

Secondary School Sensory Training Project at a North London School

Delivered by The Sound Learning Centre

Unusual Sensory Processing

Sensory difficulties are extremely stressful and underlie many learning difficulties. They adversely affect concentration, the ability to learn and to maximise potential.



Background to The Sound Learning Centre:

The Sound Learning Centre (TSLC) was founded in 1994. Our mission statement was: to help children and adults with learning and sensory difficulties to improve performance. Twenty five years later, we continue working in this area of sensory difficulties. Over the years we have developed a specialised approach to identifying sensory difficulties and that is in the form of our Assessment procedure. Almost without exception, we find that the ‘labelled’ difficulties we work with have underlying sensory difficulties at their core. And in many cases, these sensory difficulties impact performance and behaviours. Our assessment procedure is crucial to our process in enabling us to establish a detailed sensory profile for the client. Based on this profile we provide sound and light therapy and developmental programmes at our therapeutic centre in London. However, we can also provide our services as Outreach Programmes, whereby we work in-house at client sites.

Project Rationale: Commenced at a North London School, 23 February 2015

The Project was established to minimise the effect on sensory, emotional and health issues, which may create barriers to learning and prevent students from reaching their potential. Through the use of specialised interventions the project took an holistic approach which places the student at the centre and works in partnership with families and key professionals to achieve the best possible outcomes. The project model hoped to demonstrate that the student is more effectively able to access learning through the use of targeted resource management in the areas of sensory, developmental and emotional need.

Project - Group Composition:

The Project commenced 23 February 2015, immediately after half term, and at very short notice. Whilst the timing schedule for our assessments and therapies was challenging logistically, as well as needing to fit in with the students school timetable, it was all managed very efficiently by the School Project Manager. TSLC were part of a multi-disciplinary project team. There were 16 students in the Project and TSLC worked with 12 of these students. TSLC assessed each of these 12 students, 8 boys and 4 girls, aged between 11-13 years. These 12 students had a variety of Special educational Needs (SEN) requirements, as can be seen from the Table of Student Participants.

Summary: TSLC Part of Project for 12 Students:

1. To provide sensory assessments and reports to establish how over and under sensitivities in hearing together with other sensory processing and developmental deficiencies might be impacting students from a functional perspective. The sensory assessment included the influence of visual and auditory processing and a Neuro-developmental screening.
2. Deliver Auditory Integration Training (AIT) and Lightwave Stimulation (LWS) therapies to help improve performance of the students leading to either a reduction in one to one SEN provision or improved results from that input.
3. Provide a more detailed Neuro-Developmental Assessment, Report and Remedial Programme for each student to be performed and supervised at school by staff trained by TSLC.
4. The assessments and delivery of the programmes were all to be performed at the School and report production at TSLC offices.
5. Report results to the Project Organisers.

TSLC Services:

We were able to start our part of the project on time and provided assessments, sound and light therapy and developmental assessments and programmes as an Outreach Service. Our Assessment procedure was used to establish the sensory and Neuro-developmental baseline profiles for 12 of the project students.

The sound therapy we provided was Bérard Auditory Integration Training (AIT), using an Audiokinetron developed by Dr Guy Bérard, a French ear, nose and throat specialist and the light therapy method we employed was Lightwave Stimulation (LWS) pioneered by Dr. John Downing, a leading optometrist in the U.S.A and delivered by means of a Photron machine. In addition we provided a Neuro-developmental Assessment and Programme (NDP). We will refer to but not detail the AIT and NDP elements of this programme in this report.

Table of Student Participants:

No.	Ref No.	M/ F	Language	SEN* Status	SEND			Medical Register Notes	Status
					C&L	SEMH	Disability		
P1	D13452	F	English	K	C&L	SEMH			LAC
P2	D13490	M	Somali	K	C&L	SEMH		S&P (VI)	LAC, FSM
P3	D13476	F	Unknown	K	C&L			CI N	FSM
P4	D13455	M	English	K		SEMH			
P5	D13454	M	Unknown	E				CI N	ASD
P6	D13506	M	English	E	C&L	SEMH	SpLD		Asthma-inhaler
P7	D13504	F	English	K	C&L	SEMH			
P8	D13507	M	English	K	C&L	SEMH			
P9	D13505	F	Arabic	K	C&L	SEMH		CI N	
P10	D13509	M	Somali	K	C&L				
P11	D13508	M	English	E				CI N	Diagnosis ASD, Sp/lang therapy
P12	D13457	M	English	E	C&L		SpLD- Dyslexia		

* K: SEN Support E: Education, Health & Care Plan (EHCP) LAC: Looked after child
FSM: Free School Meals S & P (VI) Sensory and Physical Need (Visual Impairment)

Table of SEND abbreviations:

CIN		C&L	SEBD	SPN
Communications and Interaction Needs		Cognition and Learning	Social, Emotional & Behavioural Difficulties	Sensory and Physical Needs
ASD	SLCN Speech, Language & Communication Needs	SPLD Specific Learning Difficulty (Dyslexia, Dyspraxia)	SEMH Social, Emotional & Mental Health	HI Hearing Impairment VI Visual Impairment MSI Multi-Sensory Impairment

Typically, we obtain background information prior to assessment from a detailed questionnaire that we ask parents and carers to complete on behalf of their child. We note frequently how sensory issues can impact on development and performance. For this Project we had very little background information and therefore relied on that provided by the school – see Tables above - and our own Assessments

These programmes were delivered over a period of approximately 4 weeks at the School with two further weeks of report production by TSLC, generating 36 reports in total.

TSLC Project Group – Hours allocated			
Events completed	Hours	Students	Hours
Assessments	2	12	24
Mid-term Assessments*	1	6	6
Final Assessments	2	12	24
NDP Assessment, protocol and programme	3	12	36
Report writing – 3 reports per student	3	12	36
Total hours:			126
Supplementary:			
School staff training re NDP			4
*6 students were unable to attend M/T Assessments			

Delivery of Auditory Integration Training (AIT) and Lightwave Stimulation (LWS) therapies by two therapists for two school weeks

Assessment:

Hypo (under) sensitive or hyper (over) sensitive systems and developmental immaturity are recognised to be a source of social, emotional, behavioural and academic difficulties. For example visual difficulties very often link back to the vestibular or balance system and the vestibular apparatus, which is part of the inner ear, and can be influenced by how a person hears. The effectiveness of vision is also influenced by the strength of the eye muscles which in turn are influenced by strong sucking action as a baby while feeding. Ocular motility difficulties can often be traced back to lack of breast feeding or an under-developed suck reflex. Thus, the rationale for the assessments is to gain an understanding of underlying sensory difficulties affecting the participant's current situation.

