



Sunflower therapy for children with specific learning difficulties (dyslexia): A randomised, controlled trial

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KEYWORDS

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Osteopathy;
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Summary The aim of the study was to determine the clinical and perceived effectiveness of the Sunflower therapy in the treatment of childhood dyslexia. The Sunflower therapy includes applied kinesiology, physical manipulation, massage, homeopathy, herbal remedies and neuro-linguistic programming. A multi-centred, randomised controlled trial was undertaken with 70 dyslexic children aged 6–13 years. The research study aimed to test the research hypothesis that dyslexic children ‘feel better’ and ‘perform better’ as a result of treatment by the Sunflower therapy. Children in the treatment group and the control group were assessed using a battery of standardised cognitive, Literacy and self-esteem tests before and after the intervention. Parents of children in the treatment group gave feedback on their experience of the Sunflower therapy. Test scores were compared using the Mann Whitney, and Wilcoxon statistical tests. While both groups of children improved in some of their test scores over time, there were no statistically significant improvements in cognitive or Literacy test performance associated with the treatment. However, there were statistically significant improvements in academic self-esteem, and reading self-esteem, for the treatment group. The majority of parents (57.13%) felt that the Sunflower therapy was effective in the treatment of learning difficulties. Further research is required to verify these findings, and should include a control group receiving a dummy treatment to exclude placebo effects.
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Introduction

Dyslexia is a specific learning difficulty that affects up to 10% of school children.¹ The British Psychological Society² have defined the condition:

Dyslexia is evident when accurate and fluent word reading and/or spelling develops very

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incompletely or with great difficulty. This focuses on literacy learning at the 'word level' and implies that the problem is severe and persistent despite appropriate learning opportunities (p. 9).

Despite the emphasis on literacy difficulties, dyslexia would appear to include a wide range of symptoms including poor short-term memory, dyscalculia, visual impairment, speech disorders, and poor motor control,¹ as well as emotional difficulties such as poor self-esteem,³ clinical depression, chronic anxiety and conduct disorders.⁴ There is a lack of consensus on how dyslexia should be diagnosed, or treated.⁵ However, one systematic review has shown that traditional special educational methods have a limited impact on dyslexic children.⁶ Improvements through intensive reading interventions yield small to moderate effects over time, and there appears to be a subset of 25% of problem readers who do not respond to special education.⁷

Although dyslexia is typically thought of as a learning difficulty with educational consequences, there is increasing evidence that dyslexia is also associated with health difficulties. Autoimmune disorders, allergies, autism and schizophrenia are common amongst families where there are learning disabilities.⁸ Furthermore, Richardson⁹ observed that dyslexic children with the most severe symptoms of fatty acid deficiency (rough skin, dry skin and hair) have the most severe reading, spelling and short-term memory difficulties.

In the absence of satisfactory remediation through traditional special educational methods, there have been a number of alternative treatments offered for dyslexia.¹⁰ These include bio-feedback,¹¹ hypnotherapy,¹² music therapy,¹³ visual occlusion therapy,¹⁴ the neural organisation chiropractic technique,¹⁵ primary reflex therapy¹⁶ and DDAT exercises.¹⁷ With the dazzling array of 'wonder cures' available to parents, there is some concern about the marketing methods of unproven therapies aimed at children.¹⁸ In the United States, children receiving the neural organisation technique for learning and behavioural difficulties, as part of a state sponsored research programme, successfully won legal damages from a chiropractor for emotional and physical pain.¹⁹ Recently, Ernst²⁰ has raised health and safety concerns about complementary therapies aimed at children, while Malacrida²¹ has concluded that complementary practitioners advertising literature represents mothers of children with attention deficit disorder as inadequate parents with personal responsibility for 'healing' their children.

The use of manipulation therapies such as osteopathy was first proposed as a treatment for learning difficulties over 30 years ago.²² One study has indicated that osteopathic treatment for children suffering from neurological deficits led to greater developmental improvements, compared to children treated for non-neurological disorders.²³ Cardew²⁴ compared the structural, eye and tongue movements of 10 dyslexic children to 10 children without learning difficulties. She noted that there were no abnormalities amongst the control group but each of the dyslexic children failed a 12-category clinical assessment. She noted that each dyslexic child had difficulties with their posture, balance and eye movements and concluded that dyslexic children were at risk of chronic back pain as adults as a result of their structural abnormalities.

