

## **The Orthoptic Treatment of Dyslexia using the LASD (clinical report)**

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### **Abstract**

The purpose of this paper is to give a brief background to the development of the Lawson Anti Suppression Device (LASD) and its use and report on a preliminary study to determine whether or not treatment with the LASD could benefit those with Dyslexia.

Eighty patients diagnosed as Dyslexic or having learning difficulties were included in the study. The subjects had a full orthoptic examination and their reading ability was determined by the Watts Reading Test. The subjects then underwent a course of treatment on the LASD with associated home exercises and were reassessed at the conclusion of the treatment.

### **Introduction**

In the late '60s and early '70s, research that was carried out by Banks et al on both animals and man determined that cells in the visual cortex responded best to gratings of a certain size (spatial frequency) and orientation. By rotating these gratings through 360° it was postulated that all cells would be stimulated. From this research came the CAM stimulator. Although early results were encouraging, (eg. Banks, Campbells, Hess and Watson) further studies found that it was the Near work, not the rotating gratings that improved visual acuity. Hence the CAM stimulator has not been incorporated into many orthoptists' amblyopia treatment regime.

At the time that the CAM was being developed, Alison Lawson also developed a machine, the Lawson Anti Suppression Device (LASD). It too used the rotating gratings, however on a larger scale, for easier use. She also incorporated a light source into the machine, which seemed rudimentary, as the eye is stimulated by light.

By the introduction of a peripheral rotation mechanism the LASD has continuity of gratings and has eliminated the central blank spot that exists in the CAM.

There are also significant differences in the way the LASD is used. Treatment sessions last one hour, not seven minutes. In previous studies (Banks et al and Shor et al) the amblyopic eye is treated while the good eye is patched.

In the Lawson treatment, a red filter is used to ensure macular fixation in the eye being treated while the good eye is patched in the first treatment only. In the next four treatments the red filter is placed over the good eye with nothing on the suppressing eye. Transparencies with predominantly red work are then used over the discs thus ensuring that the suppressing eye is the eye being used. Hence the Lawson method eliminates suppression while in the binocular state.

As Lawson was refining the LASD and its uses, a patient enquired as to its applicability to learning difficulties.

During the orthoptic examination it was discovered that the fixation of one eye was not steady. The patient did not have eccentric fixation, but rather, unsteady central fixation as described by Dayson. This indicated an unsteady fixation around and across the fovea which was not steady enough to quantify as central fixation or parafoveal fixation. While one eye steadily uses the fovea the other eye alternates between the fovea and a non-foveal point. If non-corresponding retinal points are stimulated, the brain has a choice between diplopia or suppression. In almost all cases the brain suppresses one image until the eye refoveates. This intermittent use of binocular fixation causes a disruption in the pathway of information through the eye to the brain, resulting in poor learning, concentration and application to a task.

Lawson devised a treatment regime that would fix this wandering fixation. Whilst being seated at the LASD for approximately 45-60 minutes, with the gratings rotating, the patient completes a variety of stencils covering: sequencing, basic sounds and reading, left/right orientation, spelling and visual memory. The largest grating is used on the first treatment and the sizes are gradually reduced.

Filters, patches and lenses are used as follows:

1<sup>st</sup> treatment: black patch on non-affected eye; red filter on affected eye.

2<sup>nd</sup>, 3<sup>rd</sup> and 4<sup>th</sup> treatments: red filter on non-affected eye, no patch on the affected eye (red stencils used).

5<sup>th</sup> and 6<sup>th</sup> treatments: red filter on non-affected eye, +&- 1.00 D.S. and +&- 2.00D.S. used on both eyes.

7<sup>th</sup> and 8<sup>th</sup> treatments: no red filter +&- 3.00D.S. on both eyes.

Between the first 3 treatments, the patient uses the red filter over the affected eye and the black patch over the non-affected eye at home whilst watching black/white television for 2 x half hours per day to reinforce the treatment at the clinic. A full range of orthoptic exercises are also given to ensure full convergence, bar reading to N5 and all stereograms can be completed easily as well as a range of remedial work and spelling.

This total retraining of the visual system and its use has shown some remarkable results.