By thoroughly assessing participants and identifying specific weaknesses one can provide suitable methods of therapy and subsequently establish the level of improvement observed in each individual. We can then analyse the results effectively.

We strongly believe many social, emotional, behavioural and academic difficulties are attributable to sensory difficulties particularly auditory processing, visual processing or developmental difficulties. These characteristic indicators are either not necessarily identified or sufficiently understood in standard vision and hearing tests or their relevance to performance difficulties is given insufficient credence.

Based on the ability of the student to comprehend instruction, maintain concentration and provide an understandable response, the assessment looks at the auditory, visual and developmental systems, whilst also exploring the vestibular function, proprioception and laterality and how the senses are working overall. Included are auditory and visual tests and a neuro-developmental screening, tailored to the abilities of the student along with detailed critical observations and background information as provided by parents, guardians or carers and school staff.

The Standard Assessment procedure we use was fundamental in formulating an accurate and insightful sensory profile and this has been of great value to the Project. The test results were used to personalise the programmes to the needs of the individual student.

The assessment for each student took approximately two hours and all efforts were made to ensure that each student felt at ease and comfortable, with short breaks if required. Usually the assessor would provide verbal feedback at the end of the assessment, but for this project it was not appropriate. However, TSLC did provide to the school a comprehensive written report for each student with supporting materials, which included practical advice on support at home and in school as well as any other professional services we recommended.

The ideal hearing threshold is shown as a flat line, at 0dB HL across all frequencies. Though 0dB HL is technically speaking the ideal score for each frequency, it is very rare for an individual to have "perfect hearing". An individual's hearing would normally vary below the 0dB HL reference (hyposensitivity or hearing loss) or above the 0dB HL reference (hypersensitivity or over sensitivity). Either condition introduces processing distortion.

Hearing loss (hypo sensitivity) is not generally considered problematic until it is greater than 25 or 30 dB HL and is generally classed as being 'within normal limits' which really means no medical or surgical attention is needed and neither is hearing apparatus generally required. Thresholds better than 0dB HL are not normally considered a problem either but actually such hyper (over) sensitive hearing is just as, if not more debilitating, as hypo (under) sensitive hearing. In practice the general population tends to be slightly hypo-sensitive in both ears at all frequencies. This is not necessarily a bad thing since hyper-sensitivity (over-sensitivity) is generally disturbing

Where over sensitivity exists the individual is often disturbed by certain sounds, wanting to shut them off, escape their presence or physically exclude them – e.g. cover their ears. When these actions are not possible or practicable, such as in a noisy school classroom – the individual adopts the coping mechanism of 'tuning out' as protection. Now you may see reasons for the inattentive, AD(H)D or Dyslexia/Dyspraxia type behaviours, whereby the individual may fail to perform to their academic potential.

Hearing profiles whose variations are generally considered within 'normal limits' may still cause problems in a mainstream learning environment. Varieties may exist in:

- sensitivity across the audible frequency range
- pitch discrimination
- delays in timing
- distortions in perception
- the ability to discriminate sounds
- difficulties with sequencing that disrupt the normal flow of the auditory message

These are all challenges that contribute to problems ranging from severe delays in speech or language development to milder problems with concentration and memory, balance and coordination, abnormal responses to motion or sense of time and direction which in turn impact on learning and academic performance.

Improvement in performance from AIT is expected based on the measured auditory thresholds trending towards the 0dB HL reference level.

Elements of visual processing were included in the assessment since good visual processing does not just depend upon visual acuity. There may be problems with light sensitivity, depth perception, print distortions and functional restrictions in colour Visual Fields of Awareness. Stress causes a reduction in visual fields of awareness and restricted visual fields are thought to reduce the efficiency of light absorption through the eye. Thus, a reduced visual field of awareness could have considerable negative consequences on visual performance, social and emotional wellbeing and academic performance. The most common visual symptoms associated with reduced visual fields are words appearing to move, merging or skipping lines or words when reading. Constricted visual fields also affect one's spatial awareness which is the ability to accurately perceive and judge where objects are in space. Symptoms include poor eye, hand and body coordination which often results in poor organisational skills, poor handwriting or clumsiness.

Poor binocular vision can affect the students' ability to track words on the page, or read easily from the whiteboard. It means they may feel more tired, their eyes can ache or feel sore and overall, reading becomes a real chore. This all acts as a barrier to learning and performance. When something is this hard, a student may be inclined to stop trying. Performance will fall, as will self esteem.

We do not undertake standard sight or eye health tests. We are primarily interested to find out how efficiently light is being absorbed through each eye since light is needed not just for seeing but for many aspects of brain function, affecting intellectual performance, physical wellbeing, emotions and mood.

Our principal tool is the standard Visual Fields of Awareness test. For this, the client views a chart, mounted on a Campimeter, with one eye at a time. Whilst maintaining fixation on the centre of the chart, a coloured probe is moved from the periphery towards the centre and the client has to indicate when it is possible to identify the colour of the probe. This point is marked on the chart.

Four colours are tested (red, green, blue and white) on each of seven axes, separated by 45 degrees. The test is performed for each eye both before and after therapy. These measurements are not taken on the horizontal axis where the blind spot is situated (right side for right eye and left side for left eye).

Clients that can clearly benefit from a LWS programme usually have very restricted visual fields (perhaps 0°-10°). After the programme, these may open up to as much as 20° to 40°, clearly correlating with improved performance.

We also use other visual perceptual tests including a screening for Meares-Irlen Syndrome (also known as Scotopic Sensitivity Syndrome, Visual Dyslexia or Visual Stress). These terms are used to describe a number of symptoms affecting the perception of print on a page which make reading difficult and often unpleasant.

The assessment also included a Neuro-developmental **screening** using ten separate tests. The results are indicative of whether a more detailed NDP assessment and programme is of value. The screening results were also valuable as an indicator of improved function resulting from the AIT and LWS programmes independent of the auditory and visual reassessments carried out at the end of the therapies.

Sound, Light and Neuro-developmental Programmes:

Following initial assessment, the programmes used by TSLC in this project were Auditory Integration Training (AIT), Lightwave Stimulation (LWS) and Neuro-developmental Programme (NDP).

AIT involves listening through headphones to specially modulated and filtered music, delivered by means of an Audiokinetron machine, with additional narrow band auditory filters set as required.