The Sunflower therapy

Sunflower therapy is a treatment that combines nutritional supplementation, herbal remedies, homeopathy, acupressure, osteopathic manipulation, applied kinesiology and neuro-linguistic programming. It is the belief of Sunflower therapists that children with learning difficulties are suffering from a range of structural, biochemical and psychological imbalances that can be addressed using complementary medicine to enable the child to 'perform better' and 'feel better'.²⁵

The Sunflower therapy comprises a series of treatment steps that assess structural integrity of the muscular skeletal system and the finer reflex control systems. Applied kinesiology is used by practitioners to diagnose biochemical and nervous system imbalances, and homeopathic and nutritional supplementation is provided to treat any detected abnormalities. Neuro-linguistic programming is used to address negative beliefs and behaviours that may prevent a child from reaching their educational potential. Actual treatment steps are tailored to the individual needs of the patient as determined by the Sunflower practitioner. Sunflower therapists are qualified health professionals, usually from an osteopathic or chiropractic background, that have received postgraduate training to enable them to work with children with learning difficulties. The therapy is based upon applied kinesiology testing; a controversial diagnostic system of muscle testing to detect physical and psychological imbalances in the body. There is a lack of high quality research evidence to support the use of applied kinesiology.²⁶ However, one study demonstrated that applied kinesiology is not

a clinically reliable method of detecting nutritional deficiencies in children when compared to standard laboratory methods.²⁷

In support of the Sunflower therapy, a pilot study was published on the effectiveness of applied kinesiology in the treatment of dyslexia.²⁸ The authors reported an average improvement for the treatment group of eight IQ points, compared to no improvement for the control group. They reported no improvement in verbal IQ but an average improvement of 12 points in performance IQ for the treatment group. Parents reported an average 33% improvement in their children's performance after treatment.²⁸ An interview based study of parents of eleven children with learning difficulties who had used the Sunflower therapy revealed mixed levels of satisfaction with treatment. Parents of seven children claimed to have observed improvements in their children since the start of treatment. However, four parents felt that the treatment had been clinically ineffective at treating their children's learning difficulties.²⁹

Methods

The purpose of the trial was to test the research hypothesis that dyslexic children would 'perform better' and 'feel better' as a result of treatment by the Sunflower therapy, when compared to a control group of dyslexic children. This was assessed using a battery of standardised cognitive, Literacy and self-esteem tests.

Study subjects

Using G*POWER, a sample size of 52 subjects was required for statistical power of 0.81, and once the asymptotic relative efficiency procedure ($3/\pi = 0.955$) had been applied for non-parametric testing, the required sample size was 55. Based on previous research on therapies for children, a 25% attrition rate was predicted. A sample size of 70 children was therefore selected for the trial. Children were recruited for the trial through national and regional press, television news coverage and direct mail to schools/dyslexia support/educational psychology organisations. Children aged 6–13 years were eligible for the trial where they had been diagnosed with dyslexia by an educational psychologist. Children were excluded where they had any serious medical conditions, or additional developmental/behavioural difficulties. Eligible children were randomised to the treatment group, control group or reserve group for the trial. The treatment group children were allocated to

five Sunflower practitioners based at three private clinics in England. Three practitioners were assigned six children each, one practitioner was assigned eight patients and one practitioner was assigned nine patients.

Ethics

The Roehampton University ethics committee approved the research study, and informed consent was obtained from each parent. Each practitioner signed a consent form to treat the children according to the trial protocol. Practitioners were financially remunerated for treating children in the trial.

Intervention

Each child in the treatment group was allocated eight appointments of 40 min duration each with their Sunflower practitioner. The actual content of each appointment was determined by the practitioner, as long as it was part of the Sunflower therapy as described in the treatment manual. A summary of the stages of assessment and treatment is provided in Table 1. Treatment fidelity was verified by a clinical audit of patient records at the end of the trial, along with an interview with each of the participating Sunflower practitioners.