The retraining of the unsteady fixation of the affected eye leads to an improvement in the

patient's concentration and application to a task and hence reading and spelling improves considerably.

### **Method**

80 patients attending the Alison Lawson clinic in Moss Vale between March and August 1998 were included in the study. All patients had been diagnosed as dyslexic or having learning difficulties.

A general and ocular history were taken with particular attention paid to symptoms normally associated with dyslexia.

The patient's dominant hand was noted and dominant eye was determined by the cardboard cylinder "telescope" method.

The Snellen's Chart was used to assess distance visual acuity followed by near vision, cover test, ocular movements, CNP, Maddox Wing, Worth's Lights and Wirt Stereotests.

Reading Age (RA) was determined by the Watts Reading Test. Finally, fixation was assessed. All of the subjects in the study had steady macular fixation in one eye, which is referred to as the non-affected eye, and unsteady fixation in the other eye, which is referred to as the affected eye.

After the initial assessment, patients underwent a course of treatment as previously described.

### **Results**

There were 55 (68.75%) males and 25 (31.25%) females. Figure 1 shows the range of symptoms. There was a strong familial tendency with 72 (90%) of subjects having a parent and/or sibling with the same condition. There were 8 pairs of siblings in the study. Age distribution is shown in Figure 2. The range was 5-60 years. The median was 8 years (10 patients).

There were no manifest squints in the group. 51 (63.75%) were orthophoric, 11 (13.75%) were esophoric, 18 (22.50%) were exophoric. There were no significant extra-ocular muscle imbalances with 5 (6.25%) having a slight over action of the Inferior Oblique muscle.

Convergence was generally good with 15 (18.75%) having full and voluntary convergence, 18 (22.5%) with a CNP better than 2cms, a further 33 (41.25%) between 2cms and 5cms.

There was one each with a CNP of 10cm and 15cms.

The Maddox Wing showed that all subjects fell into the range of eso 3 to exo 6 with 72 (90%) between 01 exo 2. No vertical deviations were demonstrated.

Worth Lights revealed 70 (87.5%) of subjects had suppression in the affected eye. The affected eye was the non-dominant eye in 70 (87.5%) of cases. When the coincidence of these 2 figures was noted we went back to our primary data and discovered that they were in fact the same 70 subjects. In the past, monocular tests of ocular dominance were said to

be ineffective in differentiating visual dyslexics, this is clearly not the case in our study. The eye with unsteady macular fixation = the suppressing eye = the non-dominant eye in 87.5% of cases. Cross dominance was present in 29 (36.25%) of cases.

By comparing figures 3 and 4 it can be seen that there was an overall improvement in V.A. in both affected and non-affected eyes following treatment. 33 (41.25%) of subjects showed improvement of at least one line in both eyes. The remaining 27 (33.75%) had equal vision that did not alter with treatment. 54 (67.5%) demonstrated an improvement in Near Vision after treatment (see Figure 5).

These improvements occurred in eyes that were considered normal and not requiring any treatment. It does make one wonder whether 6/6 should be the norm.

Figure 6 shows the defects in stereoacuity present before treatment compared with post treatment, 100% of subjects with stereoacuity to 40 seconds of arc. The improvement in Reading Age is shown in Figure 7. The Reading Ages in the Watts Reading Test range from 6.9 to 11.9 at the initial assessment. 8 subjects had a reading age of > 11.9. As this was outside the parameters of the test we were unable to measure their improvement. There were also 7 subjects who could not read at all before treatment so if they finished with a reading age of eg. 7 years it would only appear as an improvement of 3 months when the actual improvements was clearly much greater. The improvement that we could measure ranged from 6 months to > 48 months. The average was 21.12 months. The period of time over which treatment took place ranged from 2 to 12 weeks (Figure 8).

Those treated in 5 weeks or less were interstate patients who would come and have daily treatment for 1 week, go home with their exercises for a couple of weeks and return for a second week of daily treatments. The 4 patients who had their treatment over only 2 weeks had daily treatments for the whole 2 weeks. The median was 8 weeks (29 patients). The number of treatments each patient required can be seen in (Figure 9). The number of treatments to achieve steady binocular fixation is shown in Figure 10.