- The theory is that variations in auditory profile, often considered as being ‘within normal limits’, introduce distortions in auditory processing that can be implicated in a wide range of social, emotional, behavioural and academic difficulties as well as vestibular and proprioceptive concerns.
- Music is sound which is patterned in complex ways predictable or anticipatable to the auditory processing system and can be used as a medium to retrain the auditory system.
- If the musical patterning is altered by modulating the music with the Audiokinetron such that either high or low frequencies are randomly presented and amplified or reduced in volume, rapidly and for very short periods, the sounds will still be recognisable as music but be less predictable and more difficult to process.
- If this modulated music is presented to the listener through headphones it would, over a period of twenty short listening periods, lead to the auditory system re-training itself such that the measured response of each ear is more balanced across the frequency range and also between each ear.
- Such changes in auditory response and processing would be reflected in a wide range of performance improvements.



This suggests one reason why participants involved in therapy exhibited improved behaviour and reduced behavioural difficulties following therapy.

The programme consisted of two 30 minute sessions each day with a minimum interval of 3 hours between sessions. A standard programme is 20 sessions.

The link between how we hear and how we behave is stressed by Dr. Guy Bérard in his book titled “Hearing Equals Behavior: Updated and Expanded” ISBN-13: 978-0615474526 and expressed as “*Everything happens as if human behavior were largely conditioned by the manner in which one hears.*”

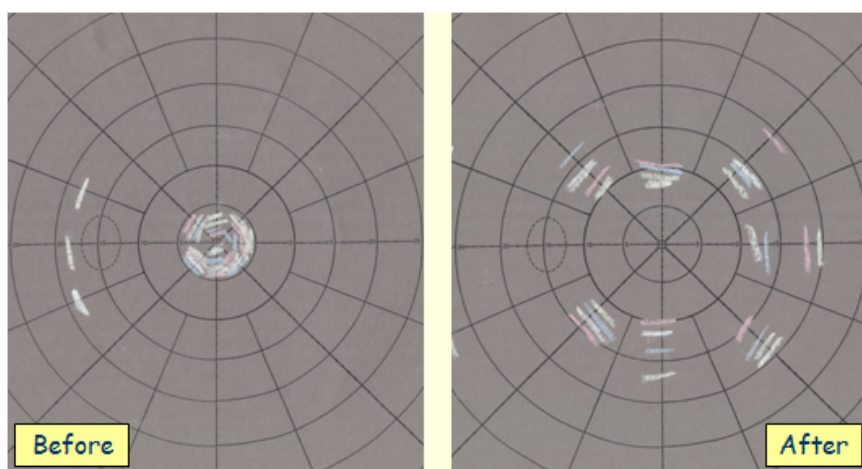
- LWS involves looking at low intensity, pulsed, coloured light in a darkened room, delivered by means of a Lumatron or Photron machine.
- The programme involved two 20-minute sessions each day for 10 days.
- The personalised LWS protocol for each client includes the required colours chosen from eleven available colours ranging from Violet to Ruby and pure white. A specific flicker rate between 8 to 15 Hz or cycles per second is assigned to each colour. For this Project TSLC used the Photron.
- The Photron is an effective, portable device that provides a very wide and balanced spectrum of white light from a Xenon gas strobe lamp source driven by electronic circuitry that enables the flash rate to be varied between 0 – 60 flashes per second. The flash accuracy is +/- 00.1 flashes per second and is displayed on an LED display.
- Internal lenses diffuse the sharp image of the lamp in order to relax focus and accommodation as well as filtering out ultraviolet light and the viewing lens system creates a uniform circular beam pattern of



approximately 7" diameter at the viewers face. Viewing should be done in a darkened environment and with a relaxed gaze at a distance of about 15" – 20" from the lens.

- The light produced by the lamp is transmitted through changeable colour filters manufactured from high quality optical glass to isolate wavelength bands to make available eleven colours in addition to white. Each colour is normally viewed at a set flash rate. The colours and associated flash rates in Hertz (cycles per second) normally used, and used in this project, are:

Colour	Flash Rate in Hz	Colour	Flash Rate in Hz
Ruby	15	Red	15
Red/Orange	15	Orange	14
Yellow	13	Yellow/Green	11
Green	10.5	Blue/Green	10
Blue	9	Indigo	9
Violet	8	White	60 (Seen as no flash)



The expected result of LWS is an expansion in the student's visual fields of awareness and an example of improvement for the left eye is shown.

Both AIT and LWS were scheduled during school hours on Monday to Friday for two weeks. Each day the first LWS session was delivered immediately

following the first AIT session. The second LWS session was delivered immediately before the second AIT session.

The mid-term auditory assessments were performed during the intervening weekend following the first therapy week and the final auditory, visual and developmental screening assessments performed during the weekend following the second therapy week.

Neuro-developmental Programme (NDP)

The Neuro-developmental Programme (NDP) was scheduled to commence in the second half of the Spring Term, w/c 13 April 2015 **following** the completion of AIT and LWS. School staff were present during the NDP assessments. TSLC also provided training for staff in delivery of the NDP programme within the school timetable to participating students. NDP protocol for each student was for about 10 minutes per school day for approximately 6 weeks. Whilst this report provides information about improvements in **screening** results before and after the AIT and LWS therapies it does not deal with results from the NDP programme.

Summary of Initial Results

The project was not intended as a research project but for interest TSLC did do some analysis of the measurements and results obtained during testing. Only some of the results are included in this article.

TSLC worked with 12 out of 16 of the Project participants and these 12 were assessed by and received therapies from TSLC with the aim of assessing their sensory profile and attempting to improve it on the basis that how the sensory systems function has a major impact on performance. There was evidence of change and improvement based upon pre and post-therapy testing of the sensory systems. Based upon previous experience it was hoped and expected that any sensory improvements would also manifest in observable improvements in the students social, emotional, behavioural and academic

performance. If so, this would help them become more confident and independent learners, able to benefit better from tuition and other educational opportunities, reduce the level of SEN support and enable them more easily to achieve the potential indicated by their intellect. It is TSLC's experience that following the therapies, improvement in functional performance develops over a period of several months although for some it may be more rapid. Improvements would normally be assessed based upon:

- a) Pre and post-therapy results
- b) Observational feedback from parents and carers, teaching staff and the students themselves, at 1, 3, 6 and 9 month intervals
- c) Wherever possible in a project such as this, the school would provide formal academic pre and post- therapy assessments

Tables of raw data from TSLC's assessments, although not all included in this report, formed the basis for some charts which indicate change for students, both individually and also as a group. It would be interesting to perform an analysis with a larger group.