The Sunflower therapy uses applied kinesiology to evaluate structural, biochemical and psychological status of the patient. Children in the trial were subject to a variety of techniques and treatments according to their particular needs, as determined by the practitioners screening and diagnostic approaches. However, the appointments centred on evaluating the structural integrity of the body and treating any neuromuscular problems identified by Sunflower practitioners. In addition, children were assessed for nutritional imbalances, allergies and intolerances using applied kinesiology, and provided with supplements and dietary advice in accordance with their perceived needs. Cranial osteopathy was used with some of the children, along with neuro-linguistic programming, acupuncture and homeopathic treatment to address their perceived neurological difficulties, personal anxieties, motivation towards learning and self-confidence issues. The actual nutritional or homeopathic supplements used in the trial varied between children according to their individual needs, as determined by the Sunflower practitioners through applied kinesiology and other diagnostic techniques.

Table 1 Stages of Sunflower therapy.²⁵

Stage 1: Initial consultation	Physical assessment and report of findings
Stage 2: Structural phase	Structural integrity tests are performed to evaluate the muscular–skeletal system, and normalise it for lying, sitting and standing positions. Children are assessed for posture, and a test of adaptation under distortion using wedges. Any abnormalities are treated using manipulation therapy
Stage 3: Neurological phase	Finer control reflex systems are evaluated. In particular, the performance of eyes, ears, gait, balance and coordination are tested, and treated using manipulation therapy
Stage 4: Psychological phase	Children are tested for basic reading, writing and numeracy. Negative neurological responses to educational tasks are monitored using applied kinesiology (AK), and treated using manipulation and nutritional therapy where appropriate. Neuro-linguistic programming (NLP) is used to explore negative responses, and homework exercises are provided where appropriate
Stages 5, 6 and 7: Chemical phase	Chemical imbalances are detected using AK. Glandular, liver, organ and intestinal functioning is assessed using AK. Nutritional supplements, a dietary plan and homeopathy are prescribed where appropriate
Stage 8: Psychological phase	NLP is used to reinforce positive thinking, and personal motivation. NLP is also used to address negative emotions and behaviour that inhibit self confidence, and educational development
Stage 9: Reassessment phase	Reassessments are conducted to evaluate progress

Outcome measures

In order to evaluate the effectiveness of the treatment, a range of cognitive, literacy and self-esteem tests were administered to each child just before the first appointment (time 1) and immediately following the last appointment of the treatment group (time 2). During the assessment, parents completed the Parenting Stress Index.³⁸ The tests used, along with an explanation of their purpose and their respective scoring systems are presented in Tables 2 and 3. Due to time considerations, the full Wechsler Intelligence Scale for Children (WISC)³⁰ was not administered, and WISC subtests were selected that are known to present difficulties to dyslexic children. Order of the tests was guided by recommendations in the WISC manual to ensure maximum test reliability. The WISC Information and Comprehension tests were included to monitor the stability of the test battery over time, and not expected to change significantly. In the revised version of the Wechsler Children's Intelligence Scale Manual, the test-retest differences in scores are lower in the verbal scale subtests than the performance scale subtests. This suggested that verbal subtests are less susceptible to practice effects over a short period of time and that verbal subtests more closely reflect educational achievement than the performance subtests. However, it has also been argued that performance tests reflect biological functioning and are more likely to change as a result of non-educational intervention than

verbal tests that are dependent on educational experience.³¹ Given this reasoning, it was hypothesised that dyslexic children would improve more on performance tests than verbal tests after using the Sunflower therapy. However, it was felt necessary to include verbal, Literacy and self-esteem tests in the assessment battery since these are areas that most concern parents of dyslexic children, and motivate their use of private and voluntary sector services.^{29,32}

Statistical analyses

For the purpose of statistical analysis, change scores were calculated for each child's test performance at time 1 to time 2. Non-parametric Mann-Whitney and Wilcoxon Signed Rank tests were used to analyse the test scores obtained in the trial. In addition to statistical significance, it is necessary to determine the practical significance of findings. For this trial, practical significance was defined as changes in test scores by one standard deviation or more.³⁹

Results

Sample characteristics

At baseline, the mean age of the children in the trial was 119.16 months (SD 21.10). The trial included 28 girls and 42 boys. At the start of the trial, 38 children were attending local authority

Table 2 Assessment battery.