	Number of patients	%
Difficulty reading	78	97.50
Difficulty keeping place when reading	35	43.75
Non readers	7	8.75
Dislikes reading	57	71.25
Closes one eye to read	10	12.50
Fatigues with reading	25	31.25
Sore eyes and/or headaches with reading	32	40.00
Poor comprehensions	66	82.50
Poor spelling	64	80.00
Slow and/or difficulty with written work	46	57.50
Required scribe	4	5.00
Reversals – letters	42	52.50
Reversals – words	29	36.25
Anagrams	4	5.00
Difficulty with right/left	23	28.75
Difficulty with sequencing	14	17.50
Clumsy/poor gross motor	35	43.75
Poor fine motor skills	5	6.25
No good at any sport	4	5.00
Poor memory and organisation skills	20	25.00
Frustrated	23	28.75
Disruptive in class	8	10.00
Poor self esteem	35	43.75
Tutor	25	31.25
Speech therapy	8	10.00
Occupational therapy	3	3.75
Physiotherapy	1	0.80
Diagnosed ADD	8	10.00

Figure 1 Presenting symptoms

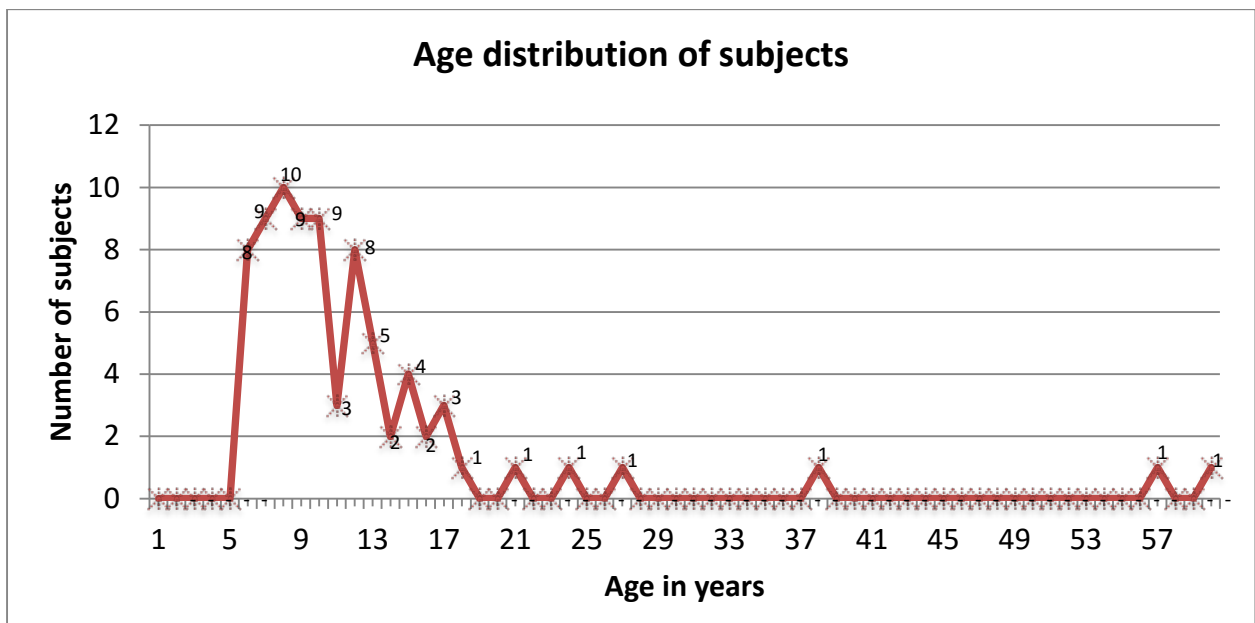


Figure 2 Age distribution of subjects

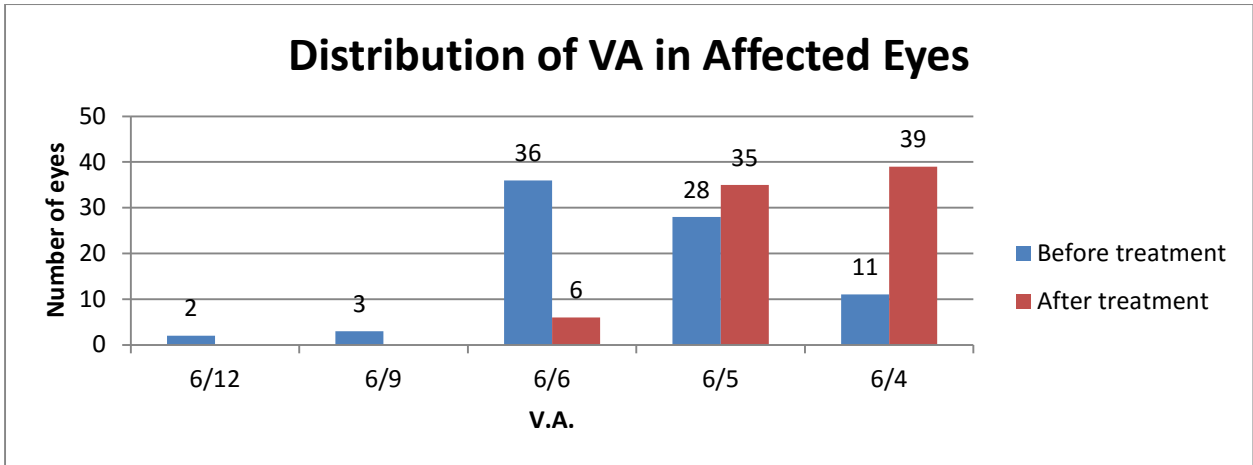


Figure 3 Distribution of VA in Affected Eyes

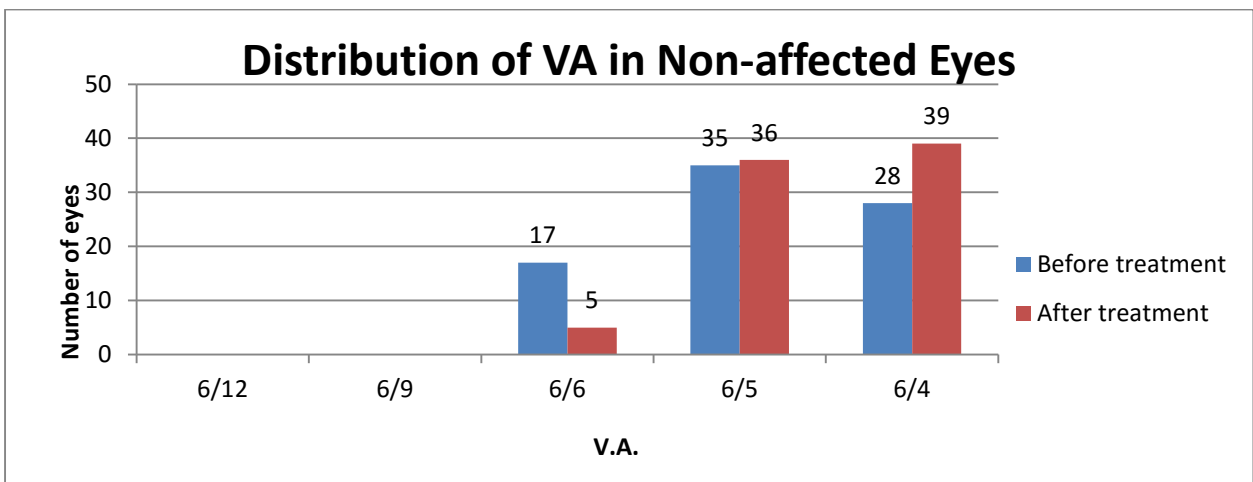


Figure 4 Distribution of VA in Non-affected Eyes

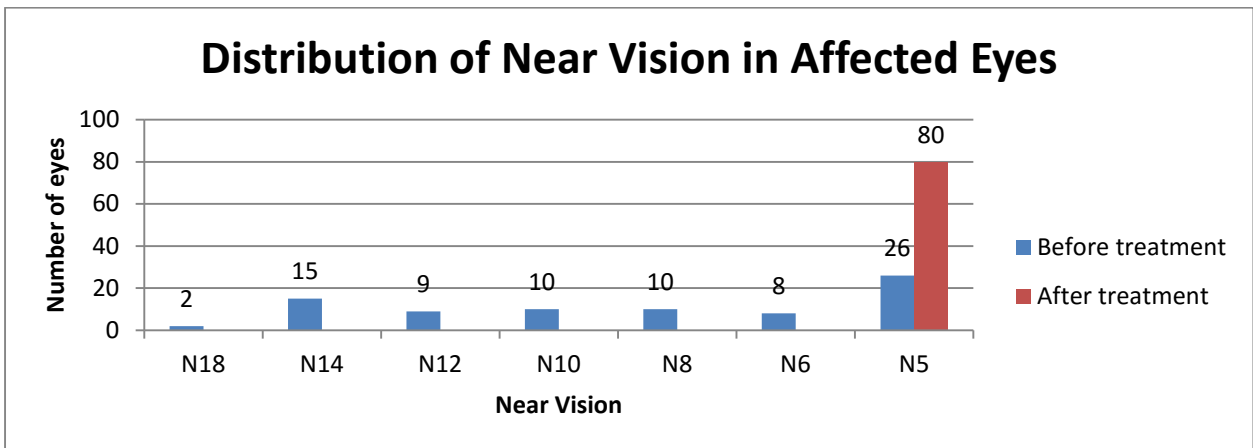


Figure 5 Distribution of Near Vision in Affected Eyes

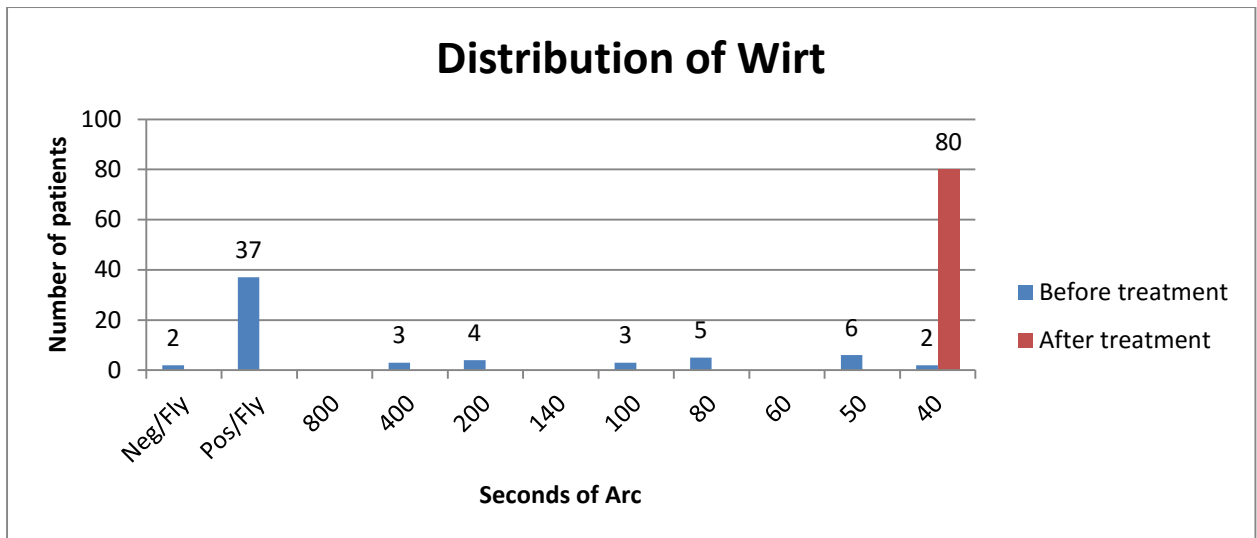


Figure 6 Distribution of Wirt

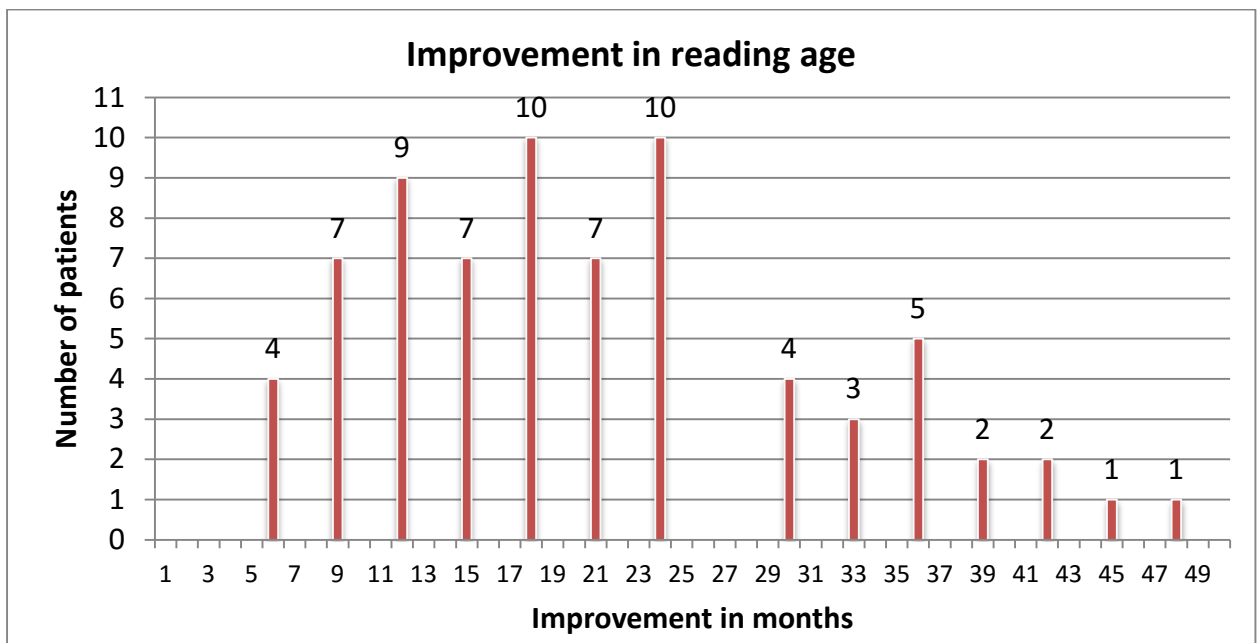


Figure 7 Improvement in reading age

<b>WEEKS</b>	<b>2</b>	<b>3</b>	<b>4</b>	<b>5</b>	<b>6</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>