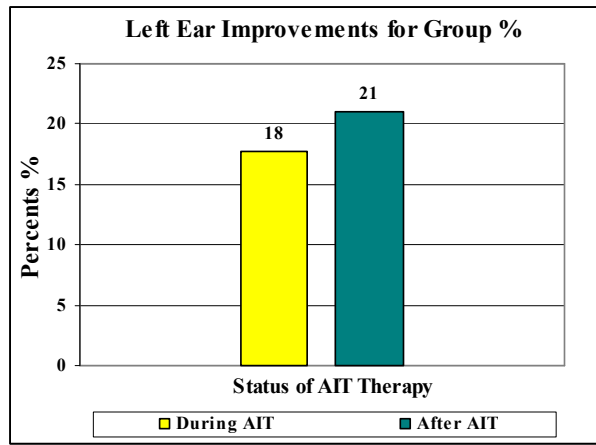
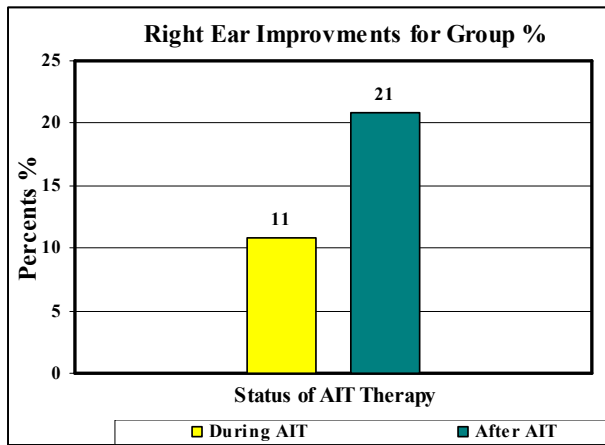
Some data and results can be found below. The data set is small and does not deal with a heterogeneous group in respect of formal diagnoses, however there were some interesting trends which were confirmed by improvements in behaviour and academic performance developing over a period of several months following the provision of AIT and LWS therapies.

Recognising the fact that sensory difficulties affect performance is crucial to providing suitable and affective SEN help. By improving auditory and visual processing, we improve sensory integration. This part of the Project demonstrated that improvements in performance could be obtained with a group of mainstream, secondary school SEN pupils with a range of difficulties. This was achieved through the use of AIT and LWS during a delivery period of only two weeks following the initial assessments and with minimal disruption to parents, carers, teachers, students or their academic studies.

Auditory Results

Before AIT all of the students had hearing generally classed as 'within normal limits'. None exhibited any serious hearing deficit that would normally attract attention, although the responses of participant 3, especially with her left ear, were of potential concern. Out of the group of twelve students, eight (66%) showed hypersensitivity (oversensitive) peaks at one or more frequencies. Three students (25%) had hypersensitive peaks on the right ear only, five (42%) on the left ear only. One student (8%) was hypersensitive on both ears. There were five students (42%) with some residual hypersensitivity at the end of AIT but the peaks were less steep and there were fewer of them.

Variations from the ideal flat hearing profile of 0dB HL affects auditory processing and impacts learning in the classroom. At the end of the therapy the **Group Total Variations** from the ideal had improved from 1150 to 910 for the right ear) and 1215 to 960 for the left ear. The data analysis is not included in this article but the chart below indicates the percentage improvement at both the mid point and end of AIT.

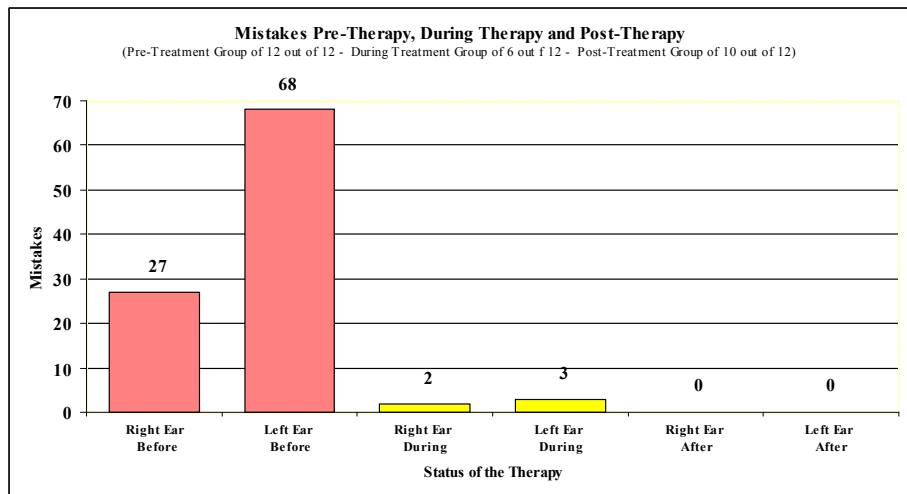


Representing Percentage of Improvements for All Group During and After AIT Therapy. A Higher score here (bigger bar) represents an improvement

Nine (75%) students showed improvement in individual Participant Totals. It is interesting that the three participants (1, 2 and 4) who did not show improvements on this measure did show general functional improvements. (See Observations and Feedback on Students) Text omitted. SLC agree.

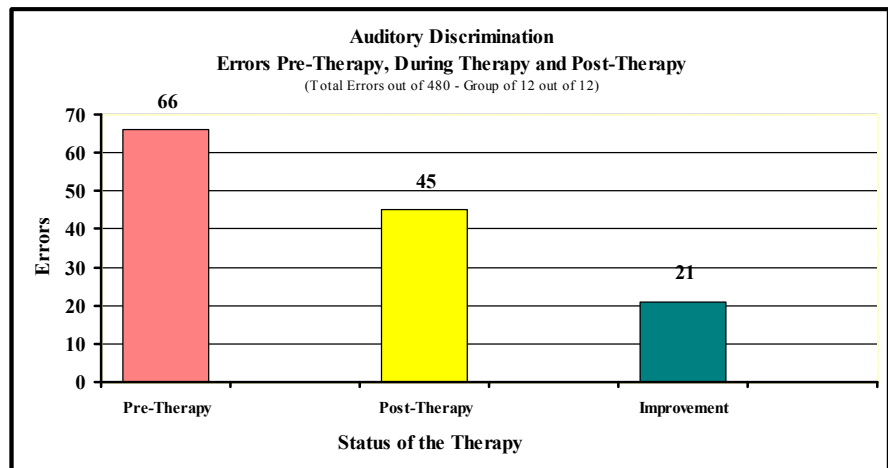
Considerable improvements were also noted for the Group in both the Selectivity and Auditory Discrimination results as can be seen to the right.