Test name	Test description
<i>Performance tests</i>	
WISC coding ³⁰	A timed test of shape matching to measure processing speed, ability to discriminate, fine motor skills, hand/eye coordination and good fixation ability
WISC symbol search ³⁰	A timed test of visual matching of shapes requiring good visual perception, attention and concentration
Draw a person ³⁴	A non-verbal measure of general intellectual ability and fine motor skills where a child draws a picture of a man, woman and self
Matrix Analogies test ³⁵	A test of non-verbal abstract reasoning, problem solving and deductive logic
<i>Verbal tests</i>	
WISC digit span ³⁰	A test of auditory short-term memory, sequential memory, visualisation ability and attention using forward and reverse span numbers
WISC vocabulary ³⁰	A test of receptive language, ability to verbalise knowledge and auditory memory (e.g. What is a hat?)
WISC Similarities ³⁰	A test of verbal abstract reasoning, logical analytical reasoning and knowledge of relationships (e.g. How are an apple and banana alike?)
WISC Comprehension ³⁰	A test of social understanding, expressive language skills, verbal expression and long-term memory of social rules (e.g. What should you do if you cut your finger?)
WISC Information ³⁰	A test of general knowledge (e.g. who discovered America?). Poor test performance is sometimes found amongst dyslexic children due to poor recall of verbal sequential information, poor short-term memory and more limited reading experience
<i>Literacy tests</i>	
WORD Literacy test ³³	A test of spelling, individual word recognition and reading comprehension
<i>Self-esteem</i>	
Chapman and Turner Reading Self-Concept ³⁷	A test of Reading Self-Concept that includes perceptions of competence in reading, perceptions of difficulty with reading and attitudes towards reading (e.g. do you look forward to reading?)
Burden Myself As Learner scale ³⁶	A test of academic self-perception and confidence (e.g. I'm good at doing tests)
Parenting Stress Index ³⁸	A test of parental distress, difficult child characteristics and dysfunctional parent-child interaction

schools, 25 children were attending independent/private schools and seven children were attending voluntary sector/church schools. At time 2, 35 dyslexic children had received Sunflower therapy and were re-tested, along with 35 dyslexic children from the control group. The mean length of time that elapsed between time 1 and time 2 test assessments for the children in the trial was 15.73 weeks (SD 2.33).

Baseline comparisons between the treatment group and the control group

Baseline test scores for both groups are presented in Table 4. With Bonferroni's adjustment applied for multiple testing, there were no statistically

significant differences between the groups on any of the tests administered at time 1. Using the guidance in the respective test manuals, it was apparent that the children were, as a group, of average cognitive ability with particular strengths in social reasoning (WISC Comprehension test) and verbal abstract reasoning (WISC Similarities test). The children's performance on the WORD Literacy test revealed low average performance in word recognition and reading comprehension. However, the mean score for spelling was over one standard deviation from the mean suggesting a particular weakness in this area; as might be expected from dyslexic children. The Burden Myself As Learner scores for the treatment group (Mean 51.6 (SD 16.27)) and the control group (Mean 52.7 (SD 15.01)) were well below published norms of 71.0

Table 3 Scoring system for test assessment battery.

Test name	Scoring system
<i>WISC tests</i>	
WISC coding	Scaled scores
WISC symbol search	Mean = 10
WISC digit span	Standard deviation = 3
WISC vocabulary	Range = 1–19
WISC Similarities	
WISC Comprehension	
WISC Information	
Matrix Analogies test	Stanine
	Mean = 5
	Standard deviation = 2
	Range = 1–9
Draw a person & WORD Literacy test	Standard score
	Mean = 100
	Standard deviation = 15
	Range = 40–160
Chapman and Turner	Mean of scale responses
Reading Self-Concept	Mean = 3.74 (SD = 0.56) based on standardisation sample ($n = 771$).
Burden Myself As Learner scale	Sum of item responses
	Mean = 71 (SD 10.5) based on standardisation sample ($n = 389$)
	Range of scores between 20 and 100
Parenting Stress Index	Sum of Item Responses
	Range of scores between 36 and 180
	Clinical significance = 90+

Table 4 Baseline test scores for both groups.