<b>PATIENTS</b>	<b>4</b>	<b>2</b>	<b>4</b>	<b>2</b>	<b>7</b>	<b>5</b>	<b>29</b>	<b>10</b>	<b>10</b>	<b>1</b>	<b>6</b>

Figure 8 Period of time over which treatment took place

<b>TREATMENTS</b>	<b>7</b>	<b>8</b>	<b>9</b>	<b>10</b>	<b>11</b>	<b>12</b>	<b>13</b>
<b>PATIENTS</b>	<b>12</b>	<b>32</b>	<b>23</b>	<b>10</b>	<b>1</b>	<b>1</b>	<b>1</b>

Figure 9 Number of treatments

<b>TREATMENTS</b>	<b>3</b>	<b>4</b>	<b>5</b>
<b>PATIENTS</b>	<b>57</b>	<b>20</b>	<b>3</b>

Figure 10 Number of treatments to achieve steady Binocular Fixation

## Discussion

At the end of the treatment what have we achieved? All patients reported vast improvement in all areas. 66.25% of subjects demonstrated an improvement in Distance V.A. 67.5% of subjects demonstrated an improvement in Near Vision. All patients found reading much easier. Before treatment there were 7 non-readers, after treatment there were none. The average improvement in Reading Age was 21.12 months. Of the 57 (71.25%) who disliked reading before treatment, 53 (92.9%) now read for pleasure. The 10 patients who found it easier to read with one eye closed no longer feel the need for this.

Comprehension has greatly improved subjectively (comprehension was not measured in this study, we hope to include it in a future study). The 4 patients who had required scribes before treatment now felt confident without them. Reversals of letters and words ceased in all patients.

Those who had reported difficulty differentiating between right/left found this was no longer a problem.