The numbers on the chart above relate to the number of mistakes made during testing with the right and left ears both before, during and after therapy. Better understanding of inflexive speech is a common result of such improvements.



Group Results Selectivity, represented by mistakes made on both ascending and descending scales

Auditory discrimination has clearly improved with therapy. It was also observed that not only did accuracy improve but generally, so did speed of response during testing after the therapy. It is expected that these improvements will translate into improved performance and increased confidence, especially in social and academic situations.



Group Total Errors Made in Wepman Test of Auditory Discrimination

Visual Results

When considering the visual data, we focused on the results of Colour Visual Field of Awareness testing.

- We were only able to obtain any Visual Field of Awareness test results for 11 students.
- Of these students 100 % had Visual Field of Awareness restricted to less than ten degrees, on one or more colour, and for one or more eye.
- Six out of eleven (54 %) had a maximum Visual Field of Awareness restricted to less than ten degrees on one or more colour and for one or more eye. Only two students had a field as large as 15%, and then only with one eye.
- Only 8 out of 12 (66%) were able to complete the full VFA testing for **all** colours.

When there are no uncompensated visual acuity problems such poor results are indicative of visual stress.

Participant		Left and Right Visual Fields	Pre-Treatment Visual Fields Min/Max		Post-Treatment Visual Fields Min/Max	
P1	D13452	R	4	15	4	17
P1	D13452	L	6	14	7	15
P2	D13490	R	5	13	7	16
P2	D13490	L				
P3	D13476	R	2	15	4	15
P3	D13476	L	1	7	3	14
P4	D13455	R	4	13	1	11
P4	D13455	L	6	13	5	14
P5	D13454	R	2	11	4	15
P5	D13454	L	3	12	5	16
P6	D13506	R	1	8	4	10
P6	D13506	L	1	5	5	9
P7	D13504	R	5	10	10	14
P7	D13504	L	5	10	10	15
P8	D13507	R	1	4	5	10
P8	D13507	L	1	5	5	10
P9	D13505	R	1	6	4	8
P9	D13505	L	1	5	5	9
P10	D13509	R	3	8	12	17
P10	D13509	L	5	9	12	17
P11	D13508	R	2	6	5	10
P11	D13508	L	1	6	4	9
P12	D13457	R				
P12	D13457	L				
Group Average			3	9	6	13

The visual fields assessment records the points, measured in degrees from a focus point, at which the colour of a target is identified by a participant as it moves in from the periphery. Four colours are used – red, green, blue and white on each of seven meridians.

Each eye was tested separately but only at the **before** and **after** therapy stages.

This raw data (not shown in this article) was tabulated and used to calculate the effective solid angle area in steradians for each colour, for each eye, and for each student at both the **before** and **after** therapy stages.

Only 8 out of 12 participants were able to complete the **full** VFA testing for **all** colours. For these Visual Field Area averages of the four colour fields for each eye and each student were also calculated as were the percentage improvement in Visual Field Area, by Participant and Colour. (*not shown*)

Participant Visual Fields maximum and minimum results, pre and post therapy.

Larger numbers are better.

The table below indicates the significant improvements seen in the students Visual Fields of Awareness.

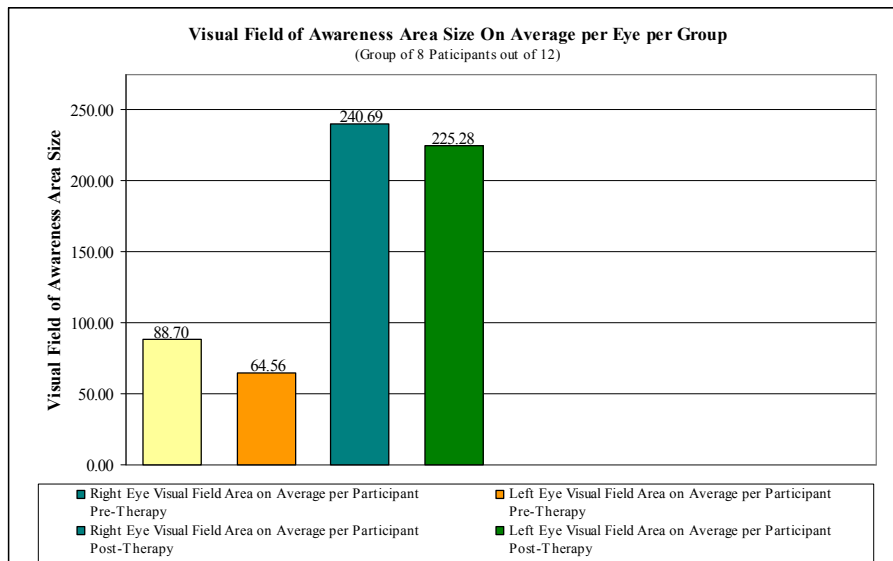
	Minimum VFA less than 3 degrees for one or more colour and for one or more eye.	Minimum VFA less than 10 degrees for one or more colour and for one or more eye.	Maximum VFA less than 10 degrees for one or more colour and for one or more eye.	Maximum VFA more than 15 degrees for one or more colour and for one or more eye.
Initial Testing Before Therapy	54 % (6)	100 % (11)	55 % (6)	0% (0)
Final Testing After Therapy	8 % (1)	82 % (9)	27 % (3)	55 % (6)

Visual Field for a group of 11 out of 12 students.

The twelfth was not co-operative so no results were available.

Following AIT and LWS therapies it can be seen that only one student had a minimum field size less than three degrees and six students now had maximum field sizes of fifteen degrees or more.

A **Group Average** improvement was calculated for the 8 out of 12 participants able to complete the



full VFA testing for **all** colours. This data is shown graphically.