Test type	Treatment group Mean (SD)	Control group Mean (SD)
Draw a person	111.11 (25.10)	103.97 (19.77)
WISC Information	10.60 (2.59)	10.57 (2.47)
WISC symbol search	11.54 (3.78)	9.63 (2.34)
WISC coding	8.91 (3.08)	8.37 (2.78)
WISC digit span	10.51 (2.76)	9.91 (3.39)
Matrix Analogies test	4.77 (1.44)	4.86 (1.48)
WISC vocabulary	11.83 (3.37)	11.94 (2.44)
WISC Similarity	14.03 (3.27)	13.43 (3.38)
WISC Comprehension	14.57 (3.09)	14.97 (2.93)
WORD (reading comprehension)	89.89 (15.22)	94.23 (17.60)
WORD (word recognition)	90.83 (16.84)	93.66 (15.73)
WORD (spelling)	83.43 (11.02)	84.89 (12.34)
Reading Self-Concept	2.74 (0.88)	2.71 (0.85)
Myself As Learner	51.60 (16.27)	52.66 (15.01)
Parenting Stress Index	88.97 (24.29)	88.00 (15.93)

(SD 10.5). The Chapman and Turner reading self-concept scores of children from the treatment group (Mean 2.74 (SD 0.88)), and the control group (Mean 2.71 (SD 0.85)) were also below published norms of 3.74 (SD 0.56).

Within-group differences in the Sunflower trial

Tables 5 and 6 present the change scores for each group of children. The Wilcoxon Signed Rank test

for within-group differences in test scores between time 1 and time 2 are presented in Table 7. There were differences in test performance for both groups over time. Furthermore, there were a greater number of statistically significant test improvements in the treatment group, compared to the control group. However, the actual size of the change in test scores was small and not of practical significance. The results suggest that there were practice effects associated with the repeat assessment, particularly in relation to the WISC Similarities test and Matrix Analogies test.

Between group differences in the Sunflower trial

The Mann-Whitney test results for between-group change score differences are presented in Table 8. There were no statistically significant differences in the performance of the children on any of the cognitive or Literacy tests. However, there were statistically significant differences in the Chapman and Turner Reading Self-Concept scores and the Burden Myself As Learner scores between time 1 and time 2.

Table 5 Change scores for the treatment group.

	Mean	SD	95% CI (Mean)	Median (IQR)	95% CI (Median)
Draw a person	-1.8	18.9	-8.3 to 4.7	0.0 (13.5)	-5.0 to 0.0
WISC Information	0.4	2.1	-0.4 to 1.1	0.0 (2.5)	0.0 to 0.0
WISC symbol search	-0.2	3.4	-1.3 to 1.0	0.0 (4.0)	-2.0 to 1.0
WISC coding	0.5	3.0	-0.6 to 1.5	1.0 (3.0)	-1.0 to 2.0
WISC digit span recall	-0.4	2.6	-1.3 to 0.5	0.0 (2.5)	-1.0 to 1.0
Matrix Analogies test	1.6	1.2	1.2 to 2.0	2.0 (1.0)	1.0 to 2.0
WISC vocabulary	1.5	2.1	0.7 to 2.2	1.0 (2.0)	0.0 to 2.0
WISC Similarities	2.3	2.8	1.4 to 3.3	3.0 (4.0)	1.0 to 4.0
WISC Comprehension	1.6	3.1	0.5 to 2.7	2.0 (3.0)	0.0 to 2.0
WORD (reading comprehension)	8.2	13.4	3.6 to 12.8	8.0 (16.0)	2.0 to 14.0
WORD (word recognition)	2.2	6.7	-0.1 to 4.5	1.0 (6.0)	0.0 to 2.0
WORD (spelling)	2.8	6.1	0.7 to 4.9	3.0 (7.5)	0.0 to 5.0
Myself As Learner	12.6	10.6	8.9 to 16.3	12.0 (13.0)	8.0 to 18.0
Reading Self-Concept	0.3	0.6	0.1 to 0.5	0.3 (0.6)	0.0 to 0.3
Parenting Stress Index	-1.1	15.7	-6.5 to 4.2	0.0 (15.5)	-4.0 to 4.0

Table 6 Change scores for the control group.