Improved stereoacuity was shown in 75% of subjects which translated into improved coordination in all 35 patients who had been having difficulty in this area and several reported a sudden increase in the number of goals being shot, the number of home runs and one even experienced an increase in confidence in show jumping. Driving became much easier for one subject.

Fatigue, sore eyes and headaches disappeared, memories improved, disruptive behaviour ceased. Increased confidence was reported in 75 (93.75%) of patients. Poor self-esteem had been reported in 35 (43.75%) of patients. It was significant that only 2 of these has been under 10 years of age, 33 of them were adolescents and adults (all of the adults and adolescents in the study). This condition clearly has a major negative impact on their lives. All reported soaring self-esteem by the end of the treatment. Would these changes have occurred with remedial work alone? 25 (31.25%) of the subjects had already had remedial work and tutoring (in some cases for years) with no improvement. All subjects had explored all other avenues available to them without any significant improvement before they presented to us. Would these changes have occurred with convergence treatment only? It was a prerequisite of inclusion in this study that the subjects were orthoptically satisfactory (with the exception of 2 patients with less than satisfactory convergence) so convergence treatment alone may have been of limited help to some patients.

It must be emphasised that all 80 (100%) of patients reported improvements in their symptoms as soon as they achieved steady binocular fixation! In 57 (71.25%) this was achieved by the 3<sup>rd</sup> treatment. This is seen as compelling evidence that the absence of steady binocular fixation was the cause of these problems.



The following anecdotes are included for information:

- Pt # 6 (12 year old female) had 2.5 years of tutoring with no improvement. Teacher had stated that she had given up on her and told her parents just be happy with what she can do and don't expect too much. Parents brought her from Melbourne for treatment. In four weeks, RA had improved from 7.3 to 10.6.
- Pt # 20 (16 yr old F). Depressed taking Prozac, 2 suicide attempts. After treatment her parents reported her self-esteem greatly improved and she was actually happy.
- Pt # 23 (12 yr old M). Talented musician but not able to read music at all. After treatment passed first music exam ever.
- Pt # 24 (6 yr old M) Non-reader; doesn't even know letters. SG to test VA. Dyslexia diagnosed – Irlen lenses prescribed with no result. After 10 treatments over a four week period he was reading with a RA of 6.9.
- Pt # 40 (8 yr old F). High IQ but couldn't read at all. Father a school teacher and had given her daily tuition but to no avail. Six weeks later she had a RA of 8.3.
- Pt # 43 (60 yr old F). Poor self-esteem all her adult life. RA improved from 7.9 to >11.9. Now everything makes sense. Now she loves reading and has enrolled in a TAFE course that she had wanted to do for years.
- Pt # 65 (38 yr old M). RA improved from 8.9 to > 11.9. Noticed driving easier too.
- Pt # 74 (9 yr old M). Gave a very precise description of his suppression scotoma: He complained that letters faded and he would get a grey blur in the middle of what he tried to read (like after looking at a bright light). It wasn't there with either eye closed, only when both eyes were open. The symptom has not recurred since he achieved steady binocular vision at the 5<sup>th</sup> treatment.
- Pt # 79 (10 yr old M). One of 3 children all diagnosed with ADD and taking Ritalin. His paediatrician said he was such a severe case that he would never grow out of it. He had poor reading and writing and required a scribe. He couldn't read small print (all eye check-ups NAD). Very poor self-esteem. At the first visit he presented as a sullen and uncooperative child who would not make eye contact. RA was 8.6. By the 5<sup>th</sup> treatment he bounced into the clinic looking forward to the treatment. RA improved to 10.6. Mother says we have transformed their lives. As well as the obvious improvements at school she now has 3 happy children and a peaceful home for the first time ever. Two weeks after treatment finished he went for a routine treatment

at the paediatrician who was at a loss to explain the extraordinary improvement in his ADD and now feels he will grow out of it.

### **Conclusion**

The purpose of this study was to determine whether or not the LASD could help those with dyslexia: the answer is most definitely yes.

RA improved an average 21.12 months in an average 8 weeks. This however grossly understates the benefit to the patients and their families who now see endless possibilities where there was no hope.

As is often the case in circumstances such as these we are left with more questions than we have answers. Further studies are clearly required. This is just the beginning.