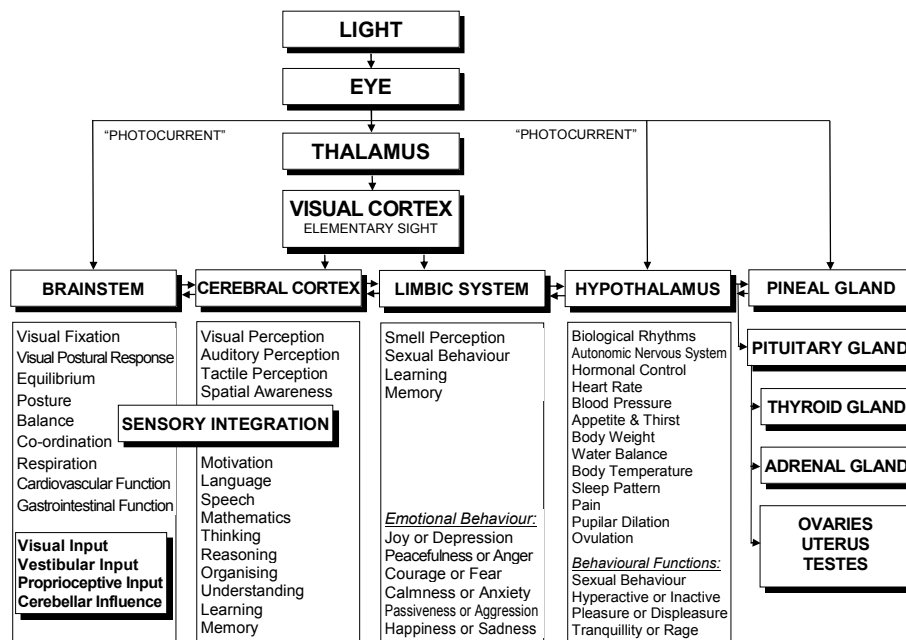
Representing Size of Visual Field of Awareness for the Left and Right Eyes for 8 out of 12 participants During and After LWS Therapy. A Higher score here (bigger bar) represents an improvement

An expanded Visual Field also allows more light to be absorbed to

drive the Autonomic Nervous System (ANS) which can have a beneficial impact on many other elements of sensory integration and performance. Because of the square law effect apparently small increases of visual field angle can result in large changes in the functional field area as can be seen above. These improvements can make visually related tasks easier and one student specifically commented that his vision had improved. Two others reported improvements in reading ability.

Light is required for vision but it has also been demonstrated that different colours of light affect us in different ways. For example, red light has been shown to stimulate the sympathetic nervous system,

while blue stimulates the parasympathetic nervous system. Light influences on other bodily functions are via pathways from the eye to the hypothalamus, which are unrelated to visual processing. A reduction in visual fields of awareness adversely affects metabolic performance as a result of influences on various parts of the brain that in turn are involved in the autonomic nervous system, sensory integration and many other bodily functions.

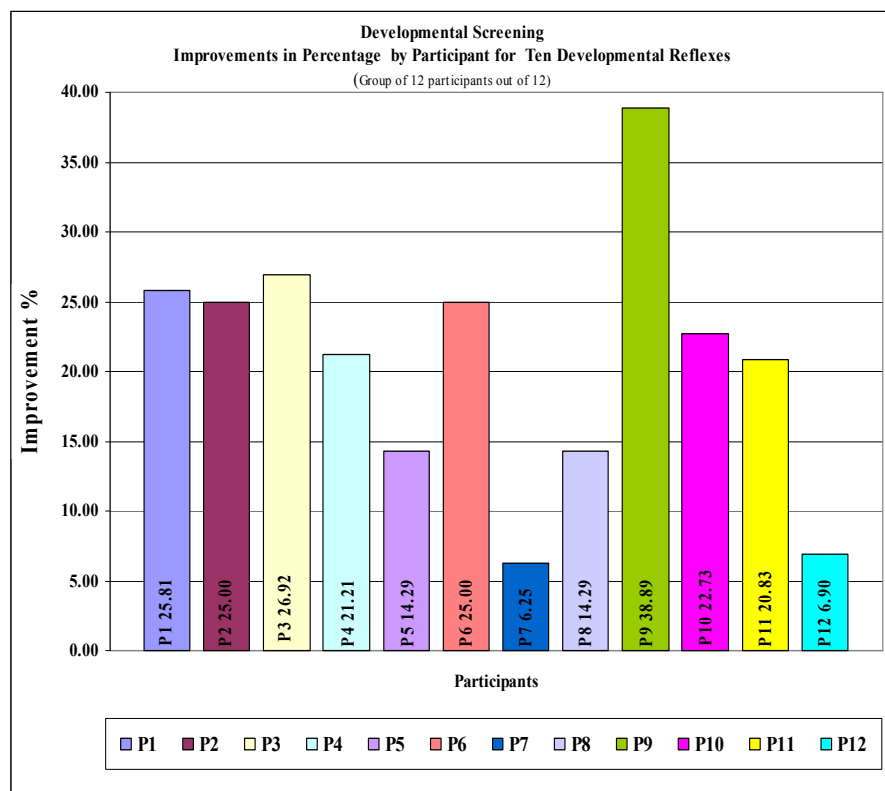


Pathways of Photocurrent Diagram – Dr John Downing PhD

Developmental Reflex Results (Screening)

The primitive reflexes should disappear by about the first year to eighteen months of development. Significant retention of the primitive reflexes will prevent the full emergence of the later postural reflexes.

The impact of an underdeveloped reflex system can be seen in a number of areas including ability to maintain attention and concentration, balance, co-ordination and gross or fine motor skills. Poor fine motor skills may cause difficulty with pen grip, leading to poor handwriting or making it difficult to write for long periods. Which in turn effects the ability to produce written work. This impacts on a student's ability to adequately produce written work in a sufficient quantity or timely fashion and will often result in a poor reflection of their actual knowledge.



The assessments before and after AIT and LWS therapies also included a ten test **screening** which looked for indications of retained primitive reflexes and underdeveloped postural reflexes.

Following the AIT and LWS therapies the results showed Group Average Improvements for every test.

In addition all students '**Individual 10 Test Average**' showed improvements ranging

from seven to thirty nine percent (7 % – 39 %). This was **before** any other inputs from other members of the Project team or the initiation of the full NDP Programme. These results are very gratifying. They correlate with improvements noted by the students themselves and it is expected that they will continue to correlate with later feedback about improved performance.

The results of the Neuro-developmental **screening** assessments provide interesting reading since all of the screening results display a general improvement amongst the participants indicating that developmental delay has been generally reduced amongst the students being tested.

Even though the Neuro-developmental level still remains well below the norm the results are very encouraging and of great importance, particularly since the improvements seen evolved over a very short period and were as a result of the AIT and LWS programmes only. Sensory difficulties and developmental delay contribute to emotional problems and even though no emotional testing was performed, anecdotal evidence from the participants themselves, as well as parents and teachers, strongly supports the idea that improvement occurred in self-esteem.

