: 81-84). The early data showed rapid improvements in language skills with the research prototype of *Fast ForWord Language*, including significant gains in oral language comprehension, speech discrimination, grammar, and syntax.

A **Multi-Site Field Study** conducted in 1996 proved the results in a "real world" setting. In collaboration with over 60 independent professionals at 35 sites in the United States and Canada, after *Fast ForWord Language* participation children experienced the same dramatic improvements in language as those who participated in the initial **Controlled Randomized Clinical Trial**. At each site, independent speech and language professionals or educators selected and

administered *Fast ForWord Language* to students aged 4 to 14 who exhibited difficulties with either listening or language comprehension skills.

Each of the 35 sites reported conclusive validation of the technology behind *Fast ForWord Language*:

- 90% of the children experienced significant gains in one or more tested areas
- Most made significant gains in multiple areas, including listening, speaking, attention, language fundamentals, grammar, and ability to follow directions
- Gains were, on average, 1 to 2 years in 4 to 8 weeks

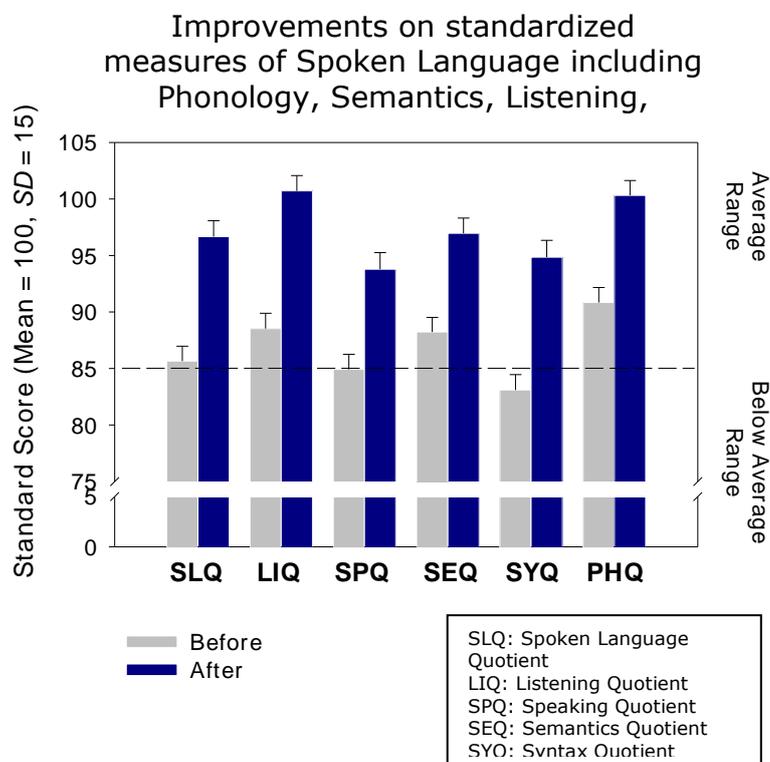
A ***School-Based Randomized Trial*** held in Autumn of 1997 in collaboration with 19 schools in 9 districts in California, Texas, Illinois, Indiana, and Nebraska established the effectiveness of *Fast ForWord Language* in schools. The goal of this controlled study, which included over 400 students in kindergarten through year 3, was to determine the effectiveness of *Fast ForWord Language* for students who were “at-risk” for failure in reading and language skills.

Classroom teachers selected the students who were at-risk and randomly assigned them to either the experimental group that used *Fast ForWord Language* or to the comparison group (matched to the experimental group by age and gender) that remained in the regular classroom and received non-*Fast ForWord Language* instruction. Data from the ***School-Based Randomized Trial*** confirmed the earlier conclusions that resulted from the initial ***Controlled Randomized Clinical Trial*** reported in the peer-review journal *Science* and the ***Multi-Site Field Study***. Again, average gains in the ***School-Based Randomized Trial*** were 1 to 2 years on standardized measures of language comprehension or phoneme awareness following 4 to 6 weeks of *Fast ForWord Language* participation (Miller et al., 1999).

These consistent results indicate an enormous potential for language and reading gains across a broad population of students in many different settings.

FAST FORWORD LANGUAGE MULTI-SITE FIELD TRIAL: MEAN IMPROVEMENTS ON A COMPREHENSIVE BATTERY OF LANGUAGE MEASURES (TOLD-P:2)

Before *Fast ForWord Language* activity, 77 students demonstrated below-average performance in most language areas. On average, **after** *Fast ForWord Language*, the students in the study demonstrated significant improvements in multiple aspects of overall language development. Their listening, speaking, semantics, syntax, and phonological skills progressed into the average range.



For the ***School-Based Randomized Trial***, the following standardized tests were used:

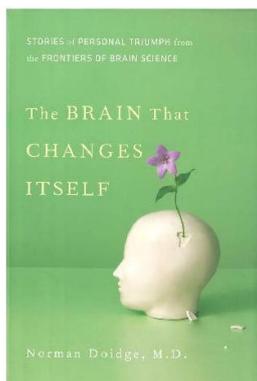
- The Test for Auditory Comprehension of Language-Revised (**TAACL-R**),
- The Phonological Awareness Test (**PAT**)
- The Woodcock Johnson Revised Achievement Battery (**WJR**)

Longitudinal studies have demonstrated that the language and reading improvements are maintained 6 and 12 months after initial *Fast ForWord Language* instruction. A research study presented in 1999 by Dr. Gail Bedi, adjunct faculty member of The Mount Sinai School of Medicine and the Director of Manhattan Neuropsychology in New York, demonstrated the continuation of overall language gains in a group of children six months after they used *Fast ForWord Language* for four weeks compared to another group of children who received natural speech therapy. Anecdotal reports from parents and teachers provide further testimony to the long-lasting and positive impact of *Fast ForWord* activity.

For Further Information see:



Lots of articles, videos and research materials on www.gemmlearning.com



The Brain That Changes Itself
By Norman Doidge
See Chapter 3 on Mike Merzenich

Email us info@gemmlearning.com for an extract