Test type	Mean	SD	95% CI (Mean)	Median (IQR)	95% CI (Median)
Draw a person	0.3	17.2	-5.6 to 6.2	0.0 (15.0)	-2.0 to 4.0
WISC Information	0.2	1.9	-0.4 to 0.9	0.0 (2.0)	0.0 to 0.0
WISC symbol search	1.2	2.6	0.3 to 2.1	2.0 (4.0)	-1.0 to 2.0
WISC coding	0.3	2.6	-0.6 to 1.2	0.0 (2.5)	0.0 to 1.0
WISC digit span recall	0.0	2.4	-0.8 to 0.8	0.0 (2.0)	-1.0 to 1.0
Matrix Analogies test	1.1	1.3	0.7 to 1.6	1.0 (2.0)	0.0 to 2.0
WISC vocabulary	0.9	1.6	0.3 to 1.4	1.0 (2.0)	0.0 to 2.0
WISC Similarities	1.4	2.9	0.4 to 2.4	1.0 (3.0)	0.0 to 2.0
WISC Comprehension	1.0	2.4	0.2 to 1.8	0.0 (2.5)	0.0 to 2.0
WORD (reading comprehension)	3.7	9.1	0.6 to 6.8	0.0 (10.5)	0.0 to 8.0
WORD (word recognition)	-0.2	6.3	-2.3 to 2.0	0.0 (8.0)	-3.0 to 3.0
WORD (spelling)	1.5	5.4	-0.4 to 3.3	0.0 (6.5)	-1.0 to 2.0
Myself As Learner	0.5	4.4	-1.0 to 2.0	0.0 (4.0)	-2.0 to 1.0
Reading Self-Concept	0.0	0.3	-0.2 to 0.1	0.0 (0.3)	0.0 to 0.0
Parenting Stress Index	-1.3	5.5	-3.1 to 0.6	0.0 (4.5)	-2.0 to 1.0

Table 7 Wilcoxon signed rank scores.

Test type	Treatment group Z score	Sig. ($p < 0.05$)	Control group Z score	Sig. ($p < 0.05$)
Draw a person	-0.69	0.55	-0.04	0.966
WISC Information	-1.31	0.19	-0.65	0.517
WISC symbol search	-0.33	0.745	-2.62	0.009
WISC coding	-1.22	0.221	-0.88	0.378
WISC digit span recall	-0.87	0.384	-0.06	0.095
Matrix Analogies test	-4.68	<0.001*	-3.92	<0.001*
WISC vocabulary	-3.35	<0.001*	-2.86	0.004
WISC Similarities	-3.87	<0.001*	-3.04	0.002*
WISC Comprehension	-2.80	0.005	-2.21	0.027
WORD (reading comprehension)	-3.31	<0.001*	-2.14	0.032
WORD (word recognition)	-1.43	0.154	-0.15	0.881
WORD (spelling)	-2.40	0.017	-1.20	0.229
Reading Self-Concept	-2.93	0.003*	-0.66	0.512
Myself As Learner	-4.69	<0.001*	-0.36	0.719
Parenting Stress Index	-0.06	0.952	-1.21	0.227

*Statistically significant with Bonferroni's adjustment applied.

The Hodges–Lehmann non-parametric effect size for the Burden Myself As Learner scale was 12 points (95% CI 8–16 points), suggesting a large effect size associated with the treatment. In total, 29 children from the treatment group had improved in terms of their academic self-esteem by the end of the trial, compared to 12 children from the control group. Burden³⁶ indicates that normal academic self-esteem scores are in the 60–82 points range. Amongst children tested at time 1, 21 from the treatment group and 20 from the control group could be identified as having low academic self-esteem through their scores of <60. By time 2, 12 children from the treatment group and 21 children from the control group could be identified as having low academic self-esteem. The Hodges–Lehmann estimate of median differences between the groups on the Chapman and Turner Reading Self-Concept scale was 0.34 (95% CI 0–0.44). This is a small effect size and equivalent to responding more positively to one of the subscales of the Reading Self-Concept scale. In total, 20 children from the treatment group had improved in terms of their Reading Self-Concept compared to 5 children from the control group by time 2. Chapman and Turner³⁷ indicate that Reading Self-Concept scores below 3 are outside normal range. At time 1, 19 children from the treatment group and 15 children from the control group scored <3 on the Reading Self-Concept test. At time 2, 11 children from the treatment group and 16 children from the control group scored <3.

Table 8 Mann-Whitney change scores.

Test type	Z	Sig. ($p < 0.05$)
Draw a person	-0.53	0.599
WISC Information	-0.06	0.956
WISC symbol search	-1.70	0.09
WISC coding	-0.29	0.772
WISC digit span recall	-0.58	0.564
Matrix Analogies test	-1.64	0.102
WISC vocabulary	-1.19	0.236
WISC Similarities	-1.61	0.107
WISC Comprehension	-0.93	0.352
WORD (reading comprehension)	-1.72	0.085
WORD (word recognition)	-1.02	0.308
WORD (spelling)	-1.06	0.291
Reading self-concept	-3.60	<0.001*
Myself as learner	-5.16	<0.001*
Parenting Stress Index	-0.14	0.892

*Statistically significant with Bonferroni's adjustment applied.