That the AIT and LWS had contributed to developmental improvements is gratifying but also expected by previous experience. Such improvements will themselves help improve performance, however most of the students will benefit from the Neuro-Developmental exercise programme that was provided following the later full NDP assessment. This programme is normally undertaken at home but it was planned to be incorporated into the school Project programme and it was demonstrated to

supervisory staff at the School. It is not known how effectively it was possible to implement it and no follow up review of the student's performance in this area has been made.

Following the AIT and LWS therapies improvements may be expected in areas such as:

- Behaviour
- Attention
- Ability to sit still
- Concentration
- Reading and comprehension
- Academic performance
- Balance and co-ordination
- Gross and fine motor skills
- Social relationships
- Self esteem

Following AIT and LWS it is also common to see improvements in verbal processing, auditory processing, reading and comprehension, and getting thoughts down on paper more effectively. When reading improves, it can be done for longer periods, with less tiredness and improved comprehension. Frequently spelling will also improve. This is particularly common in those who display dyslexic or AD(H)D type behaviours. This suggests that AIT and LWS stimulates a reorganisation and improved integration of auditory and visual connections which enhance the skills needed to become a better listener or a proficient reader. Clearly such an improvement is likely to improve academic performance as well as opening up the world of literature for pleasure.

Indications that this was the case were already evident at the time of the reassessment immediately after the therapies. Two students specifically commented that their reading had improved and one that he had started to enjoy reading.

Several students reported self-perceived improvements in their hearing and vision and many showed faster or more confident responses during testing. It is expected that improvements in functional performance will continue to develop over a period of several months.

We found improvements in sensory processing evidenced by improvements in auditory profile, visual fields of awareness and neuro-developmental profile. We found that the use of Auditory Integration Training (AIT) and Lightwave Stimulation (LWS) has proved beneficial in helping pupils with difficulties in social, emotional, behavioural or academic performance as reflected by pupil comments and feedback from parents and teachers.

Observations and Feedback on Project Students

(**Key:** Initial Status – standard text, Observations and Feedback about the students: *blue italics*)

Regardless of statistical evidence gathered, the true measure of success for any intervention is whether an individual or group of individuals begin to perform better and we received some very interesting feedback from the parents during the course of the project. A small sample is given below:

D13452 (P1) – During the assessment P1 has reported to us that she would like to be better at maths, art and science. We have also observed indications of social and emotional difficulties. She is shy and sensitive to new environments and changes, insecure at times, even sad, but with great potential. She found it difficult to follow sequential instructions. Her speech is quiet and monotonous. P1 was easily frustrated and irritable and found it difficult to cope with a variety of sensory inputs. Average All Aberrant Reflexes 56% - Major Dysfunction.

P1 wrote a Thank You card to TSLC: *From: P1 To Project Supervisor:*

“I am here writing to you about a thank you card. In this thank you card I thought it would be pleasant. Overall you did help a lot, without you we would not stand a chance.”

After the Treatment, she has been sleeping more soundly and she has been happier. She has also started to follow instructions with more ease.

D13490 (P2) – He was a very curious, playful and inquisitive young person. P2 is hyperactive and hypersensitive to sounds. His left eye was positioned noticeably inwards, which is an indication of major binocular difficulties. Average All Aberrant Reflexes 70% - Major Dysfunction.

During the final sessions of the therapy, it was observed that he had better impulse control and followed instructions more willingly. On his post-therapy assessment P2 had faster responses and overall improved performance. His final audiogram indicated more balanced responses and that there was no remaining hypersensitivity on the left ear.

D13476 (P3) – P3 struggled with social communication and found it difficult to engage with other people. She was a quiet girl with a sensitive nature. P3's left eye was positioned lower than her right eye. She complained that the headphones, used to obtain the audiogram, were hurting her and she needed to remove them many times. Average All Aberrant Reflexes 70% - Major Dysfunction.

The post-therapy Assessment indicated that her Visual Fields of Awareness and Audiometric thresholds are substantially more balanced. She also responded much faster and she was more cooperative.

D13455 (P4) – P4 was a polite and pleasant boy who was proud to be good at sports. He was very fidgety and sensitive to sounds. P4 found some of the visual tasks quite challenging and he said that his 'brain hurt'. During the assessment he cooperated willingly and his responses were very reliable. Average All Aberrant Reflexes 65% - Major Dysfunction.

During his NDP Assessment, he went to cover his ears when the fire bell went off and then dropped his hands and said that the bell doesn't bother me now.' P4's post-therapy Visual Fields of Awareness is significantly more balanced. His Audiogram outlined more balanced responses on both ears. The tests also indicated improvements in his vestibular system.

D13454 (P5) – P5 reported to us that he struggled with maths and that he needs one to one support. He was a polite boy with a shy, anxious nature and we were really pleased that during the assessment he cooperated willingly. P5 found it difficult to engage and his eye contact was not very good. He was very unstable when asked to stand still in certain positions. P5 had some articulation difficulties and at times he mispronounced some words. Average All Aberrant Reflexes 47% - Significant Dysfunction.

The hypersensitivity on both ears was eliminated post-therapy and his ability to discriminate between different words substantially improved, which would have a positive impact on P5's communication skills. He also reported that his vision has improved.

D13506 (P6) – He found it difficult to read because he saw the letters moving. P6 would also like to improve his attention span. He was inquisitive and observant and we were very impressed with the comments he made during the assessment. P6 has reported to us that he feels sleepy very often and that he found it difficult to concentrate. He told us that if he looked with both eyes; it was confusing as his eyes get 'mixed up' - one looks at one place and another somewhere else. We have observed that P6 bites his nails and sometimes scratches his hands. Average All Aberrant Reflexes 54% - Major Dysfunction.

He reported that his hearing is substantially better after completing the therapy and he is now able to hear both clearer and louder. P6 also demonstrated that his discrimination abilities have improved. Confidence is very impressive, reading improved – generally has started to like reading.

D13504 (P7) – P7 was a gentle, soft-spoken girl with a shy smile and a sensitive nature. During the assessment she was very cooperative and it was an absolute pleasure to work with her. She had some hypersensitivity on the left ear. P7 has reported to us that she gets easily distracted and we have observed that she had to stop speaking if there was any noise coming from outside.

We have also noticed that it takes a long time for P7 to formulate her thoughts and she tends to avoid speaking as much as she can. P7 has difficulties crossing the midline, which indicated a lack of inter-hemispheric integration. Average All Aberrant Reflexes 52% - Major Dysfunction.

During the post-therapy assessment, P7 was much happier. She also appeared more talkative and more engaged. P7 also demonstrated faster processing of information.