Perceived effectiveness, and cost-effectiveness, by parents

Parents of children in the treatment group completed a questionnaire at the end of the trial to assess their views on the Sunflower therapy. In total, 17 parents (48.57%) felt that the Sunflower therapy was ineffective in the treatment of dyslexia, 10 parents (28.57%) felt that it was slightly effective and eight parents (22.86%) felt

the treatment was moderately to very effective. At the time of the trial, it was calculated that the cost of treatment per child would have been approximately £800. Parents were asked if they thought the treatment was 'good value for money' at that price, even though their children received free treatment as part of the trial. In total, 15 parents (42.86%) reported that they thought the Sunflower therapy was good value for money and nine parents (25.71%) reported that they thought the Sunflower therapy was not good value for money at £800. The other parents were either undecided or did not know if the Sunflower therapy was good value for money at £800. Overall, 14 parents (40%) reported that they could have afforded to pay for the treatment of their dyslexic child using the Sunflower therapy had it not been available for free as part of the trial.

Discussion

The claim that dyslexic children will 'perform better' as a result of the Sunflower therapy is not supported by this trial. However, children receiving the Sunflower therapy did appear to 'feel better' as indicated by the substantial improvement in academic self-perception measured through the Burden Myself As Learner test.³⁶ Furthermore, children receiving treatment did appear to make a small improvement in their reading self-esteem, as measured through the Chapman and Turner Reading Self-Concept test.³⁷ One explanation for the improvements in self-esteem, in the absence of significant cognitive or Literacy improvements, is placebo or Hawthorne effects. Due to the financial limitations of the trial, it was not possible to include a control group receiving a dummy treatment. However, this would be necessary to confirm specific treatment effects associated with the Sunflower therapy. At present, it is unclear if improvements in self-esteem by the dyslexic children were related to the treatment received, or more general attention factors associated with participation in a University research programme. It was also apparent that there were some improvements in the test performance of the control group over time, as well as the treatment group, highlighting the need for researchers to be mindful of 'practice effects' when evaluating novel therapies for children with learning difficulties.

Conclusion

The Sunflower therapy did not lead to cognitive or Literacy improvements for the dyslexic children

receiving treatment under trial conditions. It is possible that statistically significant educational improvements would have been observed if the trial had been conducted over a longer time frame, or using a larger sample size. However, when parents are expected to privately finance the treatment, it is reasonable for them to expect significant observable improvements in their children to remain motivated and compliant. On a more positive note, there was evidence that dyslexic children receiving the Sunflower therapy improved in terms of their academic self-esteem, and to a lesser extent, their reading self-esteem. This is an important finding since self-confidence has been identified as a major concern amongst parents of dyslexic children.³² Just over half of the parents of children in the treatment group reported that the Sunflower therapy was an effective treatment for dyslexia based on their personal experience of the treatment under trial conditions. While these parents may have been affected by social responding, it is worth noting that similar views on the effectiveness of the treatment had been reported by parents in an earlier study where they had privately financed a course of Sunflower therapy.²⁹

Given the wide range of complementary therapies available to parents of children with learning difficulties, and the significant private fees involved, there is an urgent need for high quality research studies to establish which, if any, of the treatments are effective. Special educational interventions such as phonological training are known to be associated with moderate effect sizes.⁶ A complementary therapy is unlikely to be widely adopted by either an education or health authority without research evidence suggesting a large treatment effect. Randomised, controlled trials are the only appropriate methodology for evaluating novel therapies for children with learning difficulties, since case-studies and other research methodologies that do not include a control group are likely to over-estimate treatment effects. In addition, there is a need for research studies to verify that dyslexic children do suffer from the range of structural, biochemical and psychological imbalances that complementary medicine practitioners claim to be able to treat. The diagnostic techniques of Sunflower practitioners are controversial and there are few high quality trials supporting the use of complementary therapies in the treatment of learning difficulties, or childhood disorders more generally. Further research is urgently required to support professional and parental decision-making in relation to the treatment of the specific learning difficulties of children.

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