D13507 (P8) – P8 was very active and he found it difficult to control his impulses. He found it difficult to speak and became nervous. P8 stammers and at times it was quite difficult to understand what he was saying. During the assessment he found high pitched sounds uncomfortable and even somewhat painful. Average All Aberrant Reflexes 52% - Major Dysfunction.

P8 said he can hear better, in fact he heard his sister fall out of her cot and let his mother know. She was surprised he could hear that.

After completing the therapy, P8 reported improved hearing and demonstrated faster responses. His Visual Fields of Awareness had substantially expanded.

D13505 (P9) - She was easy to work with and she had a great sense of humour. P9 developed a slight headache when confronted with high frequency sounds. She preferred quiet places - at times noisy places bothered her. P9 was sensitive to light and her eyes hurt during some of the visual tasks. She had very restricted Visual Fields of Awareness. Average All Aberrant Reflexes - 62% Major Dysfunction.

She was talking more as well as with students in her form.

During the therapy, P9 became more talkative and dealt with social settings better. She reported that she feels that her reading skills have improved. P9's Visual Fields of Awareness expanded notably.

D13509 (P10) - Initially P10 appeared to be sad and subdued, although it did not take long for him to warm up and relax. He felt that his reading was too slow and that at times he lost his place. P10 found it difficult to concentrate at times and although his responses were not completely reliable, he was able to complete the audiometric test. He told us his concentration is 'ruined' and that he finds it extremely difficult to concentrate in a noisy environment. At times P10's mouth hangs open and we had also observed overflow movements to his mouth when P10 is using his hands. Average All Aberrant Reflexes 50% - Major Dysfunction.

Following the therapy, P10 needed less time to process information. He also managed to finish a book he had started reading. P10 noted that he has been sleeping 'better than ever'.

D13508 (P11) – He was very polite and willing to cooperate during the assessment. He was also very supportive and enquired several times if there was anything he can help with. P11 had difficulties with comprehension and required frequent repetition. He had also reported to us that he found it difficult to concentrate. He tilted his head over to the side when looking at objects and at times his left eye moved slightly inwards independently from his right eye. Average All Aberrant Reflexes 66% - Major Dysfunction.

During the post-therapy assessment, P11 demonstrated greater self-confidence. His Visual Fields of Awareness had substantially expanded and his Audiogram indicated a much more balanced response on both ears. P11 also noted that he 'feels fantastic'.

D13457 (P12) P12 found it difficult to control his emotions and he demonstrated behavioural difficulties. He also appeared angry and did not want to engage in any conversations. His systems are stressed and he found it difficult to cope with a variety of sensory inputs. P12 lost his concentration during testing and we were unable to obtain reliable results. Average All Aberrant Reflexes 70% - Major Dysfunction.

He demonstrated visual and auditory improvements.

TSLC Project Observations:

We are very pleased to have been able to take part in the School project and hope that it may herald a new approach to dealing with some of the underlying sensory problems that exist amongst students who present with special educational needs. Diagnosis and labelling alone is insufficient to explain away a student's difficulties and does not of itself provide specific help to overcome them.

We noted some of the students initially appeared to have some reservations regarding the assessments and therapies. Being 'singled out' to take part in the Project was in the beginning, something some of them were slightly wary of as it seemed being the subject of so much attention was not something they had seen in a positive light in the past. Due to the very short lead-in to the project and lack of time to disseminate much information about what they would be doing and why, this reaction was anticipated.

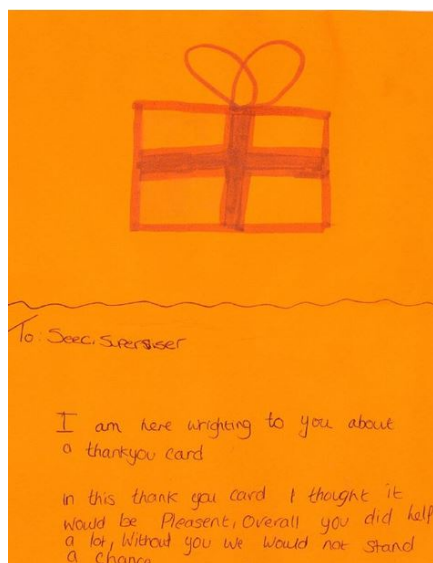
However, in a very short amount of time, as they began to know and trust us, things changed completely.

By the time our four weeks in the school was drawing to a close, the students were expressing just how much they would miss seeing us and spending time together. The students also formed relationships and strong bonds with their peers within the Project Group and it was clear that they had enjoyed these elements of the Project.

TSLC relied largely upon the school for feedback on the students after therapy and also on our own observations whenever we saw them. We met the students again briefly in June, obtaining some further feedback and hearing how they had got on since we last saw them. We met up again at the Project Celebration on 16 July 2015 when members of the Project team gave presentations to a number of other professionals at the Learning Zone in Wembley Stadium. The students who had participated in the project were in attendance and also made their own presentations. They had assembled well before the invited guests were due and during the time that the presenters were setting up they sat quietly, were composed and their behaviour was exemplary. The confidence exhibited by the students at the Project Celebration was extraordinary. All the Project team members who had been involved could see the students had shown considerable improvements and that their performance had far exceeded what had been thought possible before the project commenced. Their ability to sit quietly and be composed and interested in all the speakers and then, to perform in front of a large, adult audience was truly amazing. A tribute to the students and to their teachers, who had supported them throughout the Project.

Providing an Outreach within a school environment throws up a number of complications not least working within the confines of the school day and their timetable, whilst still ensuring students had access to their breaks. Hindsight is a great thing and we did make some suggestions for any future projects which may be helpful. However the School acted in a very professional manner, were very welcoming and co-operative during the period of the Project. There were many complex logistical arrangements to be made throughout and it was done efficiently and with the minimum fuss and disruption to the school, students, staff and TSLC.

TSLC noted initial scepticism by some of the students about what the project involved, however they were all generally very co-operative. Several became particularly interested in what they were doing, why they were doing it, how it could benefit them and the philosophy behind the programmes. They were often well aware of the difficulties they experienced both academically and socially and seemed to find it helpful to understand some of the reasons that might explain their difficulties.



At the end of our part of the project it was very gratifying to know that most of the students had found it a positive experience and several expressed regret that TSLC would no longer be directly involved with them. The perception that we had been of help and that the students were already perceiving benefit is best summed up by the sentiments expressed in a thank you card from participant one which said *'Overall you did help a lot, without you we would not stand a chance.'*

*'Thank you' card from D13452 (P1) to TSLC Therapist on last day of therapies.
(The card was accompanied by a handmade box of chocolates